

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

In the Matter of )  
 )  
Expanding the Economic and Innovation ) WT Docket No. 12-268  
Opportunities of Spectrum Through Incentive )  
Auctions )

**REPLY COMMENTS OF T-MOBILE USA, INC.**

Ari Fitzgerald  
Trey Hanbury  
Phillip Berenbroick  
AJ Burton  
**Hogan Lovells US LLP**  
555 Thirteenth Street, NW  
Washington, DC 20004  
(202) 637-5600

*Attorneys for T-Mobile USA, Inc.*

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Thomas Sugrue  
Kathleen O'Brien Ham  
Steve Sharkey  
Christopher Wieczorek  
Joshua Roland  
Indra Chalk  
**T-Mobile USA, Inc.**  
601 Pennsylvania Avenue, NW  
Washington, DC 20004  
(202) 654-5900

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## EXECUTIVE SUMMARY

The 600 MHz incentive auction represents the country's best near-term opportunity to help satisfy consumers' appetite for mobile broadband services. Careful planning of four features – the 600 MHz band plan, the forward auction, the reverse auction, and the broadcast repacking – promises to stimulate investment, promote competition, and accelerate mobile broadband deployment.

### The Band Plan

Commenters were virtually unanimous in recommending that paired 600 MHz operations occur above Channel 37, not on either side of this channel. This configuration offers flexibility for variable levels of spectrum clearing and responds to the predominant view among commenters that the greatest value and largest opportunities for competitive entry and expansion lie in maximizing paired spectrum bands. Incorporating at least 35x35 MHz of spectrum in this configuration will not only offer competitive carriers an opportunity to acquire critical, high-value low-frequency spectrum resources through competitive bidding, but also will allow up to three competitors each to acquire enough contiguous spectrum to operate at high levels of efficiency. So long as the Commission can license up to seven paired five-megahertz blocks, pairing the 84 megahertz above Channel 37 offers the greatest public benefits with the fewest and least extensive technical, economic and competitive deficiencies.

### The Forward Auction

The incentive auction may fail if too few participants join the bidding and the new spectrum auction leads to less competition in the marketplace for wireless services rather than more competition, which would benefit consumers and the federal treasury. One of the strongest deterrents to widespread participation in the 600 MHz auction is the prospect that bidding will be

pointless if the nation's two largest carriers – each of which has a market capitalization roughly ten times that of its next largest competitor – are given an unfettered ability to acquire all of the spectrum offered. Most commenters, therefore, support imposing a cap on spectrum acquisitions, such as T-Mobile's proposal to limit bidders from acquiring more than one-third of the spectrum below 1 GHz. In a highly concentrated, capital intensive market such as mobile broadband, dominant firms have a strong economic interest in maintaining and increasing market power. Excluding rivals allows such firms to charge more for existing service and relieves competitive pressure to innovate and invest in new offerings. Absent some type of cap on acquiring critical spectrum resources, the two largest carriers will have an incentive to pay a premium during the competitive bidding process not because they can realize greater efficiencies using that spectrum, but rather because acquiring the spectrum will allow them to foreclose competitors from the market. A pro-competitive cap on spectrum below 1 GHz must apply during the 600 MHz auction. After-the-fact divestitures would prevent or delay competitive entry or expansion and allow the largest carriers to select spectrum for divestiture that potential rivals would not choose due to its limited synergies, paltry scale, high development costs, or other factors. Furthermore, if a small number of incumbent providers end up with control over large amounts of spectrum, after-the-fact divestitures will not provide timely or effective remedies for competitors or consumers.

While a cap on spectrum acquisition during the auction is therefore necessary to ensure competition, it is not sufficient. Even if the two largest firms do not end up acquiring excessive amounts of spectrum within the 600 MHz band, they can raise rivals' costs and impede consumer choice by developing devices useable only in those segments of the 600 MHz band that they control. A rule against anticompetitive equipment segregation that thwarts interoperability is

therefore critical to the success of the band plan. A block-assignment policy that sufficiently diversifies holdings to prevent any one operator from exercising market power to foreclose rivals within the 600 MHz band from relying on spectrum blocks with the greatest scale will complement such a requirement.

In assigning geographic area licenses under the lead band plan, the Commission should use Major Economic Area (“MEA”) licenses, rather than Economic Area (“EA”) licenses as its primary geographic area. With a broader geographic footprint than EA licenses, MEAs reduce the exposure risk that a carrier might win some, but not all of the licenses they need to provide an economical service in the 600 MHz band. The larger footprint of MEAs minimizes the need for complicated package bidding in the 600 MHz auction. EAs can be used for areas with sufficient additional spectrum clearing and provide an opportunity for smaller carriers to provide service as well.

#### The Reverse Auction

The Commission can best encourage widespread participation in the reverse auction by adopting certain procedures and safeguards designed to maximize the information available to participating broadcasters and to provide as much certainty as possible, as soon as possible. Specifically, the Commission should:

- *Implement a sequential or staged approach to the reverse and forward auction, rather than a one-iteration reverse auction:* A staged approach will provide broadcasters crucial information about the extent of buyer demand for broadcast spectrum licenses that will better enable them to value their licenses.
- *Address the potential for unsatisfied closing requirements by adopting a take-it-or-leave-it option at the end of the auction:* A take-it-or-leave-it approach, which could be accomplished by one of several different mechanisms, would eliminate much of the uncertainty over how winning bidders will split the shortfall between their bids and the minimum price required by the clearing rule.

- *Limit broadcaster exit options to those that are provided by statute:* Allowing broadcasters to submit other types of bids beyond those set forth in the Spectrum Act would unduly complicate the reverse auction, introducing uncertainty that would chill broadcaster participation in the auction rather than encourage it.
- *Prohibit revocation of bids:* The Commission should treat reverse auction bids as irrevocable and binding to ensure that broadcasters will bid truthfully in the reverse auction, thereby maximizing predictability and participation.

### The Repacking

In devising a plan for the repacking process, the Commission should exercise its considerable discretion to implement measures designed to preserve the coverage area and population served by each relocated broadcaster to the extent reasonable, while promoting the auction's primary goal of reallocating spectrum for broadband deployment. In so doing, the Commission need not achieve identical coverage areas and service population. Instead, the Commission must only undertake "reasonable efforts" in the repacking process.

The Commission can meet that obligation while simultaneously addressing the many logistical and structural challenges posed by the relocation of broadcasters. Indeed, certain measures can reduce uncertainty about the repacking, ensure that broadcasters are made whole for relocating, and expedite the deployment of the spectrum for wireless use – all of which will encourage participation in the auction and maximize the amount of spectrum made available for broadband use. Specifically, the Commission should: (1) require broadcasters to provide inventories of equipment and facilities that will be affected by the repacking process and estimates of repacking costs; (2) gather information from television equipment manufacturers regarding the requirements, costs, and timeframes necessary for completing the broadcaster transition; (3) fix firm deadlines for various milestones that broadcasters must satisfy prior to receiving full payment for relinquishing spectrum rights or for reimbursement of relocation

costs; (4) implement a two-step reimbursement process whereby broadcasters receive an initial payment based on estimated relocation costs followed by a “true up” payment to reimburse additional reasonable costs that are incurred; and (5) encourage the Internal Revenue Service to permit reverse auction proceeds to be treated as an involuntary conversion such that the proceeds are deferred for income tax purposes.

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With pro-competitive, pro-consumer policies in place, the broadcast incentive auction will stimulate investment, spur innovation, and benefit American consumers.

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**I. INTRODUCTION**

T-Mobile USA (“T-Mobile”) submits these reply comments in response to the Notice of Proposed Rulemaking (“NPRM”) issued by the Federal Communications Commission (“FCC”) in the above captioned proceeding.<sup>1</sup> With hundreds of comments filed in this proceeding, the Commission has started to assemble an extensive record to help resolve the four key features of the 600 MHz incentive auction: the 600 MHz band plan, the forward auction, the reverse auction, and the broadcast repacking. The comments reveal several key areas of consensus and numerous viable options for success.

Many commenters endorse a band plan that maximizes paired spectrum, creates supplemental downlink spectrum, promotes interoperability, and enhances competition. The 35x35 MHz band plan that T-Mobile proposed creates more high-value spectrum for competitive bidding and wireless competition with fewer design trade-offs and interference hazards than other alternatives. Most commenters also recommend that the Commission, in crafting forward auction rules, consider the effect that the nation’s two largest wireless carriers could have on

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<sup>1</sup> Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, *Notice of Proposed Rulemaking*, GN Docket No. 12-268, FCC 12-118 (rel. Oct. 2, 2012) (“NPRM”).

forward participation if competitive safeguards are not implemented. Furthermore, a broad consensus has emerged around the need for the reverse auction to provide clear guidelines so that broadcasters have ample incentive to participate and to ensure that bids remain both accurate and binding. Finally, several commenters recommend sound steps to ensure that the repacking is conducted quickly and efficiently to ensure the spectrum resources freed by the incentive auction become available for wireless broadband use as quickly as possible.

## **II. THE PROPOSED 600 MHZ BAND PLAN**

The 600 MHz band plan represents perhaps the single most critical component to the success or failure of the incentive auction. Selecting the “right” band plan involves the balancing of innumerable competing goals in which the overly dogged pursuit of any one objective risks compromising or even thwarting the others. Push too aggressively on interference avoidance and the amount of available broadband spectrum could plummet. Stress expansion capacity too much and device costs could soar. Offer too many air interface options and inefficiencies could sap broadband capacity and destroy interoperability.

Amidst these band plan design choices, one point of general consensus has emerged: every commenter discussing the issue has recommended that the Commission first address the 84 megahertz of spectrum above Channel 37 and below Channel 52.<sup>2</sup> Focusing first on the 84

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<sup>2</sup> See, e.g., Comments of CTIA – The Wireless Association, GN Docket No. 12-268, at 21 (Jan. 25, 2013) (“CTIA Comments”); Comments of the National Association of Broadcasters, GN Docket No. 12-268, at 45 (Jan. 25, 2013) (“NAB Comments”); Comments of Sprint Nextel Corporation, GN Docket No. 12-268, at 7 (Jan. 25, 2013) (“Sprint Comments”); Comments of Verizon and Verizon Wireless, GN Docket No. 12-268, at 7 (Jan. 25, 2013) (“Verizon Comments”); Comments of AT&T Inc., GN Docket No. 12-268, at 32 (Jan. 25, 2013) (“AT&T Comments”); Comments of Sony Electronics, Inc., GN Docket No. 12-268, at 3 (Jan. 25, 2013) (“Sony Comments”); Comments of Belo Corp., GN Docket No. 12-268, at 18 (Jan. 25, 2013) (“Belo Comments”); Comments of Comcast Corporation and NBCUniversal Media, LLC, GN Docket No. 12-268, at 20 (Jan. 25, 2013) (“Comcast & NBCU Comments”); Comments of Google Inc. and Microsoft Corporation, GN Docket No. 12-268, at 32 (Jan. 25, 2013) (“Google and Microsoft Comments”); Comments of Motorola Mobility, LLC, GN Docket No. 12-268, at 9 (Jan. 25, 2013) (“Motorola Comments”); Comments of National Cable & Telecommunications Association, GN Docket No.

megahertz of spectrum above Channel 37 allows the Commission to maximize the number of high-value, five-megahertz paired spectrum blocks available for auction, creates the greatest opportunity for competitive entry and expansion, relies on cost-effective technology, and imposes the fewest number of compromises in design and performance. Allocating any spectrum cleared beyond 84 megahertz for supplemental downlink also helps carriers economically satisfy consumer demand for downlink capacity without creating additional interference or compromising other important Commission objectives.

Alternative band plans that do not maximize the number of paired spectrum blocks above Channel 37 offer too few opportunities for competitive entry and expansion, set unrealistically high (or low) expectations for state-of-the-art technology, or impose needlessly restrictive limitations on technical innovation and performance. Focusing first on the spectrum above Channel 37 – and specifically maximizing the number of five-megahertz pairs in this band segment – would allow the Commission to create a solid foundation of high-value paired spectrum with reasonable levels of design and interference tolerance.

**A. Widespread Support Exists for a Number of Core Elements in the 600 MHz Band Plan.**

1. Maximize Paired Spectrum.

The initial round comments reflect broad agreement that maximizing the amount of paired spectrum would increase the utility and value of the 600 MHz spectrum.<sup>3</sup> Maximizing the

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12-268, at 7 (Jan. 25, 2013) (“NCTA Comments”); Comments of Qualcomm Incorporated, GN Docket No. 12-268, at 4 (Jan. 25, 2013) (“Qualcomm Comments”); *see also Ex Parte* Letter from AT&T, Inc., Intel Corporation, National Association of Broadcasters, Qualcomm, T-Mobile, and Verizon Wireless to Gary Epstein and Ruth Milkman, GN Docket No. 12-268 (Jan. 24, 2013) (“Band Plan Principles Joint Letter”).

<sup>3</sup> *See* Comments of T-Mobile USA, Inc. GN Docket No. 12-268 at iii, 10, 13; Comments of Alcatel-Lucent, GN Docket No. 12-268, at 26-27 (Jan. 25, 2013) (“Alcatel-Lucent Comments”); AT&T Comments at 2, 18-19; Comments of Cellular South, Inc., GN Docket No. 12-268, at 6 (Jan. 25, 2013) (“C Spire Comments”); Comments of the Competitive Carriers Association, GN Docket No. 12-268, at 13 (Jan. 25, 2013) (“CCA Comments”);

amount of paired 600 MHz spectrum – through uplink and downlink bands in paired 5x5 MHz blocks as T-Mobile proposes (with the uplink channel located in the upper channels adjacent to the Lower 700 MHz band) – would yield a number of benefits.

First, maximizing paired spectrum would accelerate deployment of wireless broadband services to the public. As the initial round comments overwhelmingly show, paired spectrum is not only the industry preference, but also the industry standard, supported by the existing technology infrastructure.<sup>4</sup> Licensing the 600 MHz spectrum in paired 5x5 MHz blocks would allow wireless providers to leverage the existing technology to offer services in the 600 MHz band as soon as possible.<sup>5</sup> As noted by AT&T, most long-term evolution (“LTE”) providers today use Frequency Division Duplexing (“FDD”) technologies and therefore require “separate,

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Comments of the Consumer Electronics Association, GN Docket No. 12-268, at ii, 4, 18-19 (Jan. 25, 2013) (“CEA Comments”); CTIA Comments at 20, 22; Comments of Leap Wireless International, Inc. and Cricket Communications, Inc., GN Docket No. 12-268, at 5 (Jan. 25, 2013) (“Leap Comments”); Comments of MetroPCS Communications, Inc., GN Docket No. 12-268, at 21 (Jan. 25, 2013) (“MetroPCS Comments”); Qualcomm Comments at i-ii, 2; Comments of Research in Motion Corporation, GN Docket No. 12-268, at 8 (Jan. 25, 2013) (“RIM Comments”); Verizon Comments at v, 5-7.

<sup>4</sup> See, e.g., MetroPCS Comments at 21 (“Paired blocks generally are the strong preference of the industry, and are critical to support new entrants into a market.”); CEA Comments at 20 (explaining that because “[m]ost mobile broadband technologies operate on paired spectrum allocations, with one block dedicated to uplink communications, and the other dedicated to downlink communications,” paired allocations would “best facilitate the deployment of new wireless broadband services”); RIM Comments at 8 (explaining that, because “existing commercial standards are designed for paired spectrum operation,” “the pairing of spectrum assignments within the 600 MHz band is an important objective for the efficient deployment of services”).

<sup>5</sup> Many commenters agree that the Commission should auction paired spectrum in generic categories of five megahertz blocks. See CEA Comments at ii, 4, 18-19; MetroPCS Comments at 19-21; Qualcomm Comments at 5, 20-21; RIM Comments at 6-7; Alcatel-Lucent Comments at 24-25; AT&T Comments at 2; CCA Comments at 12; C Spire Comments at 6; CTIA Comments at 20, 22; Leap Comments at 5; Motorola Comments at 13; T-Mobile Comments at iv, 13-14; Verizon Comments, at v, 6, 15-16. As Motorola explains, five megahertz “blocks will align with a variety of wireless broadband technologies, including Wideband-Code Division Multiple Access (W-CDMA), High Speed Packet Access (HSPA), and perhaps most importantly LTE (when 5 megahertz blocks are aggregated to form 2x10 blocks).” Motorola Comments at 13; see also Alcatel-Lucent Comments at 25; CCA Comments at 12; CEA Comments at 18; C Spire Comments at 6; CTIA Comments at 20; MetroPCS Comments at 20; RIM Comments at 6; T-Mobile Comments at 14; Verizon Comments at 15. The Consumer Electronics Association highlights that fungible, 5x5 MHz paired blocks would “best enable providers to assemble the amount of spectrum they need to offer mobile broadband.” CEA Comments at 4; see also RIM Comments at 6. As AT&T explains, offering generic five-megahertz blocks “will greatly simplify the auction process, and it will also ensure denser (and thus more efficient) competition for the spectrum assets at issue.” AT&T Comments at 41; see also Verizon Comments at 16; Motorola Comments at 10.

dedicated uplink and downlink spectrum to provide LTE service.”<sup>6</sup> Further, even beyond LTE, paired spectrum will be critical for future wireless broadband technologies. As Alcatel-Lucent explained, paired spectrum will better prepare carriers in implementing and offering next generation technologies for which the broadband demands currently are unknown.<sup>7</sup>

Second, maximizing the amount of paired 600 MHz spectrum would enhance competition in the mobile broadband marketplace.<sup>8</sup> As explained by Alcatel-Lucent, the need to acquire paired spectrum will be “especially acute for new entrants and other carriers with limited spectrum holdings” because it offers these carriers the opportunity to obtain much needed low-frequency spectrum.<sup>9</sup> Paired 600 MHz spectrum plays an especially important role in promoting competition because it “offers extremely good propagation characteristics” that “can provide competitive operators and new entrants – especially those serving non-urban areas – with opportunities to efficiently deploy new services.”<sup>10</sup> Accordingly, the Commission should use this proceeding as an opportunity to adopt rules and policies that spur competition and lighten the multitude of barriers that wireless providers currently face to deploy service.

Third, maximizing paired spectrum best meets the needs of wireless broadband operators and represents a superior alternative to unpaired, time-division duplex (“TDD”) band plans supported by a handful of commenters. Prior to filing comments in this proceeding, Huawei predicted that “there will be very little interest in devices that support just LTE TDD within the

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<sup>6</sup> AT&T Comments at 18.

<sup>7</sup> Alcatel-Lucent Comments, at 26.

<sup>8</sup> See CCA Comments at 13; C Spire Comments at 6; MetroPCS Comments at 21; T-Mobile Comments at 5.

<sup>9</sup> Alcatel-Lucent Comments at 26.

<sup>10</sup> C Spire Comments at 7; see also CCA Comments at 13 (explaining that paired spectrum “will result in faster, more efficient deployment of 4G services,” and therefore “promote competition”).

mobile operator community.”<sup>11</sup> And with the sole exception of Sprint and Sprint’s subsidiary Clearwire, every wireless broadband operator filing comments in this proceeding sought an FDD allocation in the licensed 600 MHz band spectrum.<sup>12</sup> Given the overwhelming support for an FDD band plan, the Commission can reasonably expect bidders to favor an FDD band plan over TDD alternatives and bid correspondingly more money at auction for FDD than TDD spectrum. Recent economic analysis supports this conclusion. In 2011, for example, the Brattle Group economic consulting firm found that pairing the AWS-3 spectrum with spectrum in the 1755 MHz band would generate approximately \$12 billion at auction, compared to just \$3.6 billion if the AWS-3 band were auctioned on an unpaired basis.<sup>13</sup> More recent studies from the same authors affirm and expand this conclusion, finding that “the present value of profits from deploying unpaired spectrum is expected to be 40% lower than deploying paired spectrum, other things equal.”<sup>14</sup> Those findings are also consistent with a recent Huawei white paper, which surveyed auction results and concluded that “[m]obile operators have historically been able to purchase TDD spectrum at a lower price than FDD” primarily because there are “limited options for using TDD spectrum.”<sup>15</sup> Although auction revenues are not a primary goal of the 600 MHz proceeding, they offer a potentially helpful indicia of market value. Here, the record demonstrates that the vast preference for FDD will better meet the expectations of wireless broadband providers and, in so doing, generate more revenue than TDD band plan alternatives.

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<sup>11</sup> Daryl Schoolar, *LTE TDD Goes Mainstream: Mobile Ecosystem Puts Support Behind the Standard* 19 (Nov. 2012), available at <http://www.huawei.com/ar/static/HW-196675.pdf> (“Huawei TDD Report”).

<sup>12</sup> Sprint’s vendor Alcatel-Lucent also indicated that TDD operations might merit consideration. Alcatel-Lucent Comments at 3.

<sup>13</sup> The Brattle Group, *The Economic Basis of Spectrum Value: Pairing AWS-3 with the 1755 MHz Band is More Valuable than Pairing it with Frequencies from the 1690 MHz Band 1-2* (Apr. 11, 2011), <http://www.brattle.com/documents/UploadLibrary/Upload938.pdf>.

<sup>14</sup> Coleman Bazelon & Giulia McHenry, *Spectrum Value* 16 (Aug. 28, 2012), available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2032213](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2032213).

<sup>15</sup> *Huawei TDD Report* at 18.

The overwhelming majority of wireless operators want the maximum possible FDD allocation in the 600 MHz band. The parties also generally agree that unpaired allocations – such as a supplemental downlink offering – should occur only *after* the Commission exhausts the possibilities for paired spectrum.<sup>16</sup>

## 2. Maximize Opportunities for Competition During and After the Auction.

The record also reflects widespread agreement that the Commission should adopt rules and policies in this proceeding that promote competition during and after the auction.<sup>17</sup> Competition from rivals with sufficient scale motivates larger firms to provide competitively priced services and make investments in quality and innovation.<sup>18</sup> Competition among wireless carriers also encourages competition in complementary downstream markets, such as wireless infrastructure, mobile broadband devices, mobile applications, and the other goods and services that comprise the large and immensely important mobile data sector.<sup>19</sup>

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<sup>16</sup> CTIA Comments at 20 (“Given the desirability of paired spectrum, and based on the analysis to date, the Commission should emphasize pairing spectrum bands and should not allocate spectrum for supplemental downlink unless no pairing option is feasible.”); Alcatel-Lucent Comments at 26-27 (urging the Commission “to adopt a band plan that makes as much paired spectrum available as possible,” and noting the myriad reasons why “potential bidders would prefer to acquire paired blocks over unpaired blocks); Verizon Comments at 17 (stating that the “Commission should license any cleared spectrum that cannot be efficiently licensed in paired spectrum blocks for supplemental downlink”); Qualcomm Comments at 15 (“[I]n areas of the country where additional TV broadcast spectrum is recovered, that spectrum should be used to support SDL operations.”); C Spire Comments at 7 (“[T]he Commission [should] offer unpaired spectrum *only after* the Commission has paired as many blocks as possible in a market.”).

<sup>17</sup> For example, the Competitive Carriers Association has asked the Commission to reaffirm its “longstanding commitment to inclusive auction design” that includes “structural features to ensure broad and balanced participation by a wide range of interested parties, consistent with its statutory directives.” CCA Comments at 4. Likewise, C Spire urged the Commission to adopt a band plan that “promote[s] competition and the broadest possible deployment of mobile broadband services.” See C Spire Comments at 7.

<sup>18</sup> C Spire Comments at 2-6; Comments of Free Press, GN Docket No. 12-268, 14-15 (Jan. 25, 2013) (“Free Press Comments”); Comments of Public Interest Spectrum Coalition, GN Docket No. 12-268, 66-68 (Jan. 25, 2013) (“PISC Comments”); Sprint Comments at 7-10; U.S. Cellular Comments at 30-34; Comments of the Writers Guild of America, West, Inc., GN Docket No. 12-268 (Jan. 25, 2013) (“Writers Guild Comments”); CCA Comments at 8.

<sup>19</sup> See Writer’s Guild Comments at 2-4; U.S. Cellular Comments at 31-32; Free Press Comments at 14.

An essential prerequisite for competition is providing enough spectrum to support competitors.<sup>20</sup> Incorporating at least 35x35 MHz of spectrum not only increases the number of the high-value paired spectrum blocks offered during the competitive bidding process, but also provides an opportunity for *three* operators in every market to acquire the 20 megahertz of paired spectrum (10x10 MHz) to support a high-capacity, high-efficiency mobile broadband service.<sup>21</sup> Achieving at least three operators in every market affords consumers greater choice in wireless carrier and moderates upward pricing pressure by ensuring that at least one other competitor has spectrum space alongside the two largest carriers.<sup>22</sup> In contrast, proposals in which only two licensees have the opportunity to acquire 10x10 MHz, such as proposals to adopt smaller pairings of 25x25 MHz or 20x20 MHz, create the potential for the two dominant carriers to further consolidate their spectrum share and to engage in anti-competitive behaviors, such as tacit signaling and accommodating that can reduce consumer surplus.

### 3. Conduct a Timely Auction.

Numerous commenters joined T-Mobile in supporting the Commission's goal of meeting the nation's pressing demand for additional broadband spectrum by conducting the 600 MHz incentive auction in 2014.<sup>23</sup> Given the burgeoning demand for additional wireless broadband spectrum,<sup>24</sup> the Commission should view skeptically suggestions to take as much time as

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<sup>20</sup> See PISC Comments at 67; C Spire Comments at 6-7; Sprint Comments at 3; CCA Comments at 10.

<sup>21</sup> T-Mobile Comments at 12.

<sup>22</sup> U.S. Cellular Comments at 33-34; Sprint Comments at 7-8.

<sup>23</sup> See, e.g., CTIA Comments at 8; T-Mobile Comments at 60; U.S. Cellular Comments at 53; CEA Comments at 17; Comments of Mobile Future, GN Docket No. 12-268, 2 (Jan. 25, 2013) ("Mobile Future Comments"); Verizon Comments at 56.

<sup>24</sup> Comments of Cisco Systems, Inc., GN Docket No. 12-268, 4 (Jan. 25, 2013) (Cisco Comments); CTIA Comments at 8-11; Motorola Comments at 4; PISC Comments at 12; Verizon Comments at 2-3; Comcast & NBCU Comments at 38; RIM Comments at 3; MetroPCS Comments at 1-2; Comments of the Telecommunications Industry Association, GN Docket No. 12-268, 3 (Jan. 25, 2013) ("TIA Comments").

necessary to “get the auction done right.”<sup>25</sup> As many commenters note, consumers and the economy cannot afford delay.<sup>26</sup> Perhaps more to the point, precisely what constitutes getting the incentive auction “right” will vary by commenter, and the sheer dint of time will not forge consensus where none exists.

No one seriously contemplates undue haste in resolving the complex issues the Commission must address in this proceeding. Reasoned decision-making, however, does not require an inordinate amount of time. Nor does delay itself produce a more sound or just result.<sup>27</sup> The Commission has issued a detailed set of proposals and has received equally detailed comments in response. Although the issues presented in this proceeding are complex, the hundreds of comments submitted in this proceeding, combined with the reply comments and a growing body of *ex parte* submissions, will aid the Commission’s timely resolution of this proceeding. The extensive record evidence should allow the Commission to fulfill its goal of auctioning additional wireless broadband spectrum next year.

#### 4. Establish a Fixed Amount of Downlink Spectrum.

Commenters also generally support a 600 MHz band plan that incorporates a fixed amount of downlink spectrum, regardless of the amount of spectrum that is cleared on a market-by-market basis. Licensing downlink spectrum in this manner would reduce handset complexity

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<sup>25</sup> NAB Comments at 3.

<sup>26</sup> CTIA Comments at 4-12; Verizon Comments at 1-2; AT&T Comments at 14; Sprint Comments at 1; Cisco Comments at 4; CEA Comments at 6-12; MetroPCS Comments at 1-2; TIA Comments at 3-4; US Cellular Comments at 2; CCA Comments at 19.

<sup>27</sup> See, e.g., CTIA Comments at 8; T-Mobile Comments at 60; U.S. Cellular Comments at 53; CEA Comments at 17; Mobile Future Comments at 2; Verizon Comments at 56; see also Hélène Landemore, *Majority Rule and the Wisdom of Crowds: the Task-Specificity of Majority Rule as a Predictive Tool* (Aug. 17, 2010), available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1660577](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1660577) (noting that “once the creative and brainstorming process of generating new ideas has reached diminishing returns, there is a role for majority rule, which is not merely second best next to deliberation, but its necessary complement”).

and the need for the wireless standards bodies to adopt multiple band plans for the licensed 600 MHz spectrum. As noted by Motorola, a band plan “with defined uplink and downlink frequencies[] should apply across the entire country regardless of whether some markets are not fully cleared,” because, under that approach, “only one new 3GPP band would need to be profiled.”<sup>28</sup> Likewise, AT&T has encouraged the Commission to “define sets of contiguous downlinks blocks” to “enable[e] the industry to use a single passband (and a single duplexer) for any block within such a set.”<sup>29</sup>

T-Mobile agrees. A consistent amount of nationwide downlink spectrum would lower the costs of deploying a network, promote competition, and reduce the risk of consumers acquiring devices that are incapable of operating throughout the nation.<sup>30</sup> Further, committing to establish a uniform amount of downlink spectrum – regardless of how much uplink spectrum is available – could alleviate some of the uncertainty surrounding the precise band plan that will be implemented following the reverse auction and, as CEA notes, “enable forward auction participants to plan and budget for deployment, handset procurement, and meeting consumer demand.”<sup>31</sup>

#### 5. Create Supplemental Downlink Spectrum for Asymmetric Pairing.

Many commenters joined T-Mobile in supporting the Commission’s proposal to license as supplemental downlink any 600 MHz spectrum that cannot be paired.<sup>32</sup> Licensing unpaired spectrum for supplemental downlink would allow carriers to meet the current and future demand

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<sup>28</sup> Motorola Comments at 10.

<sup>29</sup> AT&T Comments at 18.

<sup>30</sup> *Id.*

<sup>31</sup> CEA Comments at 20-21.

<sup>32</sup> *See, e.g.,* Verizon Comments at 17; AT&T Comments at 33; CTIA Comments at 21; Qualcomm Comments at 15; RIM Comments at 9; CEA Comments at 20.

for downlink capacity efficiently. Mobile subscribers consume much more data than they create.<sup>33</sup> As a result, downlink traffic has increased substantially relative to uplink traffic and this traffic imbalance appears likely to continue for several years.<sup>34</sup> Creating a supplemental downlink responds to these asymmetrical demands on wireless networks while recognizing that dedicated uplink spectrum already exists across many different frequency bands, including the 700 MHz, 800 MHz, 850 MHz, 1.9 GHz, 2 GHz, 2.1 GHz, and 2.3 GHz bands. With supplemental downlink, carriers can combine the 600 MHz band frequencies with existing spectrum resources in other bands to satisfy downlink-intensive data traffic demand without introducing new inefficiencies into their existing spectrum portfolios.<sup>35</sup> A supplemental downlink configuration limits the need for additional uplink spectrum relative to TDD and poses fewer technical complications than TDD, both by eliminating the need for inefficient guard bands and by avoiding the added complexity of coordinating the precise data timing configurations of multiple parties.<sup>36</sup> In short, allocating unpaired spectrum for supplemental downlink would allow carriers to better leverage existing spectrum resources in other bands in order to quickly and efficiently boost aggregate mobile broadband capacity for consumers.

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<sup>33</sup> Verizon Comments at 17; Qualcomm Comments at 16; Sprint Comments at 19-20; RIM Comments at 9; CEA Comments at 20; Clearwire Comments at 6.

<sup>34</sup> Verizon Comments at 17; Qualcomm Comments at 16 (noting that “mobile broadband traffic data shows that the ratio of downlink to uplink can be 10:1 or greater”).

<sup>35</sup> Verizon Comments at 17; AT&T Comments at 33, Qualcomm Comments at 16-17; CTIA Comments at 21; CEA Comments at 20.

<sup>36</sup> See discussion *infra* at Part II. D. 3.

**B. Commenters Agree that the Commission’s Lead Band Plan Proposal Suffers from Shortcomings that Other Band Plans Can Address.**

The comments highlight two primary problems with the Commission’s proposed band plan.<sup>37</sup> First, the breadth of frequencies encompassed by the Commission’s lead band plan would require the development and use of at least two low-frequency antennas.<sup>38</sup> While antenna-related concerns will arise anytime the Commission seeks to license a substantial amount of spectrum at auction, they will prove especially acute if the Commission adopts its lead proposal for the 600 MHz band. For most antennas used in mobile wireless communications, antenna size is inversely related to the frequency; that is, the lower the frequency, the larger the antenna needed for efficient transmission. Thus, separating the uplink and downlink bands to the extent proposed by the Commission would eliminate the possibility of a single antenna covering the entire range of frequencies in the 600 MHz band. As Qualcomm noted, in the case of the 600 MHz spectrum, a single antenna may not be able to support a band plan in which downlink spectrum is located below Channel 37 and paired with uplink spectrum directly adjacent to the Lower 700 MHz band.<sup>39</sup> As a result, equipment manufacturers would have to design handsets that include either an external antenna or make additional changes in handset design to accommodate two antennas. According to Qualcomm, “[a]dding an additional antenna into smartphones and tablets to support this band increases device size, complexity, and cost,” and

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<sup>37</sup> CTIA Comments at 21, 22, 25; Verizon Comments at 8-9; Motorola Comments at 9; Qualcomm Comments at 6; RIM Comments at 8; AT&T Comments at 5, 20, 25, 30; Alcatel-Lucent Comments at 14-15; Comments of Nokia Siemens Networks US LLC, GN Docket No. 12-268, 10 (filed Jan. 25, 2013) (“Nokia Siemens Comments”).

<sup>38</sup> See, e.g., Motorola Comments at 9; Qualcomm Comments at 6; RIM Comments at 8; Verizon Comments at 8; AT&T Comments at 5, 20, 30.

<sup>39</sup> See Qualcomm Comments at 6; see also RIM Comments at 8 (cautioning that the Commission’s proposal to offer downlink spectrum at 608 MHz would create a large duplex separation that will have an adverse impact on antenna design); T-Mobile Comments at 9 (relating antenna concerns expressed to T-Mobile by equipment manufacturers).

introduces a number of material design challenges “given consumer demand for wireless devices with smartphone-sized form factors.”<sup>40</sup>

Second, placing high-power television broadcasters in the duplex gap would produce an elevated risk of intermodulation interference,<sup>41</sup> which occurs when two or more signals combine to produce unwanted interference at new frequencies.<sup>42</sup> In this case, high-power television broadcast stations would be likely to interfere with low-power broadband user equipment, while base stations and cellular broadband operations would interfere with sensitive television receivers. Although the intensity of distortion will vary with the magnitude of the two signals, “the more frequencies that are mixed together (and at higher powers), the more interference is generated.”<sup>43</sup> Accordingly, and as noted by Verizon, “leaving broadcast operations in the duplex gap will increase the risk of harmful interference against which current mobile device and base station filter technology cannot protect.”<sup>44</sup>

This potential for interference poses a serious challenge to implementation of broadband operations in the 600 MHz band.<sup>45</sup> While these challenges should prove manageable through sound engineering practices, overcoming interference would require considerable technical ingenuity and additional expenditure of time and capital compared to less complex alternatives. Whereas some of the alternative band plans proposed in the record would incorporate TV

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<sup>40</sup> Qualcomm Comments at 6.

<sup>41</sup> *See, e.g.*, Alcatel-Lucent Comments at 14-15; AT&T Comments at 25; CTIA Comments at 25; Nokia Siemens Comments at 10; Verizon Comments at 19.

<sup>42</sup> AT&T Comments at 24-25.

<sup>43</sup> CTIA Comments at 24-25 & n.71 (“Intermodulation products are categorized according to ‘order’ and can result from the interaction of two or more frequencies. The greater the number of frequencies involved, the greater the number of intermodulation products generated.”).

<sup>44</sup> Verizon Comments at 19; *see also* AT&T Comments at 25 (asserting that “placement of multiple television stations in the duplex gap could cause substantial interference in the 600 MHz, 700 MHz, *and* PCS receive bands and substantially degrade mobile operations in those bands”) (emphasis in original).

<sup>45</sup> *See, e.g.*, AT&T Comments at 25-26.

stations in the duplex gap under some clearing scenarios, the Commission's proposal would incorporate TV stations in the duplex gap in nearly *all* clearing scenarios.<sup>46</sup> Alternative approaches that reduce the number of scenarios in which broadcasters will operate in the 600 MHz duplex gap offer less costly and complex designs that can achieve better performance.

T-Mobile agrees with the many commenters recommending that the Commission first pursue alternative band plans that focus on pairing some or all of the 84 megahertz of spectrum above Channel 37 and below Channel 52.<sup>47</sup> So long as the Commission can establish at least 35 megahertz of paired spectrum using an alternative band plan, it should.

**C. The 35x35 MHz Band Plan T-Mobile Has Proposed Harnesses the Benefits of the Commission's Lead Band Plan While Avoiding Many of the Risks.**

Establishing a 35 megahertz uplink allocation at 663-698 MHz paired with a 35 megahertz downlink allocation at 618-653 MHz maximizes both the total amount of paired broadband spectrum available for competitive bidding in the 600 MHz band and the efficiency of the wireless broadband allocation created.<sup>48</sup> Of course, every spectrum band plan requires a series of trade-offs among spectrum efficiency, antenna efficiency, interference risk, cost requirements, and handset design allowances, among other considerations. And the 35x35 MHz configuration that T-Mobile has proposed for the 600 MHz band plan is no exception. In the case of a 35x35 MHz band plan, however, the issues are few and readily managed through

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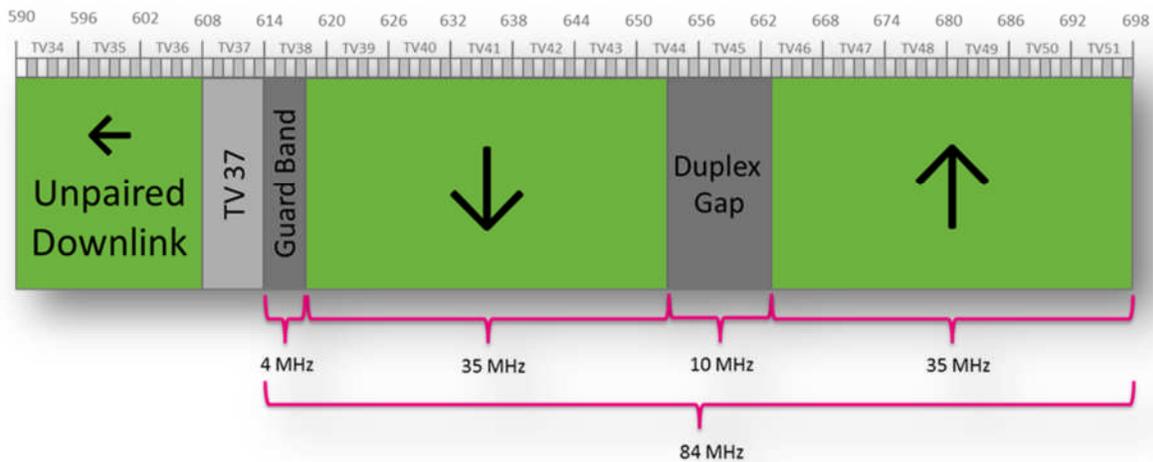
<sup>46</sup> *NPRM* ¶¶ 126, 136.

<sup>47</sup> *See, e.g.*, Nokia Siemens Comments at 11 (noting that the Commission can combat the risk of intermodulation interference caused by TV operations in the duplex gap by adopting a band plan that would “avoid any TV transmissions in the FDD duplex gap” and “relocat[ing] as many remaining TV channels as possible to the lower part of the spectrum below Channel 37 and fill in all of the band above Channel 37 with mobile broadband”); *see also* CTIA Comments at 21; NAB Comments at 45; Sprint Comments at 7; Verizon Comments at 7; AT&T Comments at 32; Sony Comments at 3; Belo Corp. Comments at 18; Comcast & NBCU Comments at 20; Google and Microsoft Comments at 32; Motorola Comments at 9; NCTA Comments at 7; Qualcomm Comments at 4; Band Plan Principles Joint Letter.

<sup>48</sup> *See* T-Mobile Comments at 10.

existing technical solutions. Moreover, reasonably anticipated technical advances make achieving a 35x35 MHz configuration even more feasible in 2014 or 2015 than it already is today.<sup>49</sup> Taken together, a 35x35 MHz band plan offers the largest amount of paired wireless broadband spectrum with the fewest and most readily managed band-specific design requirements.

The 35x35 MHz band plan T-Mobile has proposed features 35 megahertz of downlink spectrum paired with 35 megahertz of uplink spectrum separated by a ten megahertz duplex gap.<sup>50</sup> In markets where less than 84 megahertz (or 14 TV channels) are cleared, this plan would



**Figure 1: T-Mobile's proposed 35x35 MHz band plan maximizes paired spectrum while minimizing guard bands.**

prioritize downlink spectrum over uplink spectrum and preserve a common duplex gap in the 600 MHz band. In markets where more than 84 megahertz is cleared, T-Mobile's band plan

<sup>49</sup> Most of the band plans advanced in this proceeding envision supplemental downlink in some portion of the spectrum below the paired frequencies above Channel 37. The addition of supplemental downlink to the 600 MHz band will require antennas and filters to extend for roughly 110 MHz below 698 MHz. The active tuning, surface mounted and printed circuit board implementations necessary to support supplemental downlink in an economical manner will assist in the much more manageable challenge of developing a single set of antennas and filters to support the 35x35 MHz band plan.

<sup>50</sup> See T-Mobile Comments at 10.

would make the additional spectrum available for supplemental downlink in five megahertz channels located below Channel 37. Similar to every other variation of a “Down from Channel 51” band plan proposed in this proceeding, the 35x35 MHz band plan would:

- Provide for a common amount of downlink spectrum to minimize device complexity despite variable amounts of cleared broadcast spectrum;
- Eliminate the need for inefficient guard band spectrum between the 600 MHz and 700 MHz bands;
- Prioritize downlink spectrum over uplink spectrum to accommodate growing downlink traffic; and
- Avoid the risk of harmful intermodulation interference associated with placing high-power television stations in the duplex gap as contemplated under the Commission’s lead band plan.

T-Mobile’s 35x35 MHz proposal also offers several distinct features from other “Down from Channel 51” band plans. The most notable of these features is the capacity of a 35x35 MHz band plan to offer more paired wireless broadband spectrum, more efficiently than any other comparable band plan.

As explained in greater detail in the attached technical analysis prepared by Roberson and Associates, LLC (“Roberson Technical Analysis”), a 35x35 MHz configuration optimizes the spectrum for the most widely used, most readily available form of 4G broadband in existence: FDD LTE technology.<sup>51</sup> The Roberson Technical Analysis calculates that by eliminating inefficient gaps and segments a 35x35 MHz configuration increases nominal wireless broadband capacity by 40 percent compared to a 25x25 MHz band plan.<sup>52</sup> Moreover, the active bandwidth of a 35x35 MHz band plan is larger than the active bandwidth of a 25x25 MHz band plan.

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<sup>51</sup> Roberson and Associates, LLC, *Analysis of the 35x35 MHz Band Plan Proposal for 600 MHz Spectrum* 13-14 (Mar. 11, 2013) (“Roberson Technical Analysis”), attached as Exhibit A.

<sup>52</sup> *Id.* at 3, 14.

Assuming both bands use the same size duplex gap to separate uplink and downlink spectrum, the duplex gap in the 35x35 MHz band comprises a smaller portion of total active bandwidth under a 35x35 MHz band plan than under a 25x25 MHz band plan. As a result, the spectrum usage efficiency of the 35x35 MHz band plan stands at 88% compared to only 83% with a 25x25 MHz band plan.<sup>53</sup>

Segmenting the bandwidth above Channel 37 into separate downlink-only allocations or increasing the available duplex gap would introduce inefficiencies and capacity constraints. By removing spectrum from the most valuable paired uses, band plans of less than 35x35 MHz not only decrease opportunities for competitive entry, but also reduce the total amount of valuable paired spectrum resources available for competitive bidding. Few other band plans aside from the 35x35 MHz configuration advanced by T-Mobile establish up to *seven* paired, five-megahertz spectrum blocks available for auction, or allow up to *three* paired, ten-megahertz spectrum blocks available for auction. These additional paired blocks – and the increased potential to *aggregate* multiple paired blocks into larger blocks of more efficient contiguous spectrum – offer the wireless industry a wealth of spectrum ideally suited for LTE broadband operations that promises to encourage broad-based participation in the 600 MHz auction, promote intense activity among competing bidders, and increase competition in the wireless broadband marketplace following the close of the auction.

Technical challenges raised about a 35x35 MHz band plan are readily addressed. The three primary challenges of implementing a 35x35 MHz band plan are: (1) antenna performance;

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<sup>53</sup> *Id.* at 14.

(2) radiofrequency duplex filter feasibility; and (3) harmonic interference.<sup>54</sup> Each of these issues is manageable through the use of sound engineering and the deployment of current and near-term technologies.

1. Antenna Performance.

Antenna design involves fairly complex considerations of size, volume, material, scale, and tuning range to produce a product with optimum electromagnetic resonance to cover the proper combination of frequencies while meeting smartphone size constraints. And yet two truisms of antenna design remain: first, using one antenna is less costly than using two antennas, and, second, using a smaller antenna is less costly than using a larger one. To avoid the cost and complexity of multiple antennas or larger antennas, a few commenters offer 20x20 MHz or 25x25 MHz band plans above Channel 37.<sup>55</sup> While these band plans will avoid the use of multiple, larger antennas, these approaches yield considerably less spectrum for wireless broadband use than the 35x35 MHz band plan that T-Mobile supports. Based on the findings in the Roberson Technical Analysis, moreover, the Commission does *not* need to reduce the total amount of paired wireless broadband spectrum available for competitive bidding to achieve these efficiencies.<sup>56</sup> Instead, carriers can use the same antenna that supports a 25x25 MHz configuration to support a 35x35 MHz configuration with little or no performance degradation and few if any additional costs.<sup>57</sup>

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<sup>54</sup> To be sure, other technical and design challenges exist, but these are not unique to the 35x35 MHz band plan that T-Mobile has proposed. Design challenges common to all “Down from Channel 51” band plans are addressed in detail in the Roberson Technical Analysis. *See id.* at 25-45.

<sup>55</sup> AT&T Comments at 32; Qualcomm Comments at 4-24.

<sup>56</sup> Roberson Technical Analysis at 44-45.

<sup>57</sup> *Id.* at 16.

Antenna length depends on the center frequency of operation and the total range of operation: the larger the range of operation, the bigger the antenna. With a total operating spectrum range of 80 megahertz, the passband of the 35x35 MHz band plan is 20 megahertz larger than the 60 megahertz operating spectrum range of the 25x25 MHz band. This larger operating spectrum range means that the antenna needed to support a 35x35 MHz configuration will be larger than the antenna needed to support a 25x25 MHz configuration. But the Roberson Technical Analysis shows that the difference is manageable through use of current and emerging technologies.

Assuming a worst-case traditional passive antenna implementation, the length of the antenna used in a 35x35 MHz configuration would only be about seven millimeters longer than the length of the antenna used in a 25x25 MHz configuration.<sup>58</sup> This much additional space – roughly the equivalent of just seven grains of sugar – can be accommodated within existing smartphone designs.<sup>59</sup> But even if the additional volume were somehow too large for end-user devices, carriers could still use the smaller antenna that is optimized to support the 25x25 MHz configuration and experience only modest radiofrequency efficiency losses of -0.32 dB.<sup>60</sup> Moreover, carriers could likely compensate for *all* of these modest losses by simply increasing transmission power.<sup>61</sup> Perhaps best of all, existing, off-the-shelf technology, such as active antennas and printed antennas, can handle the requirements of a 35x35 MHz band plan very

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<sup>58</sup> *Id.*

<sup>59</sup> *Id.* at 16-18. Designers typically scale *down* internal antennas to meet the space requirements of a smartphone; therefore, real-world deployments would create a *de minimis* difference in antenna size. See Roberson Technical Analysis at 16 & n.2.

<sup>60</sup> *Id.* at 16-17.

<sup>61</sup> *Id.* LTE incorporates power control, which allows user equipment to adjust dynamically as it approaches the base station. As a result, the only user equipment that transmits at the maximum power of 23 dBm will occur near the cell edge or in other, low-coverage conditions. Hence, carriers can increase the transmit power for a significant number of users without compromising the system. *Id.* at 15-16.

effectively without *any* performance losses – all while occupying only about half the volume of the worst-case traditional passive antennas.<sup>62</sup> Thus, the Commission need not lower its spectrum auction target below 35x35 MHz to achieve the antenna efficiencies associated with a 25x25 MHz band plan.<sup>63</sup>

## 2. Duplex Filter Performance.

Duplex filters are a critical component in the path between the antenna and the transmitter or receiver amplifier. Duplex filters for wireless broadband operations today consist of one of two basic technologies: Surface Acoustic Wave (“SAW”) or Film Bulk Acoustic Resonator (“FBAR”). With either SAW or FBAR technology, state-of-the-art performance allows these filters to span approximately four percent of the center frequency of operations, which in the case of the 600 MHz band translates to approximately 28 megahertz.<sup>64</sup> This span is expected to expand to at least 30 megahertz by 2014 or 2015.

The problem with a 35x35 MHz configuration is that existing duplex filters are five megahertz too small to cover the full uplink or downlink bands. Yet this problem has a straightforward solution: deploy two overlapping filters, each of which would cover two-thirds of the overall bandwidth.<sup>65</sup> While this “dual” filter configuration would require additional switches, operators in other markets have demonstrated that the technique is both realistic and

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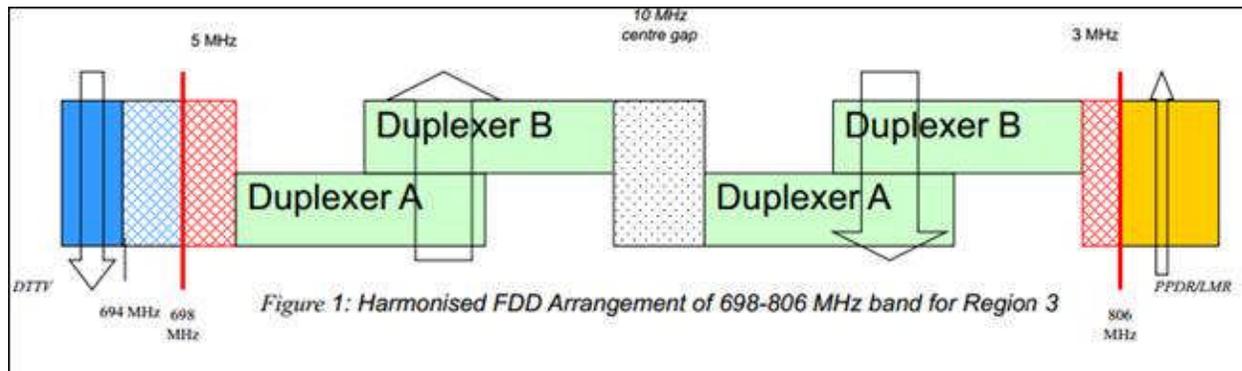
<sup>62</sup> *Id.* at 17-18.

<sup>63</sup> *Id.* at 15-18. A 25x25 MHz band plan with supplemental downlink in the remaining spectrum will experience exactly the same modest and easily resolved antenna performance constraints as a 35x35 MHz band plan. Carriers using either band plan would presumably want one antenna rather than two. In designing an antenna, however, the relevant factor is not the air interface or directionality, but rather the span of spectrum covered and the particular frequencies involved. Therefore, AT&T’s suggestion that a 25x25 MHz or 20x20 MHz band plan with supplemental downlink has different antenna performance demands than a 35x35 MHz band plan would appear to be incorrect. *See* AT&T Comments at 6. Unless AT&T intends to introduce another antenna for the supplemental downlink, its 25x25 MHz band plan plus supplemental downlink would have precisely the same antenna constraints as a 35x35 MHz band plan without supplemental downlink. Roberson Technical Analysis at 18-19.

<sup>64</sup> *Id.* at 19.

<sup>65</sup> *Id.* at 19-20.

cost effective. Qualcomm, for example, has identified commercially feasible solutions in the Asia Pacific Telecommunity (APT), which allow for a 45x45 MHz band plan in the 698-806 MHz band – ten megahertz more than contemplated by T-Mobile in the 600 MHz band.<sup>66</sup>



**Figure 2:** An excerpt from Qualcomm's 2011 *Harmonization of the Digital Dividend* demonstrates how overlapping filters allow for the realization of 45 megahertz pass bands.

Dual duplexer configurations, such as the plan APT adopted in 2010,<sup>67</sup> are fairly cost-effective because aside from the additional duplexer and associated switch, the rest of the hardware, including the amplifier and antenna, can be shared.<sup>68</sup> As a result, the two filters and switch would not consume substantially more space or impose substantially more costs than a single duplex filter would. Specifically, an additional filter and switch would consume only about 12 mm<sup>3</sup> more volume in 600 MHz device than a single filter while the cost of the additional hardware for two filters as opposed to one filter, especially at scale volumes, would be insignificant.<sup>69</sup> Finally, the Roberson Technical Analysis indicates that at the current steady rate

<sup>66</sup> See Qualcomm, *Harmonization of the Digital Dividend*, (May 2011), <http://xrl.us/boiis7>.

<sup>67</sup> See Asia-Pacific Telecommunity, *Report on Harmonised Frequency Arrangements for the Band 698-806 MHz*, No. APT/AWF/REP-14 (Sept. 2010), <http://xrl.us/boii5h>; see also 4G Americas, *The Benefits of Digital Dividend* at 16 (September 2012) (“4G Americas Report”), <http://xrl.us/boijw2> (explaining that “[c]hannel bandwidths up to 15 MHz can be supported anywhere within the [Asia-Pacific] band, but channel bandwidths of 20 MHz are limited to the upper and lower parts of the band and may not be employed in the mid-portion of the band where the filters overlap”).

<sup>68</sup> Roberson Technical Analysis at 20-21.

<sup>69</sup> *Id.*

of technical progress in SAW and FBAR filter technology, the Commission can reasonably anticipate that a 35 megahertz filter will prove commercially available in 2015.<sup>70</sup> As 4G Americas noted, “[a]dvances will be made in technology and components that will drive down cost and improve the chances for increased economies of scale across multiple bands and radio formats.”<sup>71</sup> Thus, the migration path to a single, smaller, lower-cost filter appears imminent and, in any case, should occur well prior to the auction and subsequent repacking and clearing of the 600 MHz band.

If necessary in the meantime, the dual-filter approach would not only deliver more paired wireless broadband spectrum for competitive bidding in the 600 MHz auction, but also promote more competitive wireless broadband offerings. The use of two overlapping filters, especially when combined with the random or quasi-random assignment of spectrum blocks discussed below, would ensure that no operator is left outside of the scale economies that might otherwise apply to only one of two non-overlapping filter ecosystems. The dual-filter configuration would also promote interoperability throughout the 600 MHz band, which helps ensure no consumer has to buy a new iPhone or other costly device simply to transfer from a carrier with frequencies that use one 600 MHz duplex filter to another carrier with frequencies that use another 600 MHz duplex filter.

In short, the interim use of two duplex filters to achieve a 35x35 MHz band plan does not impose material costs on carriers, nor does the use of dual filters require inordinately complex design solutions. On the contrary, the use of dual filters during the interim period until a single 35 megahertz filter is developed would deliver substantial benefits by assuring that all carriers

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<sup>70</sup> *Id.*

<sup>71</sup> 4G Americas Report at 16.

have an opportunity to compete amidst a constantly changing global ecosystem in device technology that places considerable value on volume purchases. Together with the additional and more efficient configuration of wireless broadband spectrum available for competitive bidding that the 35x35 MHz band plan achieves, these benefits outweigh any modest, short-term incremental costs associated with using two duplex filters.

### 3. Harmonic Interference.

The final consideration associated with a 35x35 MHz band plan above Channel 37 is the potential for harmonic interference. Some commenters have claimed that allowing any mobile uplink transmissions between 643-667 MHz would generate harmful third-order harmonic interference into portions of the PCS band (1989-1995 MHz) and harmful fourth harmonic interference into portions the BRS/EBS band (2652-2792 MHz).<sup>72</sup> These arguments are unpersuasive.

T-Mobile has no dispute with these commenters' calculations that operations in certain portions of the 600 MHz would generate third- and fourth-order harmonic effects in portions of other spectrum bands used for broadband services. Third- and fourth-order harmonic effects always exist at three and four times the fundamental frequency of any transmission.<sup>73</sup>

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<sup>72</sup> See, e.g., Nokia Siemens Comments at 14; CTIA Comments at 26; AT&T Comments at 27; Qualcomm Comments at 7-8. As explained by Qualcomm, harmonic interference from a transmit signal “is caused by non-linear characteristics inherent to the output stages of transmitters” and occurs at “multiples of the transmitted signal (e.g., a 695 MHz signal has a second order harmonic at 1390 MHz, a third-order harmonic at 2085 MHz and so on).” See Qualcomm Comments at 8. Consequently, a harmonic signal could fall within the passband of a receiver within the same or nearby device, and potentially degrade the receiver’s performance. *Id.*

<sup>73</sup> Other types of harmonic interference will occur – fourth, fifth, sixth, seventh, and so on – but, like waves emanating from a stone thrown into a pond, these conditions grow progressively weaker as they become more and more removed from the original source and, therefore, pose much less of a concern. Roberson Technical Analysis at 21-22. Most of these additional harmonics do not, in any case, fall within bands used for wireless broadband communications. *Id.* at 22-24.

The signal that produces the third harmonic will generally not be that strong, however. With a maximum power output of 23 dBm, a 600 MHz device transmitter in the user device will inject -26 dBm in a PCS receiver in a nearby device, which has the potential to result in up to seven decibels of desensitization to the PCS receiver.<sup>74</sup> But this condition represents the worst case. The vast majority of the time, the device transmitter will operate with far less than 23 dBm power and, as a result, produce far less desensitization into the PCS receiver.<sup>75</sup> Moreover, the internal guard bands that 600 MHz licensees will use to protect against adjacent channel interference will further limit actual power into the device.<sup>76</sup> Finally, the fourth order harmonic is more attenuated and even less likely to interfere with communications signals than the third harmonic is.<sup>77</sup>

While devices that incorporate both the interfering and victim frequencies could experience harmful interference under high-power conditions, operators have several techniques to prevent harmonic interference from ever occurring.<sup>78</sup> These simple, cost-effective interference-avoidance techniques include improved filtering, careful block selection, and spectrum exchanges.<sup>79</sup> As Sprint noted in its comments, “[p]otential third-harmonic conflicts

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<sup>74</sup> *Id.* at 23-25.

<sup>75</sup> *Id.*

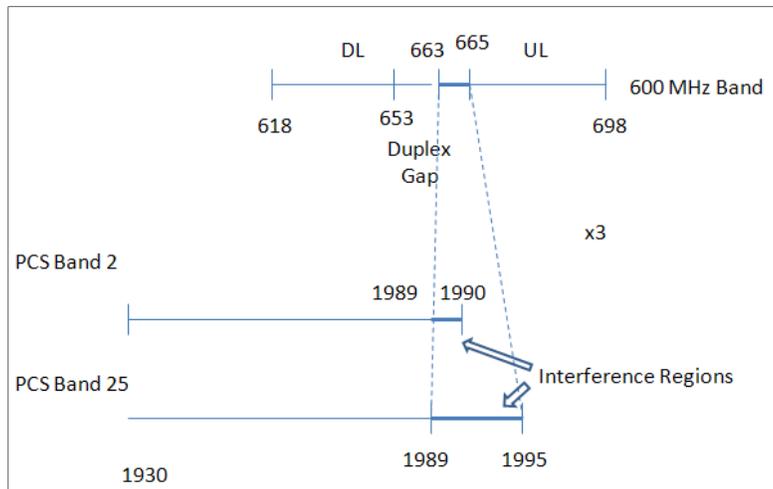
<sup>76</sup> *Id.*

<sup>77</sup> While the fourth harmonic falls within a portion of the 2.5 GHz BRS-EBS band, the effect of this harmonic is reduced an additional 10 db as compared to the third harmonic. The result is a signal of -103 dBm, which is well below the interference limit guideline of -100 dBm, and should not affect receivers in the BRS-EBS band. *Id.* at 24-25.

<sup>78</sup> Encapsulating the interfering and victim signals in the same device is itself a worst-case scenario. Whatever the harmonic effects within the *same* device, those effects are even less substantial between *different* devices. The additional separation distance and attenuation that occurs between different devices, among other things, further reduces the potential for harmful interference. *See* Nokia Siemens Comments at 14.

<sup>79</sup> *See id.*

already exist in the U.S., and yet we have seen little evidence of such interference problems to date.”<sup>80</sup> In short, harmonic effects do not pose a serious interference concern.



**Figure 3: An excerpt from the Roberson Technical Analysis shows the location of third harmonic effects in the PCS bands.**

Sprint’s lack of concern about harmonic effects is especially noteworthy. Sprint holds a nationwide license in the 1990-1995 MHz band and through its Clearwire subsidiary controls most of the 2.5 GHz band in many geographic locations. These bands represent precisely where the strongest harmonic interference effects

from the 600 MHz band would fall. Thus, the beneficiary of AT&T’s ostensible concern is not principally AT&T, but rather Sprint, which, quite reasonably, remains unconcerned.

While the risk of harmonic interference is remote and easily avoided, the *effect* of capping paired spectrum at fifty megahertz as AT&T has proposed is not: excluding the 600 MHz frequencies capable of producing harmonic interference in small portions of the PCS and BRS bands will limit the pool of high-value paired spectrum available at auction. Thus, while AT&T correctly notes that forgoing an auction of the 600 MHz uplink frequencies that produce the harmonic would eliminate any possibility of interference,<sup>81</sup> AT&T’s solution takes a sledgehammer to a nail. “Solving” the possibility of harmonic interference by not auctioning the potentially offending spectrum would impose considerable costs on consumers and taxpayers in

<sup>80</sup> Sprint Comments at 25.

<sup>81</sup> See AT&T Comments at 32, 34 (offering a band plan proposal that would not create uplink spectrum below Channel 47).

response to a fairly limited, readily managed concern. Moving spectrum from high-value paired configurations to lower-value unpaired (or, worse, guard-band) configurations represents a last-resort solution suitable for consideration only after all other avenues that could allow the most productive use of the available spectrum resource have been exhausted.

The national imperative of maximizing the amount of mobile broadband spectrum available through the competitive bidding process simply should not, in Sprint's words, "be stymied by technical concerns that can be solved through equipment design and operating practice."<sup>82</sup> Where, as here, the potential for harmonic interference is limited and manageable and the benefits of maximizing paired spectrum are extensive and broad-based, the Commission can and should take note of successful, real-world spectrum-management practices and auction the maximum amount of paired for commercial wireless broadband use.

**D. Band Plans that Provide Less than a Potential of 70 Megahertz of Paired Spectrum for Auction Will Decrease Auction Revenues and Harm Competition.**

Absent compelling evidence of pervasive harmful interference, little justification exists for the Commission to adopt a band plan that offers less than 70 megahertz of paired spectrum. Paired spectrum is simply too valuable not to maximize the amount available, and if the Commission does not adopt a band plan capable of supporting as much paired spectrum as possible, competition during and after the 600 MHz auction will likely suffer.

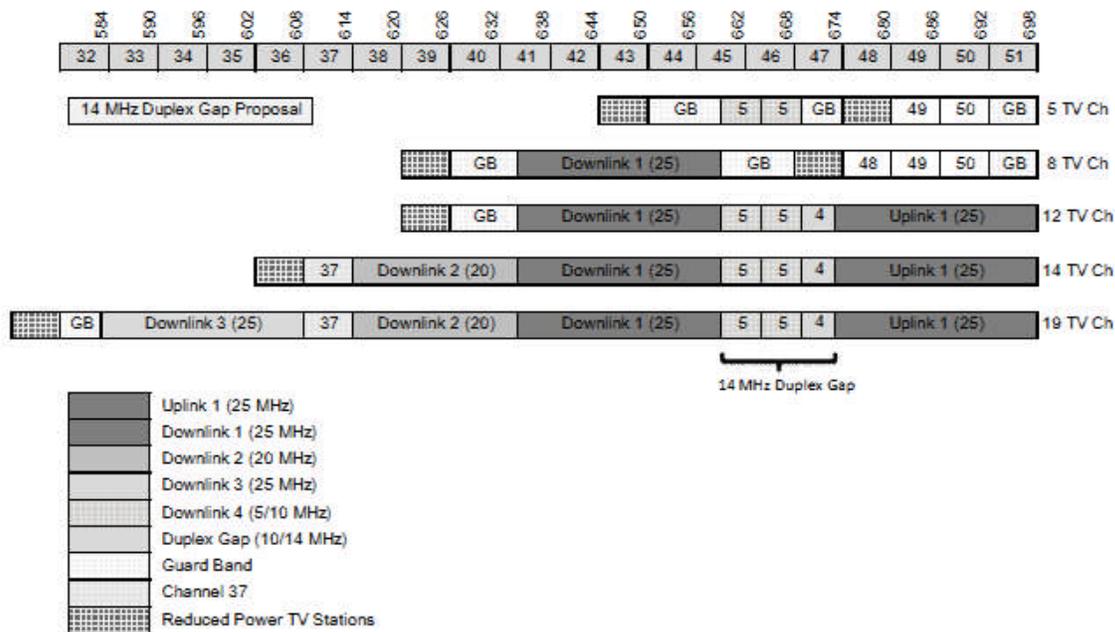
1. AT&T and Qualcomm's Band Plan.

AT&T and Qualcomm advance broadly similar band plans that offer only 50 megahertz of paired spectrum. As shown in Figure 4 below, the 25x25 MHz configuration would prohibit

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<sup>82</sup> Sprint Comments at 25.

uplink operations below Channel 47 and establish a separate downlink-only band with its own antenna below Channel 41:<sup>83</sup>



**Figure 4: AT&T's proposed band plan would cap paired spectrum at 50 megahertz.**

Although AT&T indicates its band plan is notional and subject to change, AT&T's longtime technical consultants, Jeffrey H. Reed and Nishith D. Tripathi, advance a narrow set of options that never seem to result in more than fifty megahertz of paired spectrum available for auction in the 600 MHz band.<sup>84</sup>

The Commission should reject the AT&T and Qualcomm band plan for at least three reasons. First, a 35x35 MHz band plan offers 40 percent more nominal capacity than a 25x25 MHz band plan as well as more options for highly efficient aggregations of contiguous

<sup>83</sup> AT&T Comments at 32; Qualcomm Comments at 15. The duplex gap shown in Figure 4 is 14 megahertz in width, but smaller configurations could be employed. This larger gap accommodates AT&T's proposal to use the duplex gap for supplemental downlink operations. AT&T Comments at 34.

<sup>84</sup> See AT&T Comments, Exhibit A, Jeffrey H. Reed and Nishith Tripathi, *The 600 MHz Spectrum Auction: An Analysis of the Band Plan Framework* 1-5, 25-37; accord Qualcomm Comments at 3 n.5 (discussing, but ultimately rejecting, a 30x30 MHz or 35x35 MHz plan as "unwise").

bandwidth. While the base units of LTE operations are five megahertz spectrum pairs, using ten megahertz pairs would deliver material gains in efficiency, throughput and performance.<sup>85</sup> With demand for wireless broadband speed and efficiency increasing annually, carriers will strive to acquire spectrum in ten megahertz pairs when possible.<sup>86</sup> The 50-megahertz cap on paired spectrum available at auction envisioned by AT&T and Qualcomm is, therefore, significant because it would effectively limit the number of ten megahertz pairs in any market to just two bidders – a pair of winners that in all likelihood would include Verizon and AT&T, but exclude T-Mobile, Sprint and the rest of the competitive carriers. Because contiguous spectrum blocks seem likely to play such a large role in current and future deployments, adopting the AT&T/Qualcomm proposal risks further consolidation of the already highly concentrated wireless market.

Second, maximizing the amount of high-value paired spectrum available for competitive bidding will generate funds for important public projects such as the broadcast relocation, the FirstNet public safety broadband network, and deficit reduction. Like many other commenters, AT&T and Qualcomm acknowledge that carriers value paired spectrum and its efficiencies more highly than the unpaired spectrum that they incorporate into their band plans.<sup>87</sup> Maximizing the amount of paired spectrum simply recognizes this reality and configures the 600 MHz band in a manner designed to capture the most intense interest from the vast majority of likely bidders.

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<sup>85</sup> See *NPRM* ¶ 130 n.208; RIM Comments at 7 (“[W]ider blocks handle traffic more efficiently than the minimum bandwidths, and new spectrum should be designed to meet growing demand in the most efficient way possible.”).

<sup>86</sup> As Research in Motion recognizes, “bandwidth in excess of a 5 MHz uplink and a 5 MHz downlink will be essential, in many circumstances, to provide the expected levels of service in today’s increasingly mobile society.” RIM Comments at 7.

<sup>87</sup> While AT&T’s concept of incorporating additional supplemental downlink channels inside the duplex gap is intriguing, the concept is not unique to a 25x25 MHz configuration and, if useful, could apply equally as well to any FDD configuration, including a 35x35 MHz configuration that would offer more high-value paired spectrum for competitive bidding.

Third, the ostensible technical concerns that AT&T and Qualcomm associate with a 35x35 MHz band plan do not pose any significant obstacles today and will pose even fewer obstacles tomorrow. One of the hallmarks of the wireless industry is its tremendous capacity for innovation.<sup>88</sup> AT&T and Qualcomm, however, both take an exceptionally dim view of the capacity of available and emerging technologies, the multiplicity of design choices available from global equipment vendors, and the ingenuity of network engineers to design and operate high-capacity, high-performance, cost-effective communications systems in the face of complex radiofrequency environments. Indeed, Qualcomm goes so far as to say that the Commission should base the 600 MHz band plan only upon off-the-shelf device components available on the market today, rather than components “available next year, when the spectrum will be auctioned.”<sup>89</sup> According to Qualcomm, taking into account ongoing technical progress in the dynamic and innovative wireless market would “impair the value of the spectrum” by creating unspecified implementation risks for wireless operators.<sup>90</sup>

This position is a novel one for Qualcomm, which typically emphasizes the rapid innovation found in the wireless industry.<sup>91</sup> According to Qualcomm’s Chairman of the Board and Chief Executive Officer, Paul Jacobs, for example, Qualcomm’s “vision through the years has been clear – to look past the horizon and, in doing so, anticipate and drive future capabilities

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<sup>88</sup> See, e.g., Letter from Steve Largent, President and CEO, CTIA – the Wireless Association, to Hon. Lamar Smith, Chairman, House Judiciary Committee (Nov. 28, 2012), available at <http://judiciary.house.gov/issues/STEM/CTIA-STEM%20Jobs%20Act.pdf> (“The hallmark of the wireless industry is innovation.”); CTIA, Innovation and Competition (last visited Feb. 18, 2013), available at [http://www.ctia.org/advocacy/policy\\_topics/topic.cfm/TID/64](http://www.ctia.org/advocacy/policy_topics/topic.cfm/TID/64) (noting that “the U.S. wireless industry is the most innovative and competitive in the world.”).

<sup>89</sup> Qualcomm Comments at 3.

<sup>90</sup> *Id.*

<sup>91</sup> See, e.g., Qualcomm, Inc., 10-Q (filed Jan. 30, 2013), <http://xrl.us/boh39n> (“Our industry is subject to rapid technological change, and we must make substantial investments in new products, services and technologies to compete successfully.”).

and uses of wireless technologies.”<sup>92</sup> The Commission should put its faith in Qualcomm’s business leadership. Technological change is ever-present and rapidly expanding the capacity of wireless companies to accommodate new spectrum allocations. Existing technology is more than capable of achieving a 35x35 MHz band configuration. Even if it were not, the Commission should devise a band plan based on both existing and reasonably anticipated technological developments.

## 2. Google and Microsoft.

Although they do not offer formal band plans, several commenters, including Google and Microsoft, suggest that the Commission should maximize the amount of unlicensed spectrum in the band plan.<sup>93</sup> These parties suggest that the Commission could create a massive duplex gap of up to 28 megahertz in addition to large guard bands for use by unlicensed devices.<sup>94</sup>

As an initial matter, like the AT&T/Qualcomm band plan, maximizing unlicensed spectrum would significantly harm competition in the wireless marketplace. For example, under the Google/Microsoft proposal, the maximum paired spectrum available above Channel 37 would be 25x25 MHz.<sup>95</sup> As explained in the preceding section, any band plan that offers less

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<sup>92</sup> Dr. Paul E. Jacobs, Chairman of the Board and Chief Executive Officer, Qualcomm, *Empowering Communities Worldwide Through 3G* (2010) available at <http://www.qualcomm.com/media/documents/files/wireless-reach-2012-brochure-english.pdf>

<sup>93</sup> See Google and Microsoft Comments at 32; Comcast & NBCU Comments at 44; Free Press Comments at 13; PISC Comments at 24.

<sup>94</sup> Google and Microsoft Comments at 32, 38-40.

<sup>95</sup> Because there is only 84 megahertz of spectrum above Channel 37, a 2x25 MHz band plan with a 28 MHz duplex gap is only possible if a six megahertz guard band is employed above Channel 37; a larger guard band would further reduce the availability of paired spectrum.

than 35x35 MHz of paired spectrum risks further consolidation of the most valuable sub-1 GHz spectrum by the two largest carriers.<sup>96</sup>

The Google-Microsoft and similar proposals also directly contravene the Spectrum Act's directive that "guard bands shall be no larger than is technically reasonable to prevent harmful interference between licensed services outside the guard bands."<sup>97</sup> In adopting this provision, and, indeed, through the very creation of the incentive auction framework, Congress expressed a desire to maximize spectrum available for commercial wireless.<sup>98</sup> If the Commission adopted proposals to maximize *unlicensed* spectrum, it would directly contravene Congressional intent.

Proponents of maximizing unlicensed use wrongly seek to stretch the language of the Spectrum Act to accommodate their proposals. For example, Comcast claims that "by allowing the Commission to adopt technically reasonable guard bands, Congress employed statutory language that permits the Commission to consider other policy goals – including facilitating

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<sup>96</sup> To the extent commenters seek an unlicensed allocation from spectrum acquired in the incentive auction, valuable frequencies below 1 GHz are not the appropriate location. The Commission has recognized that spectrum below 1 GHz is an especially scarce and an especially valuable resource due to its superior propagation characteristics. *See, e.g.,* Policies Regarding Mobile Spectrum Holdings, Notice of Proposed Rulemaking, WT Docket No. 12-269, FCC 12-119 ¶ 35 (rel. Sept. 28, 2012); *see also* Scott Wallsten, *Is There Really a Spectrum Crisis? Quantifying the Factors Affecting Spectrum License Value*, Technology Policy Institute at 20 (Jan. 23, 2013) (indicating that, based on analysis of every spectrum auction since 1996, "spectrum below 1 GHz," when used for broadband, is "more valuable than spectrum above 1 GHz"). In circumstances where "spectrum scarcity exists," such as under 1 GHz, the Commission's Spectrum Policy Task Force explained that "the exclusive use model is most effective at balancing [competing] claims" to a scarce resource because it is best able to "create significant incentives for efficient spectrum use." FCC Spectrum Policy Task Force, *Report of the Spectrum Efficiency Working Group* at 33 (Nov. 15, 2002), <http://xrl.us/bohzuw>. Unlicensed devices, which typically operate at low power and operate over short distances, are better suited to spectrum in the 5 GHz range due to the reduced risk of interference and the relative abundance of spectrum available.

<sup>97</sup> Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. 112-96 § 6407(b) (Feb. 22, 2012) ("Spectrum Act").

<sup>98</sup> Attempts to sideline valuable spectrum for unlicensed use can take various forms. Proponents of unlicensed operations not only propose excessively large guard bands, but also recommended large white spaces between television channels. *See* Google and Microsoft Comments at 49. If TDD were adopted, it seems reasonable to presume unlicensed advocates would want unreasonably large guard times as well as unreasonably large guard bands. All of these proposals should be rejected as directly contravening both the plain language and the intent of the Spectrum Act.

unlicensed use.”<sup>99</sup> That is not so. Congress did not just require guard bands to be “technically reasonable,” but instead required guard bands to be “no larger than is technically reasonable to prevent harmful interference between licensed services outside the guard bands.”<sup>100</sup> Comcast’s interpretation also directly conflicts with the explicit legislative history, which makes clear that “[e]nlarging the guard bands for any reason other than mitigating interference, *such as facilitating unlicensed use*, would conflict with section 6407(b).”<sup>101</sup> As the Commission itself explains, the use of guard band is intended to “minimize interference between dissimilar adjacent operations.”<sup>102</sup> Under the Spectrum Act, unlicensed uses should not take precedence over commercial licensed uses.

For their part, Google and Microsoft suggest that guard bands and duplex gaps are technically reasonable if there is *any* potential for interference.<sup>103</sup> This interpretation impermissibly reads the plain language “no larger than technically reasonable” out of the statute.<sup>104</sup> Further, the statute’s limit would be meaningless under this interpretation: base stations transmit low level noise – and potentially interfering signals – across a very wide range of frequencies. Google and Microsoft’s “any interference” interpretation would effectively allow for guard bands nearly as large as the amount of spectrum freed at auction. As commenters recognize, moreover, the Spectrum Act significantly constrains the Commission’s

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<sup>99</sup> Comcast & NBCU Comments at 44.

<sup>100</sup> Spectrum Act § 6407(b).

<sup>101</sup> Majority Committee Staff, Committee on Energy and Commerce, U.S. House of Representatives, *Memorandum: Hearing on Keeping the New Broadband Spectrum Law on Track*, at 4 (Dec. 10, 2012) (emphasis added).

<sup>102</sup> See *NPRM* ¶ 152.

<sup>103</sup> Google and Microsoft Comments at 33-39.

<sup>104</sup> See *Astoria Federal Savings & Loan Ass’n v. Solimino*, 501 U.S. 104, 112 (1991). (explaining that statutes should be interpreted “so as to avoid rendering superfluous” any statutory language).

decisionmaking authority as to permissible sizes for duplex gap and guard bands.<sup>105</sup> For example, as TIA explains, “reasonable” means that guard bands cannot be “excessive or extreme” in size.<sup>106</sup> The legislative history supports this interpretation. The version of the bill that originally passed the House did not even mention guard bands; the “technically reasonable” restriction was later added to restrict the Commission’s discretion.<sup>107</sup>

Moreover, the record demonstrates that a smaller duplex gap than the 28 megahertz gap proposed by Google and Microsoft is technically reasonable.<sup>108</sup> As the Commission notes, Band 8 (880-915 MHz and 925-960 MHz) has a ten megahertz duplex gap.<sup>109</sup> Other duplex gaps that illustrate what would be “no larger than technically reasonable” include the 11 megahertz gap for Band 20 (791-821 MHz and 832-862 MHz bands), and the 13 megahertz gap for Band 12 (698-716 MHz and 729-746 MHz band (lower 700 MHz)).<sup>110</sup> When enacting the Spectrum Act, Congress was acting with these technically reasonable duplex gaps (as well as other technically reasonable guard bands) in mind.<sup>111</sup> Google and Microsoft do not contend that any of these duplex gaps are not technically reasonable (because they are). Nor do they directly explain how

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<sup>105</sup> Cisco Comments at 12; MetroPCS Comments at 24; TIA Comments at 10.

<sup>106</sup> TIA Comments at 9 n.32.

<sup>107</sup> TIA Comments at 9-10 n.32. Free Press, however, citing to a blog article, contends that “Congress reportedly considered and rejected . . . language mandating that the guard bands be no larger than ‘technically necessary.’” Free Press Comments at 5 n.8 (citing Stephan E. Coran, *Congress Makes Sweeping Changes to Spectrum Policy; Authorizes TV Band Incentive Auctions*, Telecom-Media-Tech Law Blog (Feb. 21, 2012), <http://xrl.us/boiisg>). Neither Free Press, nor the blog article, nor any other commenters, cite to where this discussion occurred in the legislative history. In any event, the language “technically necessary” was never part of any official version of the bill.

<sup>108</sup> Qualcomm Comments at 15; Sony Comments at 4; Verizon Comments at 18; AT&T Comments at 32; CTIA Comments at 28.

<sup>109</sup> *NPRM* ¶ 167.

<sup>110</sup> *NPRM* ¶ 167 n.248.

<sup>111</sup> NCTA asserts that the duplex gap is not subject to the “technically reasonable” limit, arguing that the duplex gap is not a guard band. NCTA Comments at 11. The duplex gap, however, is a specific type of guard band under the Spectrum Act—it is a guard band that protects against “harmful interference between licensed” uplink and downlink “outside the” duplex gap. See Spectrum Act § 6407(b). Indeed, other commenters, including Google and Microsoft, explicitly recognize that the limits of section 6407(b) apply to the duplex gap. Google and Microsoft Comments at 38; Comcast & NBCU Comments at 44.

a duplex gap larger than these technically reasonable gaps can be “no larger than technically reasonable.”

Google and Microsoft nevertheless suggest that if the Commission’s goal is to auction generic, fungible blocks, the Commission must use larger guard bands and a larger duplex gap.<sup>112</sup> But the Commission need not – and, as a practical matter, cannot – create technically identical blocks of spectrum. However desirable the goal, perfectly fungible spectrum is impossible, and its absence will not affect auction revenue or bidder behavior in ways that matter to the outcome of the auction.<sup>113</sup> Bidders will always have idiosyncratic preferences that make some spectrum bands more valuable to some bidders than others. As Alcatel-Lucent notes, the Commission would find it impossible “to account for all such individualized situations without completely abandoning interchangeability” and dispensing with competitive bidding as a license distribution mechanism.<sup>114</sup> Moreover, not all differences in spectrum blocks are wholly idiosyncratic.

Each block of spectrum will operate at a distinct frequency and will face a different composite noise floor level that will result in unique performance characteristics. So long as the resulting performance does not suffer from harmful interference, variations among blocks are both inevitable and wholly inconsequential. As CTIA notes in the context of broadcast channels,

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<sup>112</sup> Google and Microsoft Comments at 39 (suggesting that the absence of interference is required for the Commission to “implement a band plan with ‘spectrum blocks that are as similar and technically interchangeable as possible’”) (quoting *NPRM* ¶ 152).

<sup>113</sup> Although Google and Microsoft themselves are unconcerned with fungibility of spectrum and the presumable increase to auction revenues – they are merely advocating for maximal unlicensed allocation – AT&T contends that concerns over fungibility and interference loom large in ultimate auction revenues. *See* AT&T Comments at 41-42. As AT&T argues, “[i]f bidders face uncertainty about the value of the spectrum they will ultimately receive . . . they will discount their bids,” thereby decreasing auction revenues. *AT&T Comments* at 41, 42; *see also* Qualcomm Comments at 20 (“[F]or the auction to be successful, each 2 x 5 MHz FDD block should be spectrally identical to each other, which requires the FCC to incorporate sufficient guard bands so that the spectrum blocks adjacent to the guard bands are protected the same as the non-adjacent spectrum blocks.”).

<sup>114</sup> Alcatel-Lucent Comments at 19 n.19. Alcatel-Lucent notes that secondary market where blocks are traded in “aftermarket transactions” can readily account for idiosyncratic values for different spectrum blocks. *Id.*

“[c]hanges in UHF frequency will necessarily mean that there will be changes in coverage that are unavoidable.”<sup>115</sup> To illustrate the concept, CTIA offers the example of different coverage areas achieved using different frequencies in the related context of replicating broadcast area coverage: “A higher UHF channel may lead to less coverage, while a lower UHF channel could increase coverage.”<sup>116</sup> Because replicating a broadcaster’s signal following the repack will prove virtually impossible, CTIA concludes that the Commission should allow ample leeway for other frequencies to satisfy the statutory directive to replicate the performance of the station’s original channel.<sup>117</sup>

A similar level of tolerance should apply to spectrum blocks available in the forward auction. It simply is not possible for the Commission to achieve perfect substitutability among blocks. No two bidders will value the identical block of spectrum the same, and no two blocks of spectrum will possess precisely the same coverage or signal carrying capacity. Fungibility, in other words, is necessarily a matter of degree.<sup>118</sup>

A quest for perfect fungibility would likely cause the auction to produce less paired spectrum than simply allowing for some variations among blocks. With limited spectrum available, achieving true fungibility would require the Commission to allocate more spectrum for guard bands, which, in turn, would likely force a reduction in the amount of paired spectrum available for broadband use – a result far more detrimental to competition, consumers, and the broadcast incentive auction than having blocks that vary somewhat in technical characteristics.

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<sup>115</sup> CTIA Comments at 35.

<sup>116</sup> *Id.*

<sup>117</sup> *Id.*

<sup>118</sup> See, e.g., Martin Weiss, *et al.*, *When is Electromagnetic Spectrum Fungible?*, IEEE Dynamic Spectrum Access Networks (Aug. 2012), available at <http://d-scholarship.pitt.edu/13442/1/fung.pdf> (evaluating numerous factors affecting the substitutability of spectrum and concluding that a multidimensional analysis of substitutability is required because “we can only speak of two bands being fungible along a continuum”).

Most wireless broadband providers, including T-Mobile, would much rather have more spectrum available for competitive bidding than have fewer spectrum blocks available at auction with fewer differentiations among them. Tolerance for variations among blocks will produce more spectrum for mobile broadband deployment and more high-value blocks subject to competitive bidding.

The Commission should ignore the fungibility red herring, reject the sprawling guard bands and duplex gaps contemplated by Google-Microsoft, and adopt only those guard bands that are no larger than technically reasonable to prevent harmful interference as the Spectrum Act requires.

3. A TDD Band Plan Has Serious Shortcomings, and Commenters Overwhelmingly Support an FDD Band Plan.

The vast majority of commenters prefer paired spectrum suitable for next generation FDD deployment, and for good reason.<sup>119</sup> FDD represents the industry standard for next-generation networks, and allocating spectrum for TDD use would create unnecessary complexities that would lead to inefficient use of the 600 MHz band.<sup>120</sup> Although TDD may merit consideration elsewhere,<sup>121</sup> the significant drawbacks of any TDD plan ultimately demonstrate it to be a far inferior option to paired downlink spectrum in the 600 MHz band.

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<sup>119</sup> See, e.g., AT&T Comments at 18-19; C Spire Wireless Comments at 6; CTIA Comments at 21; Google and Microsoft Comments at 32; MetroPCS Comments at 21; Motorola Comments at 9; NAB Comments at 45; NCTA Comments at 7-10; Nokia Siemens Comments at 11-12; Qualcomm Comments at 4; RIM Comments at 8; Sony Comments at 4; Verizon Comments at 17-18.

<sup>120</sup> Verizon Comments at 17-18; AT&T Comments at 19.

<sup>121</sup> Alcatel-Lucent at 3; see also Sprint Comments at 22; CCA Comments at 16-17 (recognizing “that most carriers will employ FDD” but noting that “the Commission should not foreclose consideration of proposals for TDD use in the 600 MHz band”).

To be sure, the TDD air interface, which divides its uplink and downlink traffic by time rather than frequency, offers some benefits.<sup>122</sup> The contiguous nature of the TDD allocation, for example, means there is no need for a duplex gap – a noteworthy efficiency.<sup>123</sup> Moreover, it would be easier to incorporate TDD rather than FDD in some 600 MHz clearing scenarios because the variable amounts of spectrum that the 600 MHz reverse auction will clear will not always neatly support both ends of a paired configuration.<sup>124</sup> Finally, TDD can be customized to support asynchronous traffic as opposed to having fixed amounts of uplink and downlink established through the band plan design.<sup>125</sup>

Unfortunately, the costs of adopting a TDD configuration in the 600 MHz band greatly outweigh these benefits. First, conducting TDD operations in the presence of FDD operations would require additional guard bands within the 600 MHz band, which would limit the amount of spectrum that could be auctioned for mobile broadband applications.<sup>126</sup> As Alcatel-Lucent notes, TDD would require separations of at least ten megahertz at every intersection of TDD with FDD uplinks, FDD downlinks, or broadcasting operations.<sup>127</sup>

Second, even if the entire 600 MHz band were dedicated to TDD – an outcome few but Sprint and its subsidiary Clearwire support – the plan would still require an extra guard band between 600 MHz TDD operations and the Lower 700 MHz that FDD configurations do not require.<sup>128</sup>

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<sup>122</sup> Sprint Comments 17-21; Clearwire Comments 6-9.

<sup>123</sup> Sprint Comments at 4; Clearwire Comments at 7-8.

<sup>124</sup> Clearwire Comments at 7-8.

<sup>125</sup> Sprint Comments at 19-20; Clearwire Comments at 6-7.

<sup>126</sup> See Verizon Comments at 17; Nokia Siemens Comments at 11-12.

<sup>127</sup> Alcatel-Lucent Comments at 11.

<sup>128</sup> Sprint Comments at 22; cf. Verizon Comments at 8; T-Mobile Comments at 10.

Third, avoiding interference among TDD operators would require all TDD operators in any given area to carefully synchronize their operations.<sup>129</sup> TDD operators, which can customize the ratio of uplink to downlink transmissions,<sup>130</sup> would have to agree to a common uplink-downlink ratio and then agree to carefully calibrate and continuously monitor their operations to ensure that the alternation of base station transmissions and end user transmissions occur at precisely the same times. While Clearwire has successfully managed to coordinate the timing of TDD operations in the high-frequency 2.5 GHz band that it largely controls, it remains unclear whether or to what extent competing 600 MHz operators operating could overcome the barriers to negotiation and accomplish the same feat.<sup>131</sup>

Fourth, the very propagation characteristics of the 600 MHz band that make the spectrum so attractive to FDD operators – namely, the band’s ability to penetrate deep inside buildings and travel long distances – may make the 600 MHz band less desirable for TDD use. Research in Motion explains that “the long range (wide area) coverage of the 600 MHz band is most suited to FDD operation due to the excessive propagation delays for channel turnaround encountered in TDD systems at these ranges.”<sup>132</sup> Whereas FDD configurations rely on fixed guard bands, TDD configurations must rely on guard times to separate uplink transmissions from downlink transmissions enough to avoid harmful interference. These guard times are generally equal to the time it takes for a signal to travel to and from the base station plus a round trip delay.<sup>133</sup>

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<sup>129</sup> TDD uses primarily ten megahertz blocks and, unless carefully synchronized, each operational block would require guard bands on either side of their operations to separate operational blocks.

<sup>130</sup> A TDD air interface divides the data stream into frames and, within each frame, assigns different time slots to the uplink and downlink transmissions. A TDD air interface allows carriers to customize the percentage of uplink and downlink they support.

<sup>131</sup> Sprint Comments at 20 n.40.

<sup>132</sup> Comments of Research in Motion, Docket No. 12-268, at 8 (Jan. 24, 2013).

<sup>133</sup> Moonblink, *TDD vs. FDD and WiMax* (last visited March 4, 2013), <http://xrl.us/bom9iz>.

Thus, even in the absence of guard bands, the requisite guard times of TDD will incorporate inefficiencies into 600 MHz band TDD operations that will constrain their carrying capacity and throughput.

Fifth, unlike the guard bands associated with FDD configurations, the guard times associated with TDD configurations are ephemeral and, at the present time, much less practical for use by unlicensed devices. The guard times, in other words, introduce idle spectrum capacity that is far less capable of being put into use by the large number of companies that have sought unlicensed access to the guard bands associated with FDD configurations.

For these reasons, among others, the Commission should not pursue a TDD allocation in the 600 MHz band.

### **III. THE FORWARD AUCTION**

#### **A. The Record Supports the Adoption of a Spectrum Cap that Would Limit the Amount of Spectrum Below 1 GHz that a Single Licensee Can Hold.**

The record reflects widespread agreement that the Commission should adopt rules in this proceeding to curtail the further consolidation of spectrum suitable for mobile broadband applications.<sup>134</sup> A bright-line rule governing spectrum concentration would (1) promote competition in services that use or rely on wireless spectrum; (2) reduce the administrative costs and delays associated with a case-by-case basis review; (3) prevent efficiency-sapping distortions in bidding that result from not knowing whether or how divestitures will occur; (4) encourage auction participation; and (5) potentially increase auction revenues.<sup>135</sup>

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<sup>134</sup> See C Spire Comments at 3; Free Press Comments at 14-15; PISC Comments at 63, 68; Sprint Comments at 3, 9; U.S. Cellular at 32.

<sup>135</sup> CCA Comments at 9; C Spire Comments at 2-6; Jonathan B. Baker, *Establishing Auction Rules that Promote Competition in Wireless Services*, at 3-4 (Mar. 12, 2013) (“Baker Economic Analysis”), attached at Exhibit B.

Wireless carriers are not alone in urging the Commission to institute a mechanism that will ensure diversity among holders of valuable spectrum resources, promote long-term competition, and increase auction participation; rather, support for these measures extends to distant downstream competitors, such as the Writers Guild, that recognize the threat that steadily increasing concentration in the wireless industry poses to their businesses.<sup>136</sup> Likewise, other countries have identified spectrum concentration as a threat to the timely and cost effective deployment of broadband services. Last week, for example, Canada’s conservative government led by Prime Minister Stephen Harper, who *The Economist* has recognized as a longstanding advocate of “encouraging entrepreneurship and keeping the government’s influence on people’s lives to a minimum,”<sup>137</sup> found that “access to spectrum represents a critical barrier to entry in this industry” and held that “without rules preventing excessive concentration of spectrum holdings, competition could suffer.”<sup>138</sup> In adopting spectrum caps for its planned 700 MHz 4G auction, Industry Canada said that the caps would “support the objectives of sustained competition and robust investment in a minimally intrusive manner.”<sup>139</sup> So too here, the best mechanism available to promote competition is a spectrum cap – specifically a cap that would limit any

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<sup>136</sup> See, e.g., Writers Guild Comments at 4, 5 (noting that “it is imperative to address the growing problem of spectrum aggregation” because “[t]he lack of competition in wireless and the harm it is causing the mobile video market makes it critical that the Commission address spectrum aggregation before making more spectrum available to wireless providers”); Baker Economic Analysis at 5 (noting that excessive spectrum aggregation can encourage the dominant incumbents “to frustrate the development of new technologies and business models brought to the market by fringe rivals and potential competitors, including future rivals that cannot now be identified”).

<sup>137</sup> Madelaine Drohan, *The United States of Canada: the Country Will Look a Lot More Like the Real America*, *The Economist* (Nov. 17, 2011), available at <http://www.economist.com/node/21537001>. Indeed, U.S. Republican Newt Gingrich has praised Harper “as a conservative and pro-American.” Michael Bolen, *Newt Gingrich: Stephen Harper Gets Shout-Out from Republican Hopeful*, *Huffington Post* (Jan. 24, 2012), <http://xrl.us/bonuoh>.

<sup>138</sup> See Industry Canada, *Policy and Technical Framework: Mobile Broadband Services (MBS) — 700 MHz Band, Broadband Radio Service (BRS) — 2500 MHz Band*, (March 2012), available at <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10121.html>.

<sup>139</sup> *Id.*

single licensee from acquiring more than one-third of the available commercial mobile spectrum below 1 GHz in the incentive auction.

1. Excessive Concentration in the U.S. Wireless Market Harms the Public Interest.

Although consumer demand for wireless communications services is rising at an unprecedented rate, the amount of spectrum ideally suited for wireless broadband applications – below 1 GHz – has become increasingly concentrated. The consolidation has been most pronounced among the nation’s top two largest carriers, Verizon Wireless and AT&T. As Sprint noted, those two carriers “have aggregated approximately 75% of the commercial spectrum below 1 GHz, including 86% of it in the top 10 U.S. markets and over 80% in the top 50 markets.”<sup>140</sup> The Commission’s own reports on the state of the U.S. wireless industry likewise bear out this marketplace development: in 2011, the Commission reported that Verizon Wireless and AT&T held 67.20% of 700 MHz commercial spectrum, and 91.30% of cellular (850 MHz) spectrum.<sup>141</sup> C Spire likewise noted that, as of 2010, consolidation in the U.S. wireless industry measured nearly 350 points *above* the threshold of a “highly concentrated” market, according to the Herfindahl-Hirschman Index (“HHI”).<sup>142</sup>

The concentration of low-band spectrum has undermined the public interest in a number of respects. Carriers (such as T-Mobile) that have been unable to acquire sub-1 GHz spectrum have been forced to incur substantially higher costs to deploy an infrastructure that achieves the coverage that consumers demand. Accordingly, as Sprint notes, the eligibility rules adopted by

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<sup>140</sup> Sprint Comments at 2.

<sup>141</sup> See Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, WT Docket No. 10133, *Fifteenth Report*, FCC 11-103 ¶ 287 & Table 27 (rel. June 27, 2011) (“*Fifteenth Report*”).

<sup>142</sup> C Spire Comments at 3.

the Commission in this proceeding will have a lasting effect on wireless competition, as well as “the innovation and economic growth the Commission envisions the incentive auctions stimulating.”<sup>143</sup>

The concentration of spectrum also has fueled the development of unforeseeable technical hurdles that have impeded service deployments in other spectrum bands. For example, as noted by U.S. Cellular, the lack of interoperability in the Lower 700 MHz band “would not have arisen if there had been a greater diversity of license winners in the A, B, and C Blocks from the outset.”<sup>144</sup> T-Mobile agrees that had measures been in place to ensure that a diversity of licensees succeeded in acquiring the 700 MHz spectrum, “[i]nteroperability would have been a practical necessity . . . because all of those carriers would have worked together to develop technology and drive a robust ecosystem.”<sup>145</sup>

2. A Spectrum Cap Below 1 GHz Should Be Applied to Prevent Further Harm Caused by the Consolidation of Valuable Spectrum into the Hands of a Few Players.

The risk of further consolidation is great, and that risk is one recognized even by AT&T, which concedes that some measures may be necessary to prevent undue spectrum aggregation. Although AT&T opposes “*ex ante* limits on the spectrum that particular carriers can obtain through this auction,” it has acknowledged that some licensees may acquire an amount of spectrum that “would bring its total holdings in a market to a level that is determined to threaten competition.”<sup>146</sup> As noted by C Spire, unless the Commission institutes “structures that prevent the 600 MHz incentive auction process from resulting in further consolidation . . . the auction

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<sup>143</sup> Sprint Comments at 7.

<sup>144</sup> U.S. Cellular at 31-32.

<sup>145</sup> *Id.*

<sup>146</sup> AT&T Comments at 79.

could result in cementing the Bell duopoly, eliminating further competition from the marketplace, and leaving the Commission with no choice but to engage in heavy-handed, public utility style regulation of a wireless industry dominated by just two operators.”<sup>147</sup>

Eligibility rules in this proceeding prohibiting a licensee from acquiring more than one-third of the available commercial mobile spectrum below 1 GHz, applied on a market-by-market basis, would mitigate the risk of further concentration of “beachfront” spectrum among only a few very large providers.<sup>148</sup> As explained in the Baker Economic Analysis, spectrum concentration can allow the largest carriers “to obtain or maintain downstream market power by keeping spectrum from their rivals.”<sup>149</sup> In an auction without caps, the two largest incumbents would have both the ability and incentive to limit competition because the “foreclosure value” the two largest incumbents gain from keeping competitors out of the band comes in addition to the value of the spectrum for providing wireless broadband service.<sup>150</sup>

Targeting spectrum below 1 GHz is especially important because low-frequency spectrum is less commonly available and more highly valued than higher frequency spectrum.<sup>151</sup> Indeed, the Commission has recognized that below 1 GHz spectrum is uniquely valuable for mobile broadband applications.<sup>152</sup> Licensees with higher frequency spectrum must construct more cell sites in a given geographic area to match the signal coverage of a licensee deploying

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<sup>147</sup> C Spire Comments at 3.

<sup>148</sup> Other parties agree. C Spire has asked the Commission to “adopt a spectrum screen that accounts for the aggregation of low band spectrum by the largest operators.” C Spire Comments at 5. Sprint likewise endorses license eligibility rules that would preclude a licensee from “exceeding the proposed low-band spectrum cap of one-third of available spectrum below 1 GHz.” Sprint Comments at 9.

<sup>149</sup> Baker Economic Analysis at 3.

<sup>150</sup> *Id.*

<sup>151</sup> See, e.g. Scott Wallsten, Technology Policy Institute, *Is There Really a Spectrum Crisis? Quantifying the Factors Affecting Spectrum License Value* at 20 (Jan. 23, 2013) (indicating that, based on analysis of every spectrum auction since 1996, “spectrum below 1 GHz,” when used for broadband, is “more valuable than spectrum above 1 GHz”).

<sup>152</sup> Policies Regarding Mobile Spectrum Holdings, WT Docket No. 12-269, *Notice of Proposed Rulemaking*, 27 FCC Rcd 11710, 11725-26 ¶ 35 (Sept. 28, 2012) (“*Spectrum Holdings NPRM*”) (citing sources).

service using 700 MHz, 850 MHz, and now 600 MHz, band spectrum.<sup>153</sup> As a result, “a wireless provider may disadvantage rivals (raising their production costs) by denying them access to low-frequency spectrum, even if high-frequency spectrum can physically substitute for low-frequency spectrum to some extent with additional capital investment.”<sup>154</sup> Moreover, if wireless services can be provided more cheaply using a mix of spectrum from different bands, firms can still disadvantage competitors by monopolizing a specific band even if different bands have different merits and spectrum in one band can to some extent substitute for spectrum in another band with additional capital.<sup>155</sup> The proposed 1 GHz cap is therefore designed to ensure that the spectrum made available in this auction will be distributed in a manner that fosters competition among both large and small wireless providers, which will produce large consumer benefits.

The spectrum cap T-Mobile has proposed would not only give effect to the Commission’s statutory obligation to “avoid excessive concentration of licensees” and distribute licenses to “a wide variety of applicants,”<sup>156</sup> but also would increase participation in the forward auction. T-Mobile agrees with Verizon that maximizing bidder participation should be one of the central goals of the forward auction.<sup>157</sup> But widespread participation will not occur unless the Commission adopts a cap or screen designed to prevent the risk of excessive spectrum concentration in the hands of the one or two largest carriers. Absent clear eligibility rules that limit the amount of spectrum below 1 GHz that a licensee can hold, smaller bidders may simply

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<sup>153</sup> The need to construct additional cell sites in higher-frequency spectrum to provide the same level of coverage also requires greater upfront capital investment and generates additional reliance on other bottleneck inputs, such as backhaul from the cell site. In some areas, moreover, constructing additional cell sites may prove difficult or impossible due to physical, regulatory, environmental, and other limitations.

<sup>154</sup> Baker Economic Analysis at 15.

<sup>155</sup> *See id.* at 16-18.

<sup>156</sup> U.S. Cellular Comments at 32; 47 U.S.C. § 309(j)(3)(B).

<sup>157</sup> Verizon Comments at 38.

assume that defeat is inevitable and choose not to participate in the forward auction.<sup>158</sup> Indeed, by encouraging widespread participation in the auction, the Baker Economic Analysis concludes that spectrum caps “have the potential to *increase* auction revenues.”<sup>159</sup>

Although the Commission could try to curtail further spectrum concentration by other means, an *ex ante* rule would be most effective. Specifically, a bright-line spectrum cap would:

- Provide the certainty necessary for interested parties to plan their participation in the forward auction, as well as their services, technologies, and financing needs;
- Avoid the administrative burdens of assessing spectrum holdings on a case-by-case basis after the auction, which requires the Commission to expend substantial resources to assess whether a licensee’s holdings are contrary to the public interest and may reduce auction revenues as bidders must discount their bids by the possibility of divestiture;
- Eliminate the costs and inefficiencies that attend the process of forcing licensees to divest certain licenses;
- Reduce the incentive of carriers to engage in insincere bidding to acquire spectrum simply to prevent other carriers from securing the necessary spectrum resources to effectively compete; and
- More effectively prevent spectrum concentration than the Commission’s *ex post* divestiture approach, which, as U.S. Cellular notes, has not imposed any meaningful limitations on the amount or type of spectrum that a single party may acquire.<sup>160</sup>

In light of the limited amount of spectrum available for mobile broadband applications, as well as the existing concentration of spectrum below 1 GHz in two dominant carriers, the Commission should adopt a pro-competitive cap on spectrum holdings below 1 GHz. Not taking

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<sup>158</sup> See Baker Economic Analysis at 10 (“Given the non-trivial fixed costs of auction participation, a firm expecting to be outbid could readily be deterred from participating in the auction in the first place.”).

<sup>159</sup> Baker Economic Analysis at 19 (emphasis added).

<sup>160</sup> U.S. Cellular Comments at 30; Baker Economic Analysis at 11-14; see also C Spire Comments at 3-4; PISC Comments at 66-68; Sprint Comments at 3, 8-9.

into account the incentives to protect and extend dominant market positions would result in an inefficient allocation of the 600 MHz spectrum.

3. The Commission Should Reject the Objections by Verizon and AT&T to the Spectrum Cap.

It is no surprise that the Verizon and AT&T – the two carriers with the largest sub-1 GHz spectrum holdings – oppose a spectrum cap. However, their objections against the spectrum-related eligibility proposals lack merit.

First, spectrum below 1 GHz is either distinctive, as T-Mobile, Sprint, U.S. Cellular, Leap, CCA, and many others contend, or it is not.<sup>161</sup> AT&T, however, claims both that a cap on excessive spectrum below 1 GHz will harm it, but that a lack of access to below 1 GHz spectrum will not harm competitive carriers. According to AT&T, competitive carriers can simply acquire higher frequency spectrum and then spend more on deploying additional infrastructure in lieu of acquiring low-frequency spectrum.<sup>162</sup> The end result, AT&T contends, will be the same: more costly spectrum plus less costly infrastructure will equate to less costly spectrum plus more costly infrastructure.<sup>163</sup> Of course, ample evidence exists to prove this contention false.<sup>164</sup> But even if spectrum above and below 1 GHz were freely substitutable, the cap should have no effect whatsoever on the dominant holders of below 1 GHz spectrum because they could simply acquire high frequency spectrum at a substantial discount and construct more infrastructure, as AT&T claims others can do. The truth is that spectrum below 1 GHz offers unique value and is

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<sup>161</sup> T-Mobile Comments at 25; Sprint Comments at 2-3; Leap Comments at 7-8; CCA Comments at 2; U.S. Cellular Comments at 5-6.

<sup>162</sup> Comments of AT&T Inc., Docket No. 12-269 (Nov. 28, 2012), Attachment A, Mark A. Israel, & Michael L. Katz, Economic Analysis of Public Policy Regarding Mobile Spectrum Holdings 65-67.

<sup>163</sup> *Id.*

<sup>164</sup> *See supra* Section III. A. 2.

not substitutable for spectrum above 1 GHz. But if – despite all the evidence to the contrary – spectrum below 1 GHz were substitutable for spectrum above 1 GHz, then adopting a below 1 GHz cap would do no harm. AT&T simply cannot have it both ways.

Second, contrary to the assertions of Verizon and AT&T,<sup>165</sup> the Commission has increasingly recognized the growing consolidation of spectrum for commercial mobile services, and has even initiated a separate proceeding to examine the adequacy of its current spectrum holdings policies, as they are generally applied in transactions and at auction.<sup>166</sup> The concentration of the highest-value spectrum below 1 GHz is especially pronounced and the 600 MHz auction threatens to reinforce the concentration that the Commission has identified. Rather than squarely address the issue, the two largest wireless operators have simply ignored the Commission’s justifiable sensitivity to the increasing consolidation of spectrum ideal for wireless broadband, as well as the statutory mandate of both the Spectrum Act and Section 309(j) of the Communications Act that the Commission foster competition through spectrum diversity.<sup>167</sup>

Third, Verizon has hypothesized that eligibility restrictions would result in some of the 600 MHz spectrum being licensed to providers that do not value it the most or who are incapable of deploying service in a timely manner.<sup>168</sup> But that would not be the case. Rather, a spectrum cap would encourage interested parties who might otherwise not have participated in the auction

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<sup>165</sup> AT&T Comments at 79-80; Verizon Comments at 38-43.

<sup>166</sup> *See generally Spectrum Holdings NPRM.*

<sup>167</sup> In the 1980s, the Commission assigned the first cellular licenses to the predecessors of Verizon and AT&T among others at no cost. With only two licenses per market, competition languished and so too did wireless deployment. Not until the 1990s, when the Commission awarded multiple new spectrum licenses during an auction conducted under a strict spectrum cap, did the United States market see the proliferation of new competitors, including T-Mobile, Sprint, and other wireless carriers that challenged the dominant incumbents with innovative new offerings.

<sup>168</sup> *See Verizon Comments at 41.*

to bid for 600 MHz spectrum.<sup>169</sup> There is no reason to think that these additional bidders would have less of an incentive or ability to build-out the spectrum simply because they are smaller or “greenfield” operators. The general support among regional wireless carriers for a spectrum-based eligibility rule offers compelling evidence of how a spectrum cap would incentivize participation in the forward auction. Moreover, the Commission can adequately protect against licensees that are unable to timely deploy service by adopting and enforcing construction deadlines and performance requirements, as it has done for other licensed spectrum.<sup>170</sup>

Fourth, the claim that a spectrum cap would suppress demand for the 600 MHz band and risk not meeting the closing conditions for the auction lacks any basis.<sup>171</sup> As T-Mobile explained in its comments and as reiterated in the Baker Economic Analysis, a spectrum cap can increase participation in a spectrum auction and yield auction proceeds that exceed what would otherwise result without a cap.<sup>172</sup> Opponents of the spectrum cap have marginalized the essential role that widespread participation would play in enhancing the market clearing prices during the forward auction. Moreover, their objection fails to account for the long-term benefits that promoting spectrum diversity would achieve, and disregards the fact that revenue maximization is just one of several goals that the Commission must pursue in this proceeding. In fact, the Spectrum Act expressly directs the Commission to adopt and enforce rules “concerning spectrum aggregation that promote competition,” but makes no mention of any obligation to “maximize revenue.”<sup>173</sup>

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<sup>169</sup> See T-Mobile Comments at 33.

<sup>170</sup> See NPRM ¶¶ 321-29.

<sup>171</sup> See Verizon Comments at 41-42; see also Ex Parte Letter from Ari Meltzer, Counsel for the Expanding Opportunities for Broadcasters Coalition, to Marlene Dortch, Secretary, Federal Communications Commission, GN Docket No. 12-268 (Jan. 28, 2013).

<sup>172</sup> See T-Mobile Comments at 33; Baker Economic Analysis at 3, 4, 7, 10-11.

<sup>173</sup> See *id.* at 34 (citing *Spectrum Act* § 6404).

Finally, a cap on spectrum below 1 GHz would not “inject uncertainty” into the forward auction, as Verizon has conjectured.<sup>174</sup> Rather, as noted above, clear and early spectrum-clearing targets would provide substantial guidance to auction participants as they determine the markets in which they can aggressively compete for 600 MHz band spectrum. For example, licensees with large spectrum holdings below 1 GHz in a particular market would know at the outset the limitations of their ability to acquire substantially more spectrum in that market. Additionally, the overwhelming majority of interested parties would not be affected at all by the adoption of a spectrum cap. Because so much of the spectrum below 1 GHz is held by Verizon and AT&T, the universe of auction participants that would need to modify their bidding strategies in response to a specific cap is limited.

After-the-fact divestitures of the type AT&T has proposed would do more harm than good.<sup>175</sup> Not only are mandatory *ex post* divestitures uncertain, unpredictable, and time-consuming, they would materially distort bidding in the forward auction as interested parties would have to guess whether, when, and how the largest carriers would reduce their spectrum holdings to less dominant levels.<sup>176</sup> As the Baker Economic Analysis explains, the cost associated with after-the-fact review are “potentially substantial” because “rivals that might have won in the initial auction but were outbid by the large firm (or decided not to bid because they expected to be outbid) may have found work-arounds by the time the winning firm is required to divest.”<sup>177</sup> Allowing the two largest carriers to choose both the spectrum that they would divest

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<sup>174</sup> See Verizon Comments at 42.

<sup>175</sup> See AT&T Comments at 79-80.

<sup>176</sup> See Baker Economic Analysis at 10-14.

<sup>177</sup> *Id.* at 20. After-the-fact review does not necessarily help Verizon and AT&T, either. A dominant incumbent that “falsely believes that its acquisition may be rejected, or fails to win because it reduces its bid due to the risk of post-auction divestitures” will also result in a less efficient spectrum assignment and potentially lower auction revenues. *Id.*

and the buyers eligible to purchase the spectrum would exacerbate the problem by providing a mechanism for the party divesting the spectrum to place the resource with the company least likely to pose a competitive threat.<sup>178</sup> Meanwhile, empowering AT&T and Verizon to shuffle assets between them would do nothing to improve competition and, in fact, would likely only reinforce the kinds of collaboration and tacit signaling that can diminish competition.

**B. Random or Quasi-Random License Assignments Will Clear More Spectrum, Increase Efficiency, Promote Interoperability, and Raise More Revenue in the Forward Auction.**

Employing the random or quasi-random assignment of 600 MHz licenses within a common license category of paired or unpaired blocks will encourage scale efficiencies, promote interoperability, eliminate the negative consequences some associate with transparent bidding, and – perhaps most important – increase the likelihood that the incentive auction will close with the maximum possible amount of spectrum dedicated to mobile broadband use. The alternative to random or quasi-random assignment of 600 MHz license blocks is to conduct an additional assignment auction following the incentive auction.<sup>179</sup> A follow-on assignment auction, however, would divert auction revenue from broadcast clearing, complicate and delay license assignment, and risk creating new impediments to consumer choice.

A random or quasi-random assignment process found strong support in the initial comment round.<sup>180</sup> AT&T, for example, called for the Commission to “avoid reliance on such supplemental bidding” and to “ensure that the generic-bidding round is the main event.”<sup>181</sup>

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<sup>178</sup> *Id.*

<sup>179</sup> While the Commission could also introduce an assignment auction into the forward auction, conducting an assignment auction as part of the forward auction each round could cause delay.

<sup>180</sup> *See, e.g.*, AT&T Comments at 42, Verizon Comments at 46.

<sup>181</sup> AT&T Comments at 42.

Verizon similarly called for assignment of licenses “through rules and policies” rather than a follow-on auction<sup>182</sup> Verizon even recognized that a degree of randomness is unavoidable in any assignment procedure, and discouraged the Commission from “seek[ing] to resolve inconsistent frequency assignments . . . through competitive bidding.”<sup>183</sup> Other commenters agreed.<sup>184</sup>

The mechanics of a quasi-random assignment process are straightforward and can be designed using transparent rules to ensure fairness and accountability. Under one approach, the Commission would generate a list of the block winners within each MEA and then randomly assign blocks to each winning bidder in a randomly generated order.<sup>185</sup> To capture the synergies of geographic and spectrum contiguity, the Commission would constrain the random assignment of licenses slightly by adopting transparent rules to ensure that (1) winning bidders with licenses throughout an MEA obtain the same block within that MEA and (2) winning bidders with more than one block within an MEA obtain contiguous spectrum within that MEA.<sup>186</sup> In a notable limitation, these two constraints on randomness would apply only *within* an MEA, not across multiple MEAs. This limitation represents an important safeguard to prevent a single licensee from obtaining the same frequency blocks everywhere in the country – a condition that creates opportunities to increase rivals’ equipment costs, thwart roaming obligations, and diminish consumers’ ability to move among different carriers.

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<sup>182</sup> Verizon Comments at 46.

<sup>183</sup> *Id.* at 46.

<sup>184</sup> Motorola Comments at 10.

<sup>185</sup> An alternative to Commission assignment would be to allow the winning bidders to choose their blocks according to a randomized *priority* set by the Commission. Under this arrangement, the Commission would offer winning bidders the choice of specific licenses according to this random list order, again subject to certain constraints designed to allow for some measure of geographic and spectrum contiguity.

<sup>186</sup> Alcatel-Lucent, for example, proposes an assignment rule that would “guarantee that bidders that win more than one 5 MHz block obtain blocks that are adjacent to each other, permitting the carrier to operate using wider channels and greater throughput than a single 5 MHz block would allow.” Alcatel-Lucent Comments at 25; *see also* Verizon Comments at 46; RIM Comments at 7.

To illustrate how the rules would function, suppose in a given MEA there are seven generic license blocks sold among three winners. Two of the winners have three licenses each and one has one license. Assuming that the license blocks are numbered A to G contiguously and the bidder with only one license received priority, then the Commission would assign the bidder that won one license to block A or D or G. If G were randomly assigned to the one-block winner, then one of the three-block winners would be either A-C or D-F within that MEA while the other three-block winner would receive the unassigned contiguous blocks. Because a different quasi-random assignment would occur in each MEA, no one winner would be likely to acquire all of the spectrum on a single set of frequencies, yet every multiple license winner could still capture the synergies associated with acquiring contiguous spectrum and common blocks in any given market area.<sup>187</sup>

A random or quasi-random assignment procedure achieves several benefits, including: (1) creating durable incentives for market-driven interoperability; (2) resolving concerns about anonymous bidding concerns; (3) establishing a more readily met closing requirement that will maximize the spectrum acquired for mobile broadband use; and (4) raising more revenue in the forward auction.

1. Creating Durable Incentives for Interoperability.

Most commenters agree that adopting an interoperability requirement for the 600 MHz band represents the simplest and most effective means of preventing anti-competitive band

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<sup>187</sup> T-Mobile Comments at 21-23. At the same time, a random or quasi-random assignment need not present any hurdles for carriers desiring to aggregate multiple blocks of spectrum. As the Commission recognizes in the *Notice*, it anticipates that it will “assign contiguous blocks to bidders that bid for multiple blocks in the same geographic area.” *NPRM* ¶ 64. If significant economies exist to having similar frequencies in every MEA, auction winners could use secondary market exchanges to achieve single-block operations, but that eventuality would offer competitors the opportunity to ensure that incompatibilities do not emerge or hamper competition.

fragmentation at 600 MHz.<sup>188</sup> Requiring interoperability will increase competition among wireless carriers and allow consumers to switch providers without requiring them to purchase costly new mobile phones, tablets, and computers.<sup>189</sup> Adopting random assignment procedures reinforces and extends the interoperability requirement that T-Mobile and many other commenters support by providing durable, market-based incentives for manufacturers to create interoperable devices capable of tuning across all paired spectrum following the 600 MHz auction.<sup>190</sup> So long as a carrier's 600 MHz blocks are distributed randomly through the band, a carrier has no incentive or ability to develop a custom, "boutique" band class centered around one block of frequencies.<sup>191</sup> As a result, handset vendors will create phones compatible with all providers, which will increase the ability of users to switch providers without switching phones – something that is not necessarily in the interest of handset manufacturers, who would just as soon see the consumer buy another costly device, or in the interest of dominant wireless operators, who use increased switching costs to reduce churn off of their networks.

These market-driven incentives for achieving interoperability among multiple wireless operators resulting from diversely assigned frequency holding would have many advantages and

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<sup>188</sup> C Spire Comments at 9 (“[T]he Commission has the power to protect the 600 MHz band from balkanization by requiring interoperability.”); CCA Comments at 16 (“CCA strongly urges the Commission to require interoperability throughout the 600 MHz band, to avoid the problems that have plagued the Lower 700 MHz band.”); Leap Comments at 7 (“[T]he Commission should ensure interoperability across the entire 600 MHz band, to prevent the splintering that has occurred in the 700 MHz band.”); MetroPCS Comments at 28 (“The Commission must ensure that [the problem of interoperability in the Lower 700 MHz band] does not happen again in the 600 MHz band by mandating a single band class across the entire band.”); Comments of the National Telecommunications Cooperative Association, GN Docket No. 12-268 2-3 (Jan. 25, 2013) (“Nat’l Telecom. Coop. Ass’n Comments”) (supporting any “measures that would ensure interoperability”); U.S. Cellular Comments at 26 (“[A]s it has done in the past, the Commission must strive to adopt spectrum policies, including an interoperability requirement, that will benefit consumers in unserved and underserved areas.”); T-Mobile Comments at 21 (“The Commission should require interoperability across all paired 600 MHz band channels.”).

<sup>189</sup> See, e.g., CCA Comments at 16; U.S. Cellular Comments at 25-26; T-Mobile Comments at 21.

<sup>190</sup> *NPRM* ¶ 162 (explaining that one of the Commission’s “goals in deciding how best to license this wireless spectrum is encouraging interoperability”).

<sup>191</sup> See U.S. Cellular Comments at 31-32.

finds strong support in the record.<sup>192</sup> Interoperability decreases the costs of devices because carriers and manufacturers are able to achieve economies of scale. It decreases the expense consumers face when switching carriers and promotes roaming between networks. And it promotes the deployment of mobile broadband services.<sup>193</sup> As the Commission well knows, lack of interoperability is devastating to the value and usefulness of a set of frequencies—the Lower 700 MHz A Block, for example, has languished following a decision by one of the largest carriers to consolidate holdings elsewhere in the band and to develop hardware incapable of operating on the 700 MHz A Block frequencies. It is thus unsurprising that many commenters desire interoperability throughout the 600 MHz band.<sup>194</sup> The Commission should adopt an interoperability mandate for the 600 MHz band and ensure a diversely held set of frequency assignments in the band. Together, these measures would help guard against the damaging consequences of artificially limiting common equipment to frequencies associated with only one wireless carrier.

## 2. Resolving Concerns about Anonymous Bidding.

Random or quasi-random assignments can also address smaller and mid-size carriers' concerns with anonymous bidding.<sup>195</sup> Several smaller carriers contend that anonymous bidding will allow larger carriers to shut them out of certain blocks, thereby compromising their ability to obtain roaming agreements and interoperable equipment. Unless competitive carriers know

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<sup>192</sup> Several commenters support creating incentives for interoperability through auction design. While it opposes an interoperability mandate, CEA calls for the Commission to “develop a band plan that will foster interoperability.” CEA Comments at 22. Research in Motion similarly calls on the Commission to examine auction design and “reevaluate the circumstances that are driving multiple band plans.” RIM Comments at 13.

<sup>193</sup> As the Commission recognizes, “[i]nteroperability has often been important to ensuring rapid and widespread deployment of mobile devices in a new spectrum band.” *NPRM* ¶ 162.

<sup>194</sup> See, e.g., U.S. Cellular Comments at 23; C Spire Comments at 8-9; CCA Comments at 16; Leap Wireless Comments at 7; MetroPCS Comments at 28; Nat’l Telecom. Cooperative Ass’n Comments at 2.

<sup>195</sup> See CCA Comments at 18; Leap Wireless Comments at 8; C Spire Comments at 5 n.11.

which spectrum blocks the nation’s largest carriers are (and are not) purchasing, the smaller carriers contend that they could find themselves boxed out of the scale economies that the nation’s largest carriers enjoy and unable to secure either the roaming arrangements or the access to first-run device offerings on which success in the consumer marketplace depends.<sup>196</sup> As Leap Wireless explains, “because small, midsize, and regional carriers rely on roaming arrangements and device ecosystems largely controlled by larger competitors, they have a particular need to evaluate the bids of such competitors, including bids in adjacent markets, to accurately assess the value of particular licenses.”<sup>197</sup>

Rather than eliminating anonymous bidding and the many administrative, revenue, and fairness benefits it can achieve,<sup>198</sup> the Commission can prevent the anticompetitive consequences of deterministic block assignments that the smaller carriers have identified by simply assigning blocks in a quasi-random fashion across MEAs. With random assignments, competitive carriers are assured that *all* winners will be assigned a random block. As a result, even the carriers with limited holdings will know that some of their blocks fall within the same frequency as those of the two largest carriers. Thus, the largest carriers could not focus their purchasing power on some blocks in ways that foreclose the smaller carriers from scale economies, raise the costs of purchasing devices, delay access to first-run devices, and preclude or obviate the need for mutually beneficial roaming agreements.<sup>199</sup>

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<sup>196</sup> CCA Comments at 18. CCA asserts that anonymous or “blind” bidding in Auction 73 resulted in the larger auction participants “herding” the smaller carriers into the Lower 700 MHz A Block. *Id.*

<sup>197</sup> Leap Wireless Comments at 8.

<sup>198</sup> See Auction of AWS-1 and Broadband PCS Licenses Rescheduled for August 13, 2008, *Public Notice*, Docket No. 08-46, 23 FCC Rcd 7496, 7536 ¶ 157 (May 16, 2008) (recognizing that anonymous bidding has competitive benefits, including reduced opportunities for bid signaling, retaliatory bidding, and other anti-competitive strategic bidding).

<sup>199</sup> The PCS block, for example, has never experienced an interoperability crisis in large part because no dominant operator has ever consolidated a spectrum position on a single block. No operator could risk developing a boutique

### 3. Making the Clearing Rule Easier to Satisfy.

Employing a random or quasi-random assignment process keeps bidding activity focused on clearing spectrum.<sup>200</sup> Bidders facing two auctions rather than one will reduce their primary forward auction bids based on their expected activity in the follow-on auction. Reduced primary auction bids will decrease the amounts offered to broadcasters to relinquish spectrum, which, in turn, will decrease the amount of spectrum to be cleared for mobile broadband.

Precisely how the Commission could prevent bidders from responding in ways that would reduce the amount of cleared spectrum *without* a random assignment process is not clear. The Commission will need to determine whether or not the clearing rule is satisfied *before* the assignment stage because the auctioneer would need to reveal information about the distribution of wins to allow assignment-round bidders to know where they stand. Revealing information about the winners before the clearing rule is satisfied risks revealing critical information that could damage the forward auction bidding. For example, if there were seven licenses available in an MEA and a bidder is winning four licenses and can only choose between licenses one through four or four through seven, then this bidder could infer that in this area there is exactly one more winner of three licenses. Knowing where rival bidders stand provides important information that, if the primary forward auction has not yet closed, the bidder could use to its advantage by, in this example, acquiring a fifth license in that MEA and frustrating the rival's intent to acquire three licenses in the same area or by trying to split licenses at three each at a low price once the bidder knows there is only one other competitor in the area. Random or quasi-

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band class for a single frequency because no one operator holds a single frequency block across a majority of geographic areas.

<sup>200</sup> AT&T Comments at 42; *see also* T-Mobile Comments 22-23.

random assignments reduce the risk of strategic behavior that could frustrate a successful forward auction.

#### 4. Raising More Revenue.

The random-rule assignment can also generate more revenue in the forward auction than would be the case if the Commission employed a follow-on assignment auction. Suppose that there are two licenses in an area and three bidders, each demanding one license. Suppose further that License A is 10% better than license B because, for example, it experiences less interference from adjacent TV stations. Finally, suppose that Bidder 1 values license B at 140; Bidder 2 values it at 120; and Bidder 3 values it at 100. Regardless of the license assignment process, Bidder 3 will set the price of the license because Bidder 3 will bid up to its value of winning a generic license. In the case of a random-order assignment, Bidder 3 would bid up to 105 because if he won a license, he would have equal probability of getting the more valuable License A, and the average value of the A and B license combined is 105  $((100+110)/2=105)$ . If Bidder 3 expected an assignment auction, however, he would expect not to be able to outbid the other winner for License A and hence Bidder B would drop out of the forward auction at 100, resulting in forward auction revenue that is lower by ten than under random assignment. In this way, using a random assignment process rather than a follow-on assignment auction can cause the forward auction to raise more revenue for broadcast clearing, public safety, and deficit reduction.<sup>201</sup>

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<sup>201</sup> While the highest price Bidder 1 is willing to pay in this example is lower under the random assignment process, that fact does not reduce revenues because Bidder 1 does not affect the price in the forward auction.

**C. The Commission Should License the 600 MHz Spectrum By Major Economic Area.**

Licensing the 600 MHz primarily on an MEA basis with the possibility of some EA licenses would (1) satisfy the needs of most wireless carriers; (2) preserve the ability of licensees that wish to provide service in a smaller geographic area; and (3) reduce the need to permit package bidding in an already complex auction. The exclusive use of geographic areas smaller than MEAs creates serious exposure risk for bidders that wish to provide national or regional service and increases the need for a package bidding process.

Exposure risk creates a fundamental problem for companies such as T-Mobile that seek to challenge the two largest carriers in gaining access to the 600 MHz band spectrum. To compete on the national level using 600 MHz spectrum, T-Mobile must acquire 600 MHz spectrum virtually everywhere. If 600 MHz licenses were sold only on an EA basis, T-Mobile might have to spend billions of dollars before learning that the total price for the bundle of licenses T-Mobile wants “makes the whole entry unaffordable or unprofitable.”<sup>202</sup> Without some mechanism to aggregate an economically efficient minimum set of licenses, companies’ winnings could fall short of what is needed to compete effectively in the 600 MHz band and the risk of such an outcome could compel T-Mobile to sell its 600 MHz licenses to the two largest carriers “at firesale prices” rather than pursue a competitive network deployment that has been rendered uneconomical for want of sufficient scale or sufficient geographic scope.<sup>203</sup>

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<sup>202</sup> Jeremy Bulow, Jonathan Levin, and Paul Milgrom, *Winning Play in Spectrum Auctions*, (February 2009), <http://www.stanford.edu/~jdlevin/Papers/AWS.pdf>.

<sup>203</sup> *Id.*

Several commenters agree that EA licenses pose too great an exposure risk to encourage robust bidding.<sup>204</sup> Faced with the risk of acquiring markets that lack sufficient scale, potential bidders could simply forego participation in the forward auction, which could hinder the development of competitive wireless broadband services by keeping valuable spectrum from the wireless market. The two largest carriers support limited package bidding with pre-defined packages based on Major Economic Areas (MEAs), Regional Economic Area Groupings (REAGs), or even nationwide licenses. Given its complexity in this context, however, package bidding will prove difficult. The far simpler alternative is to adopt a larger geographic license area, namely the MEA, as the primary license area.

Large geographic area licenses such as the MEA reduce exposure risk and allow most carriers to more readily assemble a footprint commensurate with the market they seek to serve. Some commenters, however, remain unconvinced that small EA licenses will expose national carriers to serious financial losses that risk diminishing auction participation and dampening bidding activity.<sup>205</sup> But simply because smaller bidders favor small licenses does not mean that using them would be efficient or improve the consumer experience. Instead, wireless consumers have spoken: they want contiguous service over large areas. U.S. Cellular, however, contends that the use of license areas as small as CMAs or even smaller will not disadvantage competitive carriers that seek to acquire a national or regional footprint.<sup>206</sup> U.S. Cellular even claims that T-Mobile's success in acquiring a nationwide footprint during the AWS auction offers as an example of a carrier successfully assembling a nationwide footprint with smaller geographic area

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<sup>204</sup> See, e.g., Verizon Comments at 49; AT&T Comments at 52 & Exhibit B.

<sup>205</sup> See, e.g., U.S. Cellular Comments at 10-11; CCA Comments at 14-15; MetroPCS Comments at 17-21.

<sup>206</sup> U.S. Cellular Comments at 10-13.

licenses.<sup>207</sup> U.S. Cellular is mistaken. T-Mobile acquired its national AWS footprint using large, REAG geographic areas, not small EAs or CMAs.<sup>208</sup> Moreover, while smaller carriers can acquire a footprint larger than their preferred market area by forming bidding consortia with other smaller carriers and then partitioning the spectrum, carriers with a larger geographic footprint have no such alternative: absent larger geographic areas or package bidding, they have no means of avoiding the exposure risk created by small geographic area licenses.

While the differences between smaller carriers that want smaller licenses and larger carriers that want larger licenses are not readily reconciled, a compromise may be possible: the Commission could use MEAs as the base geographic unit but disaggregate those MEAs that have portions of their territory encumbered by broadcast uses into their component EAs. This approach would provide MEA licenses to minimize exposure risk and, in encumbered areas, offer EA licenses as a means of promoting entry by smaller carriers and raising spectrum clearing targets that might otherwise be reduced over a large area.<sup>209</sup> Deconstructing the New

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<sup>207</sup> See *id.* at 55.

<sup>208</sup> T-Mobile acquired a nationwide footprint during the AWS auction by purchasing larger geographic area licenses, not by assembling smaller ones. The AWS auction involved six different spectrum blocks comprised of geographic area licenses of different sizes: Block A was comprised of 734 Cellular Market Area (CMA); Blocks B and C were each comprised of 176 Economic Area (EA) licenses; and Blocks D, E, and F were each comprised of twelve large Regional Economic Area Groupings (REAGs). In T-Mobile's case, the vast majority of the company's AWS spectrum holdings – and the foundation of the nationwide AWS footprint T-Mobile holds – rests not on the smallest CMA-sized area licenses of Block A or even the small EA-sized areas of Blocks B and C, but rather on the large REAG-sized area licenses of Blocks E and F. Far from supporting the notion that CMA or EA geographic-area licenses can allow the assembly of a nationwide footprint, T-Mobile's experience in the AWS auction reinforces the need for larger geographic area licenses. While *SpectrumCo* acquired a national footprint using EAs, this result is generally regarded as an aberration – the result of savvy strategic bidding, circumstances peculiar to the AWS auction (in particular, that both small and large licenses were offered nationwide and the activity rules that prevented arbitrage between them), and more than a fair amount of luck. See Jeremy Bulow, Jonathan Levin, and Paul Milgrom, *Winning Play in Spectrum Auctions*, 1-3 (February 2009), <http://www.stanford.edu/~jdlevin/Papers/AWS.pdf>.

<sup>209</sup> In an incentive auction, the amount of spectrum available for broadband use will depend upon the amount of spectrum the reverse auction can clear. If too many broadcast incumbents remain in a portion of the geographic area, then the entire geographic area would offer less spectrum for broadband use. Suppose, for example, the reverse auction in the New York City portion of the New York MEA is very successful and clears 120 megahertz of spectrum, but the reverse auction in upstate New York is considerably less successful and clears only 60 megahertz

York MEA into its composite EAs, for example, might allow higher levels of spectrum clearing in New York City EA than otherwise possible if cross-border interference issues in the Vermont, New Hampshire, and upstate New York EAs constrained the amount of spectrum-clearing that could occur throughout the entire MEA. Under this construct, MEAs would remain the base licensing unit and limit the exposure risk, but the selective disaggregation of EAs for all blocks would allow a measure of flexibility and increase the total amount of spectrum clearing.

Employing a mix of licenses in this manner can function well even in an auction comprised of otherwise roughly fungible spectrum blocks. Suppose, for example, an MEA has three EAs, called EA<sub>1</sub>, EA<sub>2</sub>, EA<sub>3</sub>. Suppose further that, in a 35x35 MHz band plan, the reverse auction clears seven paired licenses nationwide or MEA-wide with variable amounts of supplemental downlink in each of the three composite EAs. In EA<sub>1</sub>, there is one supplemental downlink possible; in EA<sub>2</sub> there are two supplemental downlinks possible; and in EA<sub>3</sub> there are three supplemental downlinks possible. In this example, the nested MEA approach would rely on MEAs for the seven paired blocks and for the one supplemental downlink common to each

	EA <sub>1</sub>	EA <sub>2</sub>	EA <sub>3</sub>
MHz cleared	84+6	84+12	84+18
Paired	7	7	7
SDL	1	2	3

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of spectrum. If the only geographic unit available is the MEA, then the total amount of spectrum available at auction in the entire MEA would be no more than the 60 megahertz available in the most constrained portion of the MEA. In an incentive auction, smaller geographic areas work as a kind of quarantine on encumbrances. The smaller the geographic area is, the lower the risk is that an encumbrance will “infect” other areas and force lower spectrum-clearing targets across a large swath of otherwise available territory.

of the three composite EAs within the MEA. But the Commission would create an additional supplemental downlink block on an EA basis in EA<sub>2</sub> and two additional supplemental downlink blocks on an EA basis in EA<sub>3</sub>. This nested MEA approach maximizes the spectrum available for licensing while still recognizing and placing a priority on minimizing the exposure risk that those auction participants most apt to participate aggressively in the 600 MHz auction are likely to face with smaller geographic licensing units. This approach would also resolve the “overflow problem” AT&T identified without the additional complexity of package bidding or the cost of losing some cleared spectrum.<sup>210</sup>

**D. The Commission Should Allow Package Bidding for Geographic Areas if It Adopts EAs, for Unpaired Blocks, and, if It Adopts Safeguards Against Abuse, for Paired Blocks.**

While geographic package bidding is complex in the context of an incentive auction, national carriers need some mechanism to mitigate the risk that they will acquire some, but not all, of the licenses they need to create a national footprint. If MEAs are not adopted, the Commission should allow package bids for combinations of spectrum in multiple geographic areas. Allowing additional package bidding for less complex combinations of paired and unpaired spectrum within a geographic area and, under certain circumstances, combinations of paired spectrum within a geographic area would also limit exposure for carriers. Because permitting package bidding for combinations of paired spectrum within a geographic area poses substantial risks of inordinate concentration of spectrum resources, however, the Commission should not permit package bidding for paired spectrum unless the Commission also adopts clear competitive safeguards against undue spectrum concentration below 1 GHz.

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<sup>210</sup> AT&T Comments, Exhibit B, Yeon-Koo Che, Phil Haile, and Michael Kearns, *Design of the FCC Incentive Auctions* 28-31.

**Geographic Package Bidding.** Licensing by MEA would reduce the need for package bidding in many cases because a single license covering an MEA would be sufficiently large to provide a commercially viable service. If the Commission does not adopt MEA geographic license areas to minimize the financial risks that carriers will face in acquiring a national footprint in the 600 MHz band, then it should adopt package bidding for multiple EA geographic area licenses. As the Commission noted, “[p]ackage bidding could be particularly helpful to bidders that face a risk of winning certain licenses but losing complementary licenses they consider essential to their business plans.”<sup>211</sup> In the absence of larger MEA licenses, allowing bidders the opportunity to make package bids that are contingent on obtaining other spectrum units would encourage broader auction participation, increase auction revenues, and enable greater efficiencies for carriers seeking to deploy 600 MHz service across a wide footprint.<sup>212</sup> A national carrier such as T-Mobile needs a national or nearly national footprint before investing the considerable funds needed to develop, deploy, and support a new spectrum band for its existing and prospective customers.

**Paired-Unpaired Package Bidding.** Failing to win paired 600 MHz spectrum could make deployment of unpaired 600 MHz spectrum uneconomical. Without paired spectrum, the per unit costs of deploying the necessary equipment to support downlink-only 600 MHz operations at the network and handset level is made more expensive. Whereas a bidder with

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<sup>211</sup> *NPRM* ¶ 62.

<sup>212</sup> See Spectrum Exchange Group, LLC, *FAQs about Ascending Auctions with Package Bidding* 1 (2000) (explaining that the “exposure problem” occurs when a bidder faces the risk of acquiring only some of the licenses that are necessary to carry out its business plan. If the bidder fails to acquire some of the licenses it needs, the complimentary licenses the bidder acquires are not worth the prices paid.); see also Christoph Brunner *et al.*, *An Experimental Test of Flexible Combinatorial Spectrum Auction Formats* 2 (2007) (describing how package bidding eliminates the exposure problem by allowing bidders to submit bids that include combinations of complementary licenses and allow the bidder to either win the entire package or nothing at all, and “as a result, bids can reflect value complementarities, which should raise efficiency and seller revenue”).

paired spectrum could rely on the same device and network hardware (such as antennas, filters, and similar frequency-related components) to support downlink-only operations in proximate bands, a bidder without paired spectrum in the vicinity would have to make difficult decisions about whether or not to invest the developmental, financial and physical resources to support an additional band not already in its portfolio. If the winning bidder has not already committed to develop the hardware necessary to deploy paired 600 MHz spectrum, holding a small outpost of downlink-only spectrum in a distant band may simply not prove worth the carrier's time and money to develop. The exposure risk that results from a lack of package bidding with paired and unpaired spectrum will prove especially problematic for T-Mobile, which is unique among the four nationwide carriers in having virtually no low-frequency spectrum that unpaired 600 MHz could readily and logically supplement. Allowing for package bidding for paired and unpaired blocks in the 600 MHz band would greatly reduce the uncertainty for T-Mobile and other bidders that lack access to low-frequency spectrum resources and minimize the risk that bidders will wind up with licenses they cannot economically use.

One potentially attractive alternative to offering package bidding for paired and unpaired spectrum is to permit limited bid withdrawals for unpaired spectrum bids. A bidder that is outbid on paired spectrum might still hold the top bid on unpaired spectrum. Rather than leaving these bidders stranded with unpaired spectrum that may prove uneconomic to deploy, the Commission could allow them to withdraw their bids on the unpaired spectrum. Bidders can use bid withdrawals strategically, and the Commission would have to adopt a few clear limitations to avoid gaming the bid-withdrawal process. First, because the bid withdrawal is designed to prevent a bidder on paired and unpaired spectrum from becoming stranded with only unpaired spectrum, the bidder would have had to have bid on paired spectrum to become eligible to

withdraw its bid on unpaired spectrum. Second, because the exposure risk to unpaired spectrum results from economies of scale in equipment procurement, the bidder would have to have bid on some substantial amount of both paired and unpaired spectrum. Third and finally, because multiple withdrawals could be used strategically during the auction regardless of the other safeguards that may be in place, bidders who are eligible for withdrawal should be limited to only one withdrawal of a bid on unpaired spectrum for lack of complementary paired spectrum during the incentive auction.

***Paired Spectrum Package Bidding.*** While T-Mobile supports the Commission's proposal to auction the 600 MHz spectrum in 5x5 MHz spectrum blocks, this amount of paired spectrum falls short of both the increasingly large blocks of contiguous spectrum contemplated for LTE and the 10x10 MHz blocks already deployed or under deployment by the two leading national carriers. Especially for carriers such as T-Mobile that hold no low-frequency spectrum resources, the 600 MHz auction represents an important opportunity to provide consumers with a high-performance broadband network that can readily penetrate inside buildings and propagate over large geographic areas with minimal infrastructure. Acquiring low-frequency resources in combinations of 10x10 MHz or greater would enable T-Mobile and other competitive carriers to develop low-frequency, coverage networks and potentially allow them to reduce the amount of roaming fees they must pay the two largest wireless providers that hold most of the low-frequency spectrum in the U.S. market today.

Yet, without some limit on the two largest carriers' ability to package paired spectrum in the 600 MHz auction, the risk that they would pay a premium to exclude carriers such as T-Mobile from these valuable, low-frequency resources is great. While the two largest wireless providers may also achieve some potential synergies between the 600 MHz band spectrum and

existing spectrum and infrastructure resources, they will have a strong incentive to deter competitive entry in the low-frequency spectrum bands that they dominate today. Absent a limit on spectrum holdings below 1 GHz, the market concentration resulting from allowing the two largest wireless providers to place package bids on paired spectrum would harm consumers and reduce total economic benefit.<sup>213</sup> Unless the Commission establishes safeguards to prevent concentration of spectrum holdings below 1 GHz, the costs to competition of allowing this type of package bidding would likely outweigh the potential incremental benefit of allowing package bidding for paired blocks in the 600 MHz band.

**E. Without Careful Oversight and Stiff Penalties for Abuse, Special Bidding Credits Will Harm the Auction and Damage Competition.**

Bidding credits create powerful incentives to acquire wireless broadband spectrum.<sup>214</sup> These subsidies not only provide a strong inducement for market entry, but also can entice applicants to try to capture a portion of the subsidy for themselves. As one economist noted, bidding credits encourage companies to create eligible bidders that are “carefully constructed to satisfy the rules but circumvent their intent.”<sup>215</sup> Even the most conscientious recipient of bidding credits still faces the prospect of a large payout if they can lease or sell the spectrum or spectrum capacity that, by design, is worth more than they actually paid.<sup>216</sup>

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<sup>213</sup> Peter Cramton *et al.*, *Using Spectrum Auctions to Enhance Competition in Wireless Services* 5 (2011), available at <http://www-siepr.stanford.edu/repec/sip/10-015.pdf>.

<sup>214</sup> See Implementation of the Commercial Spectrum Enhancement Act and Modernization of the Commission’s Competitive Bidding Rules and Procedures, *Second Report and Order and Second Further Notice of Proposed Rulemaking*, Docket No. 05-211, 31 FCC Rcd. 4753 (Apr. 25, 2006) (“*Bidding Rules Modernization 2d R&O and 2d FNPRM*”).

<sup>215</sup> Peter Cramton, Professor of Economics, University of Maryland, *Lessons from the United States Spectrum Auctions*, Prepared Testimony before the Senate Budget Committee (Feb. 10, 2000).

<sup>216</sup> Peter Cramton *et. al.*, *Using Spectrum Auctions to Enhance Competition in Wireless Services*, 54 *Chi. J. L. & Econ.* S167, S176 (2011), <http://www.cramton.umd.edu/papers2010-2014/cramton-kwerel-rosston-skrzypacz-spectrum-auctions-and-competition.pdf>.

To combat these incentives, the Commission has had to expend significant time and energy in monitoring compliance with bidding credit rules. The anti-windfall rules have included requiring entities to seek advance approval for sales, applying additional scrutiny to deal by eligible entities, and randomly auditing recipients of eligible entities' use of bidding credits.<sup>217</sup> Even then, ensuring compliance has proven challenging.<sup>218</sup> As the Commission has recognized in policing bidding credits, companies' strategies continually evolve to take advantage of the bidding credit payout.<sup>219</sup>

If bidding credits are adopted, therefore, the Commission must adopt detailed eligibility criteria, exhaustive limitations on flipping, and robust compliance audits. The Commission must also swiftly apply meaningful sanctions in the event of non-compliance. To preserve competition, the Commission must also ensure that eligible entities are not used by the dominant carriers to skirt whatever spectrum caps or screens the Commission may adopt in this proceeding or elsewhere. Finally, the spectrum acquired using those credits should be fully attributed to the party who actually uses it whether that spectrum or spectrum capacity is acquired through lease, option, joint venture or any other form of ownership or collaboration, broadly defined.

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<sup>217</sup> *Bidding Rules Modernization 2d R&O and 2d FNPRM* ¶ 42 (explaining that it has “witnessed a growing number of complex agreements between” entities receiving bidding credits “and those with whom they choose to enter into financial and operational relationships”).

<sup>218</sup> Peter Cramton, Professor of Economics, University of Maryland, *Lessons from the United States Spectrum Auctions*, Prepared Testimony before the Senate Budget Committee (Feb. 10, 2000) (“In our opinion the use of bidding credits for small businesses in the US spectrum auctions did not have a major impact on post-auction competition.”).

<sup>219</sup> *Bidding Rules Modernization 2d R&O and 2d FNPRM* ¶ 21.

#### IV. THE REVERSE AUCTION

##### A. Addressing the Most Important Reverse Auction Concerns As Soon As Possible Would Promote Broadcaster Participation and Accelerate the Incentive Auction.

The Commission has already acknowledged the importance of generating broad participation in the reverse auction.<sup>220</sup> Meeting this goal means creating a simple and transparent process for broadcast licensees to submit bids to voluntarily relinquish or share their spectrum.<sup>221</sup> To this end, the Commission has engaged in a number of outreach efforts to inform the broadcast community of the issues presented in this proceeding, and intends to continue those efforts in the coming months and years.<sup>222</sup> As Commissioner Pai recently noted, “[t]he broadcast incentive auction is inherently complicated” and “unnecessary complexities are likely to deter participation.”<sup>223</sup> Chairman Genachowski has likewise expressed the Commission’s commitment to providing broadcasters the information necessary for them “to make sound business decisions and to help [broadcasters] recognize the full value of the opportunity” afforded by this auction.<sup>224</sup>

One of the principal means by which the Commission can deliver certainty to the market and increase participation in the reverse auction is by resolving as many reverse auction issues as possible, as soon as possible. By promptly establishing the regulatory framework for spectrum-clearing, channel reassignment, reverse bid options, and radiofrequency interference criteria – among other issues – the Commission will enable broadcasters to determine whether the reverse

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<sup>220</sup> See *NPRM* ¶ 36.

<sup>221</sup> See *id.*

<sup>222</sup> *Id.*

<sup>223</sup> Statement of Ajit Pai, Federal Communications Commission Hearing Before the Subcommittee on Communications and Technology of the United States House of Representatives Committee on Energy and Commerce (Dec. 12, 2012).

<sup>224</sup> Remarks of Julius Genachowski, National Association of Broadcasters Show 2012 (Apr. 16, 2012).

auction offers a sound business opportunity for them, and provide them with ample time to identify viable business models, investor preferences, and strategic plans.<sup>225</sup> In addition, as noted by Verizon, by providing a known spectrum-clearing target, the Commission could provide interested parties with a better understanding of where broadcast and mobile operations are likely to occur in the 600 MHz band after the auction.<sup>226</sup> In markets where the repacking formula demonstrates that the Commission can achieve the spectrum-clearing target completely through repacking, broadcasters would know in advance that their stations in those markets will not be part of the reverse auction, and could plan accordingly. Likewise, this information would assist broadcasters in planning their auction strategy in those markets where repacking would not alone clear sufficient spectrum.<sup>227</sup> The resulting certainty would also benefit new 600 MHz licensees required to deploy their wireless facilities in a timely manner, in accordance with any performance standards that the Commission adopts.

To address the critical issues regarding the reverse auction, the Commission anticipates “issuing a series of public notices in the future that will provide additional opportunities for interested parties to comment on incentive auction design issues.”<sup>228</sup> However, as noted by Verizon, deferring these matters, rather than expediting their resolution, could frustrate the Commission’s objectives in this proceeding, delay the completion of the 600 MHz reallocation, and reduce participation among interested parties.<sup>229</sup> Given the complexity of this proceeding, T-Mobile joins Verizon in urging the Commission to adopt rules concerning the reverse auction as soon as possible, even if other issues remain pending or warrant further deliberations.

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<sup>225</sup> See Verizon Comments at 21.

<sup>226</sup> *Id.* at 23.

<sup>227</sup> See Verizon Comments at 23.

<sup>228</sup> *NPRM* ¶ 36.

<sup>229</sup> See Verizon Comments at 24.

Expediting the most salient reverse auction concerns should be paramount if the Commission intends to begin this proceeding in 2014.

**B. Using Multiple Opening-Round Bids Promises a Simpler and Faster Auction that is More Likely to Satisfy the Clearing Rule than Other Alternatives.**

Offering broadcasters multiple opening bids will make the auction simpler to conduct and faster to complete. The incentive auction requires the Commission to make opening bids for broadcast stations throughout the country, and T-Mobile has generally encouraged the Commission to start high.<sup>230</sup> As a rule, competition among reverse auction participations should ensure that the price for broadcast stations remains reasonably related to the prices forward auction bidders prove willing to pay. In some markets, however, an insufficient number of broadcasters may participate in the incentive auction to ensure pricing that accurately reflects the willingness of the marginal broadcaster to sell its spectrum at a given target level of clearing. This phenomenon could needlessly increase the cost of clearing the broadcast spectrum and, perhaps more importantly, could artificially reduce the total amount of spectrum cleared. For example, the Commission may set a spectrum-clearing target that involves four broadcast stations in a region. If four broadcasters are willing to cease broadcasting at a price of \$100, but the fifth broadcaster is only willing to relocate at a price of \$200, no competitive force would exist to drive the price below \$200. Such a large gap between private value and collective payment creates substantial inefficiencies and could cause the auction to fail to satisfy the minimum revenue clearing rule.

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<sup>230</sup> T-Mobile Comments at 46; TIA Comments at 13; Comments of the Expanding Opportunities for Broadcasters Coalition, GN Docket No. 12-268, at 10 (Jan. 23, 2013) (“EOBC Comments”); Comments of a Prospective Reverse Auction Participant, GN Docket No. 12-268, at 6-7 (Jan. 23, 2013).

One suggestion to prevent market failure is the use of “reference prices” for broadcast stations from other areas.<sup>231</sup> While this idea of using prices from other areas as a surrogate for in-market competition has some potential, it remains unclear how the Commission might incorporate this concept into a voluntary spectrum auction without risking missing the clearing target. That is, the “reference price” could lead a broadcaster to believe that its participation is required for the Commission to meet its spectrum-clearing target and refuse to exit the band at a low reference price.

As an alternative (or a complement) to pursuing a more detailed and predictable means of establishing “reference prices” for markets across the country, the Commission should simply offer broadcasters multiple opening bids.<sup>232</sup> This process is straightforward for the Commission to administer and for broadcasters to understand. Rather than only ask a broadcaster whether it would leave the 600 MHz band for \$200, for example, the Commission would ask whether the broadcaster would leave the 600 MHz band for \$240, \$190, and \$140. In response, the broadcaster would simply need to provide a series of yes or no answers, such as “yes” to \$240, “yes” to \$190, and “no” to \$140. In this way, the Commission could set a very high initial price *and* additional lower prices. Each broadcaster would indicate whether it would be willing to cease broadcasting at each of the opening prices. In essence, this process would create a simple sealed bid for broadcasters in the initial round of bidding. The Commission would determine the lowest price where there were enough broadcasters to satisfy the target clearing and then start the descending clock auction at that price. In situations where more broadcasters were willing to cease operations at the lowest price than there was demand for the spectrum, the clock would

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<sup>231</sup> See Auctionomics-Power Auctions, *Option for Forward Auction* 4-5 (Feb. 1, 2013) (“APA Joint Filing”), available at <http://apps.fcc.gov/ecfs/document/view?id=7022116356>.

<sup>232</sup> T-Mobile Comments at 46-47.

decrease. In cases where the number of broadcasters was exactly equal to the spectrum-clearing target, the clock would not decrease.

Using the example above with opening prices of \$240, \$190 and \$140, each of the four broadcasters and the fifth broadcaster would decide which, if any, of the Commission's three offers it would accept. With a single high opening bid of, say, \$240, the clock would decrease to \$200 and stop there. With multiple opening bids, all four low-value broadcasters might signal a willingness to accept \$190 or even \$140, which would then be the price in the reverse auction. This process would make the incentive auction more likely to satisfy the clearing rule while enhancing efficiency. In economic terms, using multiple opening bids provides a very simple mechanism to incorporate an element of a first-price auction into the second-price general design, which is precisely the approach leading theorists have advocated for auctions that incorporate a risk of low competition.<sup>233</sup>

**C. Sequentially Alternating the Reverse and Forward Auctions Balances the Need for Simplicity and Speed Against the Desire to Allow Participants to Monitor and Respond to a Changing Auction Environment.**

Commenters support an alternating or “staged” approach to the reverse and forward auctions.<sup>234</sup> As Verizon explains, under such an approach, the Commission would commence the auction process by conducting an individual stage of the reverse auction.<sup>235</sup> The Commission would collect reverse auction bids based on a target amount of broadcast spectrum to be cleared – for the initial round, an elevated best-case scenario target.<sup>236</sup> The Commission would then

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<sup>233</sup> See, e.g., Paul Klemperer, *What Really Matters in Auction Design*, 16 J. Econ. Persp. 169, 181-82 (2002) (explaining that a hybrid Anglo-Dutch auction, which combines elements of ascending and sealed-bid auctions, encourages competition where competition is otherwise expected to be weak), available at <http://xrl.us/bontxw>.

<sup>234</sup> T-Mobile Comments at 42-44; Verizon Comments at 24-27.

<sup>235</sup> See Verizon Comments at 25.

<sup>236</sup> *Id.*

conduct the forward auction, with prospective wireless licensees bidding on the wireless licenses that would be created if the target from the preceding reverse auction stage is cleared.<sup>237</sup> After a single stage of each of the reverse and forward auctions is complete, the Commission would then determine if the forward auction bids are sufficient to cover the reverse auction bids and meet the overall auction closing conditions.<sup>238</sup> If the total forward auction bids are sufficient, the incentive auction would be closed and the process complete. If, however, the aggregate forward auction bids fall short of the closing conditions, the Commission would try to coax additional bids out of the forward auction participants to meet the closing conditions.<sup>239</sup> And if the total forward auction bids still fall short after attempts to coax higher bids, then the Commission would start a new round of reverse and forward auction stages by incrementally reducing the spectrum target for the new stage of the reverse auction.<sup>240</sup> This staged process of alternating reverse and forward auctions would continue with incremental reductions to the spectrum target until the closing conditions of the auction are met.<sup>241</sup>

Important common value considerations among the broadcasters may exist that would prompt broadcasters to update their valuations based on the results of the forward auction. For example, if the forward auction fails to clear a 120 megahertz target, the size of the shortfall may provide important information to the participating broadcasters about how much the forward-

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<sup>237</sup> *Id.*

<sup>238</sup> *See NPRM* ¶ 60.

<sup>239</sup> *See infra* Part IV. C.

<sup>240</sup> Verizon Comments at 25.

<sup>241</sup> Verizon's proposed "staged" approach for the forward and reverse auction is largely similar to T-Mobile's proposed "alternating" approach. T-Mobile Comments at 42 n.92. The only notable difference is that T-Mobile suggested that the Commission consider conducting multiple "stages" of the reverse auction, by seeking bids at more than one clearing target, before switching to the forward auction. *Id.* To the extent that conducting multiple stages of the reverse auction before alternating to the forward auction would speed and simplify the auction process, the Commission should consider it as an option for conducting the "staged" auction.

auction participants value their spectrum and may cause some broadcasters to change the value they have placed on retaining a license.

The logical alternative to sequentially alternating the forward and reverse auctions is to conduct a “one-iteration” reverse auction in which the Commission would run the reverse auction from the highest possible price with the most clearing all the way down to whatever price resulted in no broadcast incumbents exiting the band. This process would provide the Commission with considerable information about the price at which the auction could satisfy the full range of spectrum-clearing targets in every geographic area in the country. Unlike the single-round, sealed-bid approach a one-iteration reverse auction would permit the spectrum incumbents to learn from one another as the auction progressed, which would steadily lead to better, more informed pricing across a wide range of values and geographies.

Unfortunately, however, a one-iteration reverse auction would not provide any feedback to the broadcasters about the *buyers’* demand for broadcast spectrum licenses. A one-iteration reverse auction would also have to run its entire course before the forward auction could begin and, as a result, would require considerable time to complete and likely create major business, financial, logistical and legal challenges for participating incumbents.<sup>242</sup> An alternating auction format, by comparison, would provide much of the same helpful information in far less time. Although buyers would not develop information about the full supply curve, they would develop information about relevant portions of it during the alternating sequences. The sellers could also monitor forward-auction bids to gauge whether the bidders seemed likely to prove able to meet or exceed the broadcaster’s value assessment. In this way, alternating forward and reverse

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<sup>242</sup> See, e.g., Verizon Comments at 26 (explaining that broadcasters “must reveal more sensitive information under a” one-iteration reverse auction approach, “including the offer price for their channel(s) under” multiple clearing targets).

auction participation would allow the buyers and sellers to benefit from the participants on both sides of the market, which would help refine their estimates of the “common value” of the spectrum resource.

**D. Offering Broadcasters Too Many Exit Options in the Reverse Auction Could Produce Excessive Uncertainty and Delay or Disrupt the Auction Process.**

The costs of offering reverse-auction participants options not required by the Spectrum Act outweigh the benefits. The Spectrum Act requires the reverse auction to include three bid options for participating broadcasters: (i) voluntary relinquishment of all spectrum usage rights, (ii) voluntary relinquishment of all UHF usage rights in exchange for VHF spectrum rights, and (iii) voluntary relinquishment of spectrum usage rights in order to share a television channel with another licensee.<sup>243</sup> In the *Notice*, the Commission sought comment on whether to allow eligible reverse auction bidders to submit other types of bids, including bids to accept additional interference, reduce coverage areas, or accept a different antenna pattern.<sup>244</sup> The *Notice* also stated that one of its goals “is to permit as many broadcasters to participate in the reverse auction as possible,” and explained that allowing reverse auction bidders additional bid options could enable the Commission to clear more spectrum.<sup>245</sup> At the same time, the Commission expressed concern that allowing too many challenging or variable bidding options “might also significantly complicate the reverse auction process.”<sup>246</sup>

While adding options for broadcasters has the potential to reduce the cost of clearing the spectrum, the Commission’s concerns about complexity are well founded. T-Mobile agrees with

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<sup>243</sup> Spectrum Act § 6403(a)(2).

<sup>244</sup> *NPRM* ¶¶ 87-88.

<sup>245</sup> *Id.* ¶¶ 72, 87-88.

<sup>246</sup> *Id.* ¶ 88.

commenters who have expressed concern that offering broadcasters too many additional bid options beyond the statutory minimum risks unduly complicating the reverse auction, and that any benefits would be outweighed by additional uncertainty, delays, or disruptions to the auction process.<sup>247</sup> Offering an array of variable, fact-specific options to exit the 600 MHz band creates excessive complexity that risks *diminishing* broadcaster participation – precisely the opposite effect of what the Spectrum Act intended and what the Commission seeks to achieve by providing alternative bid options. Keeping the auction design simple is particularly important to encourage broadcaster participation because the auction process is entirely new to many of the broadcast licensees.<sup>248</sup> Moreover, “[m]aking the process as straightforward and simple as possible will foster participation by smaller broadcasters who may be unwilling to put together an elaborate team of auction experts to help them navigate a complicated process.”<sup>249</sup> Furthermore, overly complicating the reverse auction could have negative consequences for the forward auction because if broadcasters are able to bid to accept additional interference or reduce their coverage areas rather than vacate UHF television channels, forward-auction participants may find it difficult to understand what they are actually bidding for.<sup>250</sup>

Even proponents of alternative mechanisms to exit the 600 MHz band acknowledge that additional bid options could complicate the reverse auction and discourage participation.<sup>251</sup>

CTIA, for example, urged the Commission to “strike an appropriate balance between simplicity

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<sup>247</sup> See e.g., EOBC Comments at 17-18 (explaining that the Spectrum Act specifically contemplates three bid options for broadcasters, and in doing so “Congress appropriately balanced the utility of providing flexible bid options in furtherance of its goal of reallocating at least 120 MHz for mobile broadband use against the risk of over contemplating the reverse auction and undermining those efforts”); MetroPCS Comments at 5 (noting the auction should be designed to foster wide participation by broadcasters, but also avoid unnecessary complexity); Sprint Comments at 6; T-Mobile Comments at 51-52.

<sup>248</sup> MetroPCS Comments at 5.

<sup>249</sup> *Id.*

<sup>250</sup> Sprint Comments at 6.

<sup>251</sup> See e.g., CEA Comments at 13; CTIA Comments at 33; TIA Comments at 14-15; Verizon Comments at 33-34.

and ensuring maximum flexibility for broadcasters.”<sup>252</sup> While TIA praised the *potential* of additional bid options, it noted that “[a]n overly complex . . . decision tree may be intimidating for some broadcasters, particularly those with limited resources to invest in educating themselves about the reverse auction process” creating the “possibility that a complicated auction may discourage some TV licensees from participating.”<sup>253</sup> And while Verizon favored the potential benefits of providing broadcasters additional flexibility, it observed that “[a]llowing broadcasters to submit an alternative bid . . . would likely add a degree of complexity to the Commission’s administration of the auction, including the bid assignment and repacking methodology.”<sup>254</sup>

Only a handful of commenters, including some broadcasters and equipment manufacturers, support allowing alternative bids without reservation.<sup>255</sup> And notably, those who advocate for additional bidding options do not address how the Commission or the bidders would resolve the additional complexity that these alternatives would introduce.

While T-Mobile strongly supports any measure that clears more valuable below 1 GHz spectrum for broadband use, the risk that offering too many exit options will diminish participation and delay the incentive auction outweighs the potential benefit of clearing additional spectrum in this case. Allowing broadcasters to submit bids to accept additional interference, reduced coverage, or different antenna patterns would create needless challenges for reverse-auction and forward-auction participants as well as the Commission itself. In short, the benefits of pursuing alternative bidding options do not outweigh the costs.

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<sup>252</sup> CTIA Comments at 33.

<sup>253</sup> TIA Comments at 14-15.

<sup>254</sup> Verizon Comments at 33-34.

<sup>255</sup> See Comments of Harris Corporation, Broadcast Communications Division, GN Docket No. 12-268, at 23 (Jan. 25, 2013) (“Harris Corp. Comments”); Qualcomm Comments at 24; Comments of Tribune Company, GN Docket No. 12-268, at 4 (Jan. 25, 2013) (“Tribune Comments”).

### **E. Addressing an Unsatisfied Closing Requirement.**

Addressing unsatisfied closing requirements by seeking to coax additional money from forward auction participants will help free additional spectrum for wireless broadband.<sup>256</sup> The overall auction ends only if the total bids in the forward auction meet a reserve price for the spectrum. This reserve price, or clearing rule, serves an important function in matching spectrum supply to demand, but poses some strategic problems for forward-auction bidders that could introduce inefficiencies into the auction that suppress efficient spectrum clearing.

As T-Mobile and other commenters explained in their initial comment filings, the crux of the problem is that, while every bidder may want additional spectrum, each bidder will always want other bidders to pay to support the higher level of spectrum clearing.<sup>257</sup> Suppose, for example, that there are two licenses, A and B, and three bidders. Bidder 1 values License A at 60; Bidder 2 values License B at 60; and Bidder 3 values each of the two licenses at 50. The clock auction envisioned here would end at a price 50 (when bidder 3 drops out) and Bidders 1 and 2 would win. If the clearing rule requires total revenue of 110, however, then the forward auction revenue in this example would fall short of the requisite target. Even though the winning bidders are willing to pay 120, which would more than satisfy the clearing rule, each bidder has an incentive to delay revealing their preferences in the hope that the other bidder raises its bid enough to meet the shortfall; therefore, the Commission would not award any licenses, but instead reduce the spectrum-clearing target and try again.

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<sup>256</sup> T-Mobile Comments at 56. AT&T proposes a similar mechanism that would coax additional spectrum clearing from broadcasters who might risk not selling if the auction drops to a low spectrum-clearing target. See AT&T Comments at 71-74. AT&T's proposal to encourage additional spectrum clearing where the bidders are close to a higher spectrum-clearing target is sensible; however, the free rider problem among reverse auction bidders is liable to prove substantially worse than among forward auction bidders. While the free rider problem may frustrate reverse-auction side measures to satisfy the closing rule, AT&T's insight on this point may merit additional exploration by the Commission.

<sup>257</sup> See, e.g., T-Mobile Comments at 56-58; AT&T Comments at 71-74.

The Commission has several means of coaxing additional money from the bidders to clear the maximum amount of spectrum. One approach is to ask each of the forward auction winners to pay its proportionate share of the shortfall. A variant is to avoid a potential free-rider problem with small bidders and allow them to benefit from the propensity of larger bidders to pay more for a higher spectrum-clearing target by allocating the shortfall among bidders with 5% or more of the currently winning bids. Large bidders will likely have at least some licenses with values far above the final prices; therefore, these large bidders are more likely to agree to a lump sum. By comparison, small bidders might prove more reluctant to pay additional amount for the spectrum they seek. Alternatively, the Commission could ask for contributions from only the provisionally winning bidders in areas where the bidder wins more than one paired license on the theory that the “extra” license that these bidders hold might not be available if the spectrum-clearing target were reduced. In either case, the rule would only have a single round where bidders could say “yes” or “no” to the call for increased bids. Because each large bidder would know that its participation would be necessary for the higher spectrum clearing-target to be met, bidders would have a reduced incentive to act as free riders on the presumed willingness of other bidders to make up the shortfall. Whether the Commission used a percentage or an absolute number of licenses to identify and seek contributions from larger bidders, this approach would avoid reducing the spectrum-clearing target reduction for all parties by coaxing additional payments from only those forward-auction participants likely to benefit most from additional spectrum clearing and allowing those who benefit less to avoid additional payment.<sup>258</sup>

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<sup>258</sup> Yet another approach would be to stipulate that all bidders applying to participate in the auction would make a deposit proportional to the initial eligibility they sought. In the event of a shortfall between the bids and the spectrum clearing target that would cause the clearing rule to not be satisfied, a portion of the sum of the deposits could be used to cover the shortfall. Under this option, bidders that would be provisional winners in the auction would receive only a partial refund of their deposits.

Whatever the precise mechanism, adopting a procedure that offers a take-it-or-leave-it option at the end of the auction to help maintain the highest level of spectrum clearing would help mitigate the risk that willing bidders are forgoing additional bids in the mistaken assumption that the other bidders will make up the shortfall. A take-or-leave-it approach at the end of the auction would cut through the gamesmanship and miscommunication that might lead to a lower spectrum clearing target by offering willing bidders a final opportunity to collectively satisfy the clearing rule. Adopting one of the take-it-or-leave-it mechanisms described here would remove much of the uncertainty over how winning bidders would split the shortfall between their existing bids and the minimum price required by the clearing rule and, in so doing, greatly increase the likelihood of a higher spectrum clearing target.

**F. While the Concept of Extended Rounds Has Great Promise, Modifications Are Needed and a Last-Call Solution May Offer a Simpler Solution to the Problem of a Clearing-Rule Shortfall.**

Whether through use of the extended rounds proposal or the last-call approach or some hybrid of the two, the Commission should adopt a mechanism to meet any funding shortfall with the closing-rule before reducing the spectrum-clearing targets. Dynamic alternatives to the last-call mechanism T-Mobile proposed hold promise, but the mechanisms proposed thus far require further refinement. A joint filing by Auctionomics and Power Auctions (the “APA Joint Filing”), for example, proposes “extended rounds” to address a clearing-rule shortfall.<sup>259</sup> The APA Joint Filing is broadly consistent with the demand-matching procedures T-Mobile proposed in its initial comments and, in some cases, incorporates proposals that T-Mobile endorses, such

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<sup>259</sup> See APA Joint Filing at 6.

as the concept of *gradually* reducing spectrum-clearing target, area-by-area, rather than all at once for the whole country.<sup>260</sup>

The concept of extended rounds is best explained by example. Suppose the auction begins with a target of eight paired licenses. The forward auction would continue until the demand is no larger than eight licenses. If cumulative bidding satisfied the clearing rule, then the auction would end. If cumulative bidding did not satisfy the clearing rule, however, then the APA Joint Filing proposes a series of extended rounds to bring the auction to a close.<sup>261</sup> Extended rounds would work by reducing the spectrum-clearing target in every area by one license to seven licenses to use the example provided earlier. In any area where the demand supports more than seven licenses, prices would continue to increase. If at any point during the extended rounds the total revenue satisfied the clearing rule, however, the forward auction would stop in all geographic areas.<sup>262</sup> When the auction stops, some areas would have demand sufficient to support clearing eight licenses while other areas would have demand sufficient to support clearing only seven licenses.<sup>263</sup> Although not directly addressed in the APA Joint Filing, the reverse auction would presumably restart in those areas where demand dropped to seven in order to reduce the number of broadcast stations that need to be cleared from that geographic area – a process that would reduce the Commission’s clearing costs and enhance its net auction revenues.<sup>264</sup>

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<sup>260</sup> Compare *id.* at 6 with T-Mobile Comments at 52-55.

<sup>261</sup> APA Joint Filing at 6.

<sup>262</sup> *Id.*

<sup>263</sup> In all markets where bidding satisfies the clearing rule without demand dropping from eight to seven, the outcome is equivalent to every provider agreeing to pay the lump-sum additional amount to cover the shortfall as T-Mobile envisioned in its last-call proposal.

<sup>264</sup> Alternatively, the remaining licenses could be re-auctioned.

The APA Joint Filing's extended rounds proposal has substantial merit. As with the last-call model T-Mobile proposed, the extended rounds concept matches forward-auction demand with reverse-auction supply in the event of an incongruity. Unlike T-Mobile's last-call proposal, moreover, the extended rounds concept allows bidders to gather information about the bidding preferences of auction participants and adjust their pricing strategies in response.

Despite the dynamic features of the extended round process, certain elements of the proposal appear to rely on assumptions that may result in unexpected outcomes. The APA Joint Proposal, for example, appears to assume that target revenue for the reverse auction will not decrease. However, the total spent in the reverse auction should, in fact, fall with a lower spectrum-clearing target because, even if prices in the reverse auction did not decrease any further, bidders would need to purchase one (or more) fewer television stations than previously. Using the example above of an eight-station market moving to a seven-station clearing target, reverse-auction spending in that geographic area should fall by roughly  $1/8^{\text{th}}$  of the previous bidding total. The decrease in spending associated with a decrease in the spectrum-clearing target would pose a complication for the extended round concept. In a given area, the exact number of television stations needed to achieve the reduced spectrum-clearing target under the extended round model may be unclear due to the daisy chain effect of broadcast stations that have some logical connections to other markets. While the Commission should prove able to develop some mechanism to determine a lower bound on the savings from not having to purchase an additional station in that market, it should not assume it can relax the clearing rule for that market without experiencing a concomitant reduction in the revenue target.

The Commission might also consider combining T-Mobile's proposal to offer wireless providers a once-per-target opportunity to cover a clearing rule shortfall on a pro-rata basis with

the idea of extended rounds. Before starting extended rounds, the Commission might offer participants a last-call opportunity to make additional offers to satisfy the clearing rule.<sup>265</sup> If the last-call method succeeds, the Commission would not have to administer extended rounds.

If the Commission settles on a dynamic mechanism such as extended rounds to help satisfy a closing rule over a relative static mechanism such as T-Mobile's last-call proposal, the Commission should incorporate safeguards into the extended rounds to minimize gaming opportunities. For instance, bidders should be prohibited from switching their demands among different areas and instead be allowed only to reduce their demand. For the same reason, any reduction in demand in the extended rounds should count as a reduction of eligibility that counts for the next phase of the forward auction when it is restarted. With these no-substitution constraints, the extended rounds concept is reasonable and should allow bidders to express their preferences in ways that either increase forward-auction revenues, or decrease spectrum-clearing targets in a rational manner.

The potential pitfalls associated with the closing rule that the APA Joint Filing identifies pose real concerns that the Commission's auction procedures should address. The APA Joint Filing's proposal provides more opportunities for dynamic responses than T-Mobile's last-call proposal does; however, T-Mobile's proposal may prove easier for the Commission to administer, create fewer opportunities for gaming, and clear more spectrum. On balance, the last-call option seems to offer nearly as many benefits as the extended rounds option but with less administrative complexity and risk. If the Commission nonetheless elects to pursue the extended rounds option, a compromise approach that incorporates some of the elements of T-

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<sup>265</sup> In principle, that offer could be made every time demand in an area drops by one unit, but it is unclear whether any potential benefits would be worth the increased complexity.

Mobile's last-call approach, such as multiple spectrum-clearing targets, might provide a superior outcome compared to the original extended round proposal found in the APA Joint Filing.

**G. Broadcasters Participating in the Incentive Auction Should Not Be Allowed to Revoke Their Bids During or After the Auction.**

Reverse auction bids should be treated as “irrevocable, binding offers” of the broadcast spectrum licensee to relinquish spectrum usage rights.<sup>266</sup> A broadcaster's bid will affect the amount of spectrum cleared in a market, which, in turn, will affect the number and value forward-auction bidders place on the spectrum at auction. Allowing a broadcaster to withdraw a bid after the auction is complete would require re-running the auction process for the geographic region where the broadcaster is located and, quite likely, the nation as a whole, given the many different interdependencies that exist between neighboring geographic areas both on the reverse- and forward-auction sides.

Equally troubling, if a broadcaster were permitted to withdraw a winning bid, then broadcasters would have little or no incentive to bid truthfully.<sup>267</sup> Instead, broadcasters would have a strong incentive to bid below their actual costs for at least two reasons. First, low-ball bids serve as the only reliable mechanism to ensure that the bidder is among the reverse-auction winners in a non-binding auction.<sup>268</sup> Studies show that a bidder who bids his true cost in a non-binding auction will probably lose.<sup>269</sup> Second, bidders can use low-ball bids in a non-binding auction to punish rivals. A bidder who has no intention of leaving the 600 MHz band, for

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<sup>266</sup> *NPRM* ¶¶ 249, 282.

<sup>267</sup> See e.g., Brian Merlob et al., *The CMS Auction: Experimental Studies of Median-Bid Procurement Auction with Non-Binding Bids* (April 2011), available at <http://www.hss.caltech.edu/SSPapers/sswp1346.pdf> (discussing the detrimental effects of non-binding bids in the context of auctions operated by Centers for Medicare & Medicaid Services).

<sup>268</sup> *Id.*

<sup>269</sup> *See id.* at 7.

example, might have an incentive to force prices for broadcast stations down to prevent those broadcasters who are most interested in leaving the 600 MHz band from doing so.<sup>270</sup> Closing off the possibility of a timely and lucrative exit path might make the losing reverse-auction bidders more likely to sell to the untruthful reverse-auction winner.<sup>271</sup> These predictable and unwelcome consequences threaten to unravel the stability necessary for either the reverse auction or the forward auction to function. Furthermore, as Verizon explained, the uncertainty and gamesmanship made possible by non-binding bids would delay forward auction winners in their work to integrate the 600 MHz spectrum into their networks.<sup>272</sup> The Commission therefore should reject the request of a handful of commenters who want to submit non-binding bids.<sup>273</sup>

## V. RELOCATION AND CLEARING

### A. The Repacking Process Should Seek to Maximize the Amount of Spectrum Reallocated for Flexible Use.

To free additional spectrum for broadband use, the Spectrum Act directs the Commission to repack the broadcast television channels that do not exit the 600 MHz band while “mak[ing] all reasonable efforts to preserve . . . the coverage area and population served of each broadcast television licensee.”<sup>274</sup> The Spectrum Act does not require the Commission to preserve the identical service area or population coverage for each station.<sup>275</sup> Nor does the Spectrum Act require a broadcaster’s new service area and population to be of the same size or extent as

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<sup>270</sup> *See id.*

<sup>271</sup> *Id.*

<sup>272</sup> *See* Verizon Comments at 67-68.

<sup>273</sup> *See* Tribune Comments at 8-11.

<sup>274</sup> Spectrum Act § 6403(b)(1)-(2).

<sup>275</sup> Verizon Comments at 36; CEA Comments at 31-32; CTIA Comments at 34-35; AT&T Comments at 77.

existed prior to the incentive auction.<sup>276</sup> Instead, the Commission need only make “all reasonable efforts” to preserve the coverage area and population served of repacked broadcast licensees.<sup>277</sup> Measures that are too costly, too complicated, or too time consuming are inherently unreasonable.

1. The Plain Text of the Spectrum Act Accords the Commission Substantial Flexibility in Repacking Broadcasters.

Under the Spectrum Act, the Commission need not achieve perfection in replicating broadcast contours when it repacks and reassigns broadcast channels—the Commission need only “make all reasonable efforts to preserve . . . the coverage area and population served of each broadcast licensee.”<sup>278</sup> This provision offers the Commission ample flexibility. As AT&T explains, “[w]hen Congress instructs an agency to take ‘reasonable’ steps to accomplish any goal, it grants the agency considerable discretion, . . . and courts will grant the agency ‘substantial deference.’”<sup>279</sup>

Although the precise meaning of the phrase “all reasonable efforts” may “depend[] on the circumstances involved,”<sup>280</sup> no interpretation requires the Commission to take every conceivable measure to preserve the coverage area and population served of each broadcast licensee.<sup>281</sup>

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<sup>276</sup> See, e.g., Comments of the Association of Public Television Stations, Corporation for Public Broadcasting, and Public Broadcasting Service, GN Docket No. 12-268, at 9-10 (Jan. 25, 2013); Comments of ABC Television Affiliates Association, CBS Television Network Affiliates Association, FBC Television Affiliates Association, and NBC Television Affiliates, GN Docket No. 12-268, at 33 (Jan. 25, 2013) (“Broadcast Affiliate Comments”); Comments of the Walt Disney Company, GN Docket No. 12-268, at 34-35 (Jan. 25, 2013) (“Disney Comments”); NAB Comments at 24-25; Tribune Comments at 16-17; Harris Corp. Comments at 8 (interpreting the Spectrum Act to require the Commission preserve broadcaster service “to all persons that a station currently serves”).

<sup>277</sup> Spectrum Act § 6403(b) (emphasis added).

<sup>278</sup> *Id.* § 6403(b)(2).

<sup>279</sup> AT&T Comments at 77 (citing *Capital Network Sys., Inc. v. FCC*, 28 F.3d 201, 204 (D.C. Cir. 1994)).

<sup>280</sup> *Id.*

<sup>281</sup> See generally Kenneth A. Adams, *Understanding ‘Best Efforts’ and Its Variants*, The Practical Lawyer (Aug. 2004), <http://www.adamsdrafting.com/downloads/Best-Efforts-Practical-Lawyer.pdf> (citing *Coady Corp. v. Toyota Motor Distrib.*, 361 F.3d 50, 59 (1st Cir. 2004) (“‘Best efforts’ . . . cannot mean everything possible under the sun.”); *Triple-A Baseball Club Assocs. v. Northeastern Baseball, Inc.*, 832 F.2d 214, 228 (1st Cir. 1987) (“We have

Instead, the Commission has correctly recognized that the phrase “‘all reasonable efforts’ . . . comports with the common meaning of the word ‘reasonable.’”<sup>282</sup> The D.C. Circuit has interpreted this phrase in a different context to require only “feasible” actions.<sup>283</sup> And as the Commission notes, the phrase “all reasonable efforts” does not require the exertion of *unreasonable* efforts.<sup>284</sup>

Further, the reasonableness requirement by its plain terms is a measure of effort – *i.e.* the actions taken to achieve a goal – and not of the outcome itself. Congress could have required that the Commission to preserve the coverage area and population served of each broadcast television licensee, but it did not.<sup>285</sup> Even the National Association of Broadcasters recognizes that the phrase “all reasonable efforts” does not require the Commission to perfectly replicate broadcast contours.<sup>286</sup> Thus, under the plain language of the statute, the Commission only need make “reasonable efforts” to maintain coverage area and the population served.

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found no cases, and none have been cited, holding that ‘best efforts’ means every conceivable effort.”); *Bloor v. Falstaff Brewing Corp.*, 601 F.2d 609, 614 (2d Cir. 1979) (“The requirement that a party use its best efforts necessarily does not prevent the party from giving reasonable consideration to its own interests.”)).

<sup>282</sup> *NPRM* ¶ 105 (citing *Blacks Law Dictionary* (6th Ed. 1990) at 1265, which defines “reasonable,” among other things, as “[f]air, proper, just, moderate, suitable under the circumstances. Fit and appropriate to the end in view.”).

<sup>283</sup> *See Raicovich v. U.S. Postal Service*, 675 F.2d 417, 424 (D.C. Cir. 1982); *see also Miller v. U.S. Postal Service*, 231 Ct. Cl. 804, 810 (Ct. of Cl. 1982).

<sup>284</sup> *NPRM* ¶ 105 n.162.

<sup>285</sup> Spectrum Act § 6403(b)(2).

<sup>286</sup> *See* NAB Comments at 19. Other commenters agree. *See, e.g.,* CTIA Comments at 35 (explaining that “requiring precision in this area . . . would greatly complicate the repacking process” and “is not required by the Spectrum Act”); CEA Comments at 32 (acknowledging that “there may be some situations in which reductions in service areas of more than two percent will occur,” and “[i]t is reasonable in such cases for the Commission to allow a greater than two percent change in contour or interference level”). However, the Walt Disney Company argues that “any reduction” in a station’s service area constitutes an “involuntary relinquishment of spectrum rights” in violation of the Spectrum Act. Disney Comments at 34. Not so. Congress never has suggested that the lack of perfect replication constitutes an involuntary relinquishment of spectrum. *See* Spectrum Act § 6403(b)(2). The Commission, moreover, has ample authority to modify licenses to promote the public interest. *See* *Improving Public Safety Communications in the 800 MHz Band, Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order, and Order*, WT Docket 02-55, FCC 04-168, (Aug. 6, 2004) (“800 MHz Order”). Sections 316, 303, 301, and 154(i) of the Communications Act grant the Commission authority to conduct spectrum-management activities, including license modifications, in furtherance of the public interest. *See* 47 U.S.C. §§ 316, 303, 301, and 154(i). And the courts have acknowledged and deferred to the Commission’s spectrum-management authority and

2. The Purpose of the Spectrum Act, Including Provisions Addressing Repacking of Broadcasters, is to Reallocate Spectrum for Broadband Deployment.

The Commission’s repacking methodology should maximize the amount of spectrum that can be repurposed for mobile broadband services. In fact, the animating purpose behind broadcast repacking is to do just that.<sup>287</sup> Numerous compelling public policy reasons justify prioritizing clearance of the band for broadband so long as reasonable efforts are made to preserve broadcast coverage area and population in the repacking effort:

*First*, as Cisco and U.S. Cellular explain, repurposing the broadcast television spectrum for broadband use represents “the single greatest opportunity” to satisfy burgeoning consumer demand for wireless broadband applications and services.<sup>288</sup> Although the current broadcast television allocation can help satisfy video communications based on a one-to-many model, the allocation cannot satisfy the wealth of data communications based on the many-to-many model of the modern Internet, such as presence information, context-sensitive data, and social networking. The allocation of the nation’s spectrum resources must change in response to consumer demand and technology.

*Second*, the continued development and expansion of mobile broadband networks and the adoption of mobile broadband technologies throughout the economy directly contributes to

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judgment. *See 800 MHz Order* ¶ 64 (citing *Teledesic LLC v. FCC*, 275 F.3d 75, 84 (D.C. Cir. 2001) (“[W]hen it is fostering innovative methods of exploiting the spectrum, the Commission ‘functions as a policymaker and, inevitably, a seer—roles in which it will be accorded the greatest deference by a reviewing court.’”) (citation omitted)). Nothing in the Spectrum Act constrains this authority to administer spectrum licenses to promote the public interest.

<sup>287</sup> *See* 158 CONG. REC. H. 914 (2012) (statement of Rep. Upton) (“One of the key elements of [the Spectrum Act] is freeing up an enormous swath of spectrum for use.”), (statement of Rep. Waxman) (“Our bipartisan, bicameral negotiations resulted in legislation that will make new spectrum available for broadband services.”), (statement of Rep. Walden) (“The underlying piece of this legislation frees up spectrum that will generate hundreds of thousands of jobs as 4G is built out. They need spectrum to build out 4G. This provides spectrum.”), *available at* <http://www.gpo.gov/fdsys/pkg/CREC-2012-02-17/pdf/CREC-2012-02-17-pt1-PgH907-3.pdf#page=1>; *See also, e.g.*, AT&T Comments at 74-76; TIA Comments at 6-8; Verizon Comments at 36.

<sup>288</sup> *See* Cisco Comments at 7; U.S. Cellular Comments at 2.

increases in productivity.<sup>289</sup> Maximizing the amount of reclaimed spectrum will allow for the continued proliferation of advanced mobile networks and devices, resulting in increasing productivity gains and economic growth.

*Third*, as U.S. Cellular details, making available large amounts of spectrum is crucial for the development of greater mobile broadband competition, “and with competition comes increased investment and innovation.”<sup>290</sup>

*Fourth*, repacking with an eye towards maximizing the amount of spectrum available for flexible use is critical to the success of the incentive auction itself. Under the Spectrum Act, revenues from forward auctions enable the Commission to reimburse repacked broadcasters, pay winning reverse auction bidders, fund a nationwide public safety network, and pay down a portion of the national debt.<sup>291</sup> As AT&T observes, failure to maximize the amount of spectrum recovered for flexible use would “dramatically increase the risk of auction failure.”<sup>292</sup>

*Fifth* and finally, as the Commission itself notes, addressing America’s spectrum challenge “is essential to continuing U.S. leadership in technological innovation, growing our economy, and maintaining global competitiveness.”<sup>293</sup>

Some commenters, however, argue that the Spectrum Act’s principal purpose is not to free additional spectrum for broadband use but to preserve the population and service area of existing broadcast channels.<sup>294</sup> Comcast and NBCU, for example, claim the Spectrum Act’s

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<sup>289</sup> Cisco Comments at 8.

<sup>290</sup> U.S. Cellular Comments at 3 (citing *Fifteenth Report* at 9820); Joint Statement on Broadband, GN Docket No. 10-66, 25 FCC Rcd 3420 (Mar. 16, 2010)).

<sup>291</sup> See Cisco Comments at 9.

<sup>292</sup> AT&T Comments at 74-75.

<sup>293</sup> *NPRM* ¶ 1.

<sup>294</sup> See e.g., Broadcast Affiliate Comments at 19-38; Comcast & NBCU Comments at 11-14; Disney Comments at 34-35; Harris Corp. Comments at 5-9; NAB Comments at 18-31; Comments of Sinclair Broadcast Group, Inc., GN Docket No. 12-268, at 13-14 (Jan. 25, 2013) (“Sinclair Comments”); Tribune Comments at 16-18.

directive to make “all reasonable efforts” to preserve “broadcast coverage and population” requires the Commission to “focus first and foremost on preserving the ability of broadcast stations to continue to serve the needs and interests of their viewers.”<sup>295</sup> Comcast and NBCU further claim that the statute does not even permit the Commission to consider how efficiently it is repacking television stations; instead, the Commission must focus solely on preserving the broadcasters’ coverage areas and populations served.<sup>296</sup>

Relying on these (faulty) interpretations, certain commenters seek to impose on the Commission specific requirements for the repacking outcome. For example, NAB proposes that the Commission should preserve service to all of a station’s specific viewers, rather than measuring population served with regard to the same total number of viewers.<sup>297</sup> NAB further seeks to have the Commission limit the amount of interference created by an individual channel assignment, considered alone, to a 0.5% reduction in population served,<sup>298</sup> provided further that the Commission caps the total amount of such additional interference at 1% of the total population served.<sup>299</sup>

The Commission should reject requests to adopt overly stringent standards for repacking because they are based on fundamentally unsound interpretations of the Spectrum Act. Insisting

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<sup>295</sup> Comcast & NBCU Comments at 12-14.

<sup>296</sup> *Id.* (“The *Notice* . . . proposes that the ‘all reasonable efforts’ mandate should be understood to depend on ‘all of the circumstances involved,’ suggesting that the Commission thinks Congress intended a complex balancing act, with the rights of broadcasters and viewers under the Act in one hand and the efficiency of the repacking process in the other. . . . Compliance with the Spectrum Act’s mandate . . . requires the Commission to focus first and foremost on preserving the availability of broadcast stations to continue to serve the needs and interests of their viewers.”); see NAB Comments at 19 (interpreting the Spectrum Act to allow the Commission flexibility in repacking only where there are “extraordinary circumstances” that prevent the Commission from fully preserving a broadcaster’s coverage area and population served).

<sup>297</sup> NAB Comments at 20; see also *NPRM* ¶ 105.

<sup>298</sup> Even absent NAB’s further proposed 1% cap, this option for interpreting “reasonable efforts” is overly restrictive because it measures whether the population served before and after repacking contains the exact same viewers.

<sup>299</sup> See NAB Comments at 20-21; see also Tribune Comments at 17; Belo Comments at 14.

on the technical identity of viewers or population or all but *de minimis* variations in coverage area would frustrate the intent of Congress to free additional spectrum for broadband use by greatly complicating, if not altogether thwarting, the repacking.<sup>300</sup> As Verizon explains, although “[t]he Spectrum Act . . . requires the Commission take ‘reasonable efforts’ to preserve the broadcasters’ coverage areas and population served,” that “population served should be based on *total* over-the-air population, not ‘the same specific viewers,’” because “otherwise, the Commission would be locked into preserving existing geographic markets irrespective of the different radiofrequency environment in which the repacked station would operate.”<sup>301</sup> Furthermore, arbitrary caps and interference restrictions not only are inconsistent with the provisions of the Spectrum Act, but also will create severe logistical impediments to the Commission’s repacking efforts and prevent new 600 MHz licensees from using the spectrum in an efficient and productive manner. Absent some measure of flexibility to conform broadcast operations to new frequencies and locations, repacking would be impossible and would frustrate the Spectrum Act’s purpose of freeing additional spectrum for broadband use.

#### **B. The Commission Has a Number of Options to Overcome the Challenges of Repacking Broadcasters.**

Although repacking the remaining broadcast television licensees poses a number of challenges,<sup>302</sup> there are a variety of measures the Commission can adopt to overcome them. As

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<sup>300</sup> See CTIA Comments at 34-35 (explaining that perfectly replicating broadcast contours is not even feasible and would greatly complicate the repacking process).

<sup>301</sup> Verizon Comments at 36. CEA agreed, noting that the Spectrum Act’s directive to make “all reasonable efforts” to protect broadcasters’ existing populations instructs the Commission to strike a balance between replication of coverage area and population served and other considerations and actually prohibits the Commission from seeking to replicate existing populations covered in all instances. CEA Comments at 31-32.

<sup>302</sup> See, e.g., Disney Comments at 38 (noting the time needed for numerous “governmental approvals and extensive coordination of construction projects” in major urban areas as well as the logistical challenges posed by weather and diffuse facility ownership).

the Commission explained in the *NPRM*, “repacking involves reorganizing the broadcast television bands so that the television stations that remain on the air . . . occupy a smaller portion of the UHF band, allowing the Commission to reconfigure a portion of the UHF band into contiguous blocks of spectrum suitable for flexible use.”<sup>303</sup> The Commission should address the challenges of broadcast relocation in ways that: (1) maximize broadcaster participation; (2) reduce uncertainty for both reverse and forward auction bidders; (3) expedite the reallocation of spectrum for flexible use; (4) ensure full and timely reimbursement of repacked broadcasters; and (5) reduce opportunities for waste, fraud, and abuse.

To address the repacking challenges, the Commission can and should require all broadcasters to provide it with an inventory of their equipment and facilities that will be affected by the repacking process, along with an estimate of the repacking costs. Several commenters proposed that broadcasters be required to conduct an audit of existing equipment and facilities.<sup>304</sup> As CTIA explains, without broadcaster inventory data, “the Commission will be unable to determine effectively the transition timelines for repacking nor will it be able to optimize the repacking algorithm to minimize disruptions to incumbent TV stations,” and minimize relocation costs.<sup>305</sup> These inventories are important for the Commission to understand the effect and costs of repacking on each broadcaster, because, as Comcast noted, the potential repacking costs for broadcasters can “vary substantially depending on the details of the reassignment and the particular facilities of the station involved.”<sup>306</sup> By obtaining and verifying these assessments, the Commission would have a more thorough understanding of the nature and scope of the repacking

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<sup>303</sup> *NPRM* ¶ 91.

<sup>304</sup> See CTIA Comments at 35-36; Sprint Comments at 11.

<sup>305</sup> CTIA Comments at 35-36.

<sup>306</sup> Comcast & NBCU Comments at 28.

costs and logistics and will be able to minimize costs and speed the repacking process. Compiling an inventory of equipment and facilities need not be overly burdensome on broadcasters. As Sprint explains, many broadcasters likely have some of this inventory already completed due to the recent DTV transition, and broadcasters who are contemplating participating in the forward auction have likely begun to compile an inventory, as well as estimates of potential relocation costs.<sup>307</sup> Furthermore, requiring broadcasters to compile an inventory and estimate repacking costs could have other benefits as well, such as reducing the opportunity for waste, fraud, and abuse in the reimbursement process.

The Commission should also engage the equipment vendor community in discussions to develop a better understanding of the requirements, costs, and timeframe for completing the broadcaster transition on both a market-by-market and a national basis.<sup>308</sup> T-Mobile supports CTIA's recommendation to gather information from television equipment manufacturers in order to better understand the capabilities of radiofrequency channel modifications to television antennas and transmitters.<sup>309</sup> With this information, along with inventories from the broadcasters, "the Commission will be well-positioned to determine the costs associated with the repacking that can be input into its model to ensure the most effective and cost-effective repacking."<sup>310</sup> Sprint similarly observes that reaching out to broadcaster and television equipment vendors will allow the Commission to better understand and scrutinize broadcaster relocation cost estimates.<sup>311</sup> Having this information would also help guide Commission

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<sup>307</sup> Sprint Comments at 12.

<sup>308</sup> *See id.*

<sup>309</sup> CTIA Comments at 36.

<sup>310</sup> *Id.*

<sup>311</sup> Sprint Comments at 12.

decision-making concerning the timeframes need to complete the repacking process.<sup>312</sup> As with broadcaster inventory information, the lack of input from equipment manufacturers would deprive the Commission of the critical information it needs to set repacking transition timelines, minimize disruptions to broadcasters, and minimize relocation costs to the public.<sup>313</sup>

To ensure timely and predictable relocation of broadcasters that relinquish their spectrum, the Commission should adopt firm milestones that a broadcaster must satisfy prior to receiving full payment for relinquishing its spectrum rights or for reimbursement of its relocation costs.<sup>314</sup> As Sprint notes, there are a number of milestone structures and methodologies that the Commission could adopt to achieve this end.<sup>315</sup> Additionally, a framework with intermediate deadlines would be familiar to the broadcast community because infrastructure deployments are typically subject to contractual milestones and performance benchmarks. As Sprint recommends, the Commission should withhold or cancel payment to any broadcaster that fails to meet a specific milestone absent good cause or does not timely transition by a specific date the Commission specifies without a showing of exceptional circumstances beyond the licensee's control.<sup>316</sup> Likewise, full reimbursement should be conditioned on completion of relocation activity (*i.e.*, the final milestone). Accordingly, the Commission should disregard any pleas to make final reimbursement a closing condition of the auction, which could empower broadcasters to unreasonably delay the finality of the auction.<sup>317</sup> These measures will provide forward auction

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<sup>312</sup> CTIA Comments at 36.

<sup>313</sup> *Id.*

<sup>314</sup> *See* Sprint Comments at 12-13.

<sup>315</sup> *Id.* at 12 (detailing one milestone option for reverse auction payments and relocation reimbursement costs that would make 50 percent of payments to reverse auction participants at the conclusion of the auction; 25 percent upon the execution of contracts between suppliers and broadcasters in cases where a broadcaster is relocating, channel sharing, or being repacked; and the final 25 percent when the spectrum is made available for mobile broadband use).

<sup>316</sup> *See id.*

<sup>317</sup> *See* Sinclair Comments at 14.

winners with reasonable confidence that spectrum won at auction will be available by a date certain.<sup>318</sup> Without the assurance of reasonable benchmarks for broadcast clearing, fewer parties may participate in the forward auction and those that do participate may bid less aggressively, which would reduce auction revenues and fail to increase competition in the mobile broadband market.

The Commission should also establish reimbursement payments based on the broadcasters' inventory and cost estimates that are informed by discussions with vendors to prevent the escalation of reallocation costs beyond the statutorily authorized amount of money available for relocation.<sup>319</sup> Several commenters proposed a sensible two-step reimbursement process in which the broadcaster would receive an initial upfront payment followed by a "true up," a process the Commission has successfully permitted before and one which could prove helpful to ensure all expenses are fully reimbursed while safeguarding against fraud and abuse.<sup>320</sup> As explained by the Tribune Company, "[t]his two-step approach would ensure that broadcasters could relocate or modify facilities as quickly as possible without concern for whether they can secure the necessary capital to effectuate the repack."<sup>321</sup> Public broadcasting commenters note that this approach will ensure that broadcasters encountering unexpected challenges, such as severe weather events and other disruptions that "can significantly increase costs and make it more difficult to accurately estimate a station's relocation costs," are able to be made whole for

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<sup>318</sup> See Sprint Comments at 13.

<sup>319</sup> See *id.* at 14.

<sup>320</sup> See Comments of Association of Public Television Stations, Corporation for Public Broadcasting, and Public Broadcasting Service, GN Docket No. 12-268, at 27-28 (Jan. 25, 2013) ("Public Broadcaster Comments"); Comcast & NBCU Comments at 24; NAB Comments at 53-54; Tribune Comments at 16.

<sup>321</sup> Tribune Comments at 16.

their actual relocation costs.<sup>322</sup> Comcast agrees, noting that adopting this two-step approach is both within the Commission’s authority and area of expertise – as the Commission has used such an approach with respect to reimbursement credits issued to Nextel in the 800 MHz proceeding.<sup>323</sup> And NAB details additional advantages of the two-step reimbursement approach, including treating all broadcasters equally and “ease[ing] the [upfront] burden of capital financing for repacking expenses.”<sup>324</sup> Finally, requiring all broadcasters to document actual expenses would not only reduce the likelihood of waste, fraud, and abuse, but also increase the odds of identifying and sanctioning improper expenses.<sup>325</sup> While a two-step cost recovery holds great promise for timely and effective spectrum clearing, the Commission would still need to exercise close oversight over the process to guard against strategic delays, “gold plating,” and other behaviors that might escalate costs or extend the relocation process. Derivations from presumptively reasonable amounts and transition schedules should be the exception, not the rule.

Protecting only those facilities licensed, or fully eligible for licensing, as of February 22, 2012, provides the certainty forward auction bidders need and reverse auction participants have a right to expect.<sup>326</sup> The Spectrum Act identifies February 22, 2012 as the date before which the Commission must make all reasonable efforts to preserve the coverage area and population of each broadcast licensee.<sup>327</sup> Tying the application cut-off date to the statutorily established cut-off date for contour protection avoids the inequities of having those broadcasters with licenses granted or pending prior to February 22, 2012 receive more protection than those that come later

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<sup>322</sup> Public Broadcaster Comments at 28.

<sup>323</sup> Comcast & NBCU Comments at 24-27.

<sup>324</sup> NAB Comments at 54.

<sup>325</sup> *Id.*

<sup>326</sup> TIA Comments at 8; T-Mobile Comments at 37; *NPRM* ¶ 77.

<sup>327</sup> Spectrum Act § 6403(b)(2).

in the licensing process. While some broadcasters state that the February 22, 2012 date proposed by the Commission is problematic or unfair, nothing suggests the date is arbitrarily over- or under-inclusive, and the Commission would likely face similar complaints regardless of the date selected.<sup>328</sup> The alternative of a less definitive or more flexible cut-off date is far worse. Failing to establish an unambiguous cut-off date for broadcast participation risks delaying or disrupting the auction by making a moving target out of the spectrum that is its subject.

Finally, as advocated by the Tribune Company, the Commission should support measures to encourage the Internal Revenue Service (“IRS”) to ensure that reimbursed reverse auction relocation expenses and relocation proceeds are treated equitably from a tax perspective.<sup>329</sup> The Commission should not delay resolution of this proceeding while waiting for an IRS ruling, but it should work with the IRS to allow any gains from a broadcaster’s participation in the reverse auction to be treated as an “involuntary” conversion, with the proceeds to be deferred for income tax purposes. As the Tribune Company explains, if the IRS were to consider the auction an “involuntary” disposition of the broadcasters caused by government action, broadcasters may defer any gains from their participation in the reverse auction so long as those gains are reinvested in similar property. Furthermore, the Commission should attempt to work with the IRS to provide clarification that any gains attributable to reimbursement for repacking may be deferred.<sup>330</sup> By working with the IRS to ensure favorable tax treatment for participating broadcasters, the Commission can encourage greater broadcaster participation, helping it achieve

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<sup>328</sup> See *e.g., id.*; Network Affiliate Comments at 21-24; Comments of Bahakel Communications, Ltd., GN Docket No. 12-268, at 1-3 (Jan. 25, 2013); Comcast & NBCU Comments at 14-16; Comments of SATV10 LLC, GN Docket No. 12-268, at 3-4 (Jan. 25, 2013); Comments of Univision Communications Inc., GN Docket No. 12-268, at 8-13 (Jan. 25, 2013).

<sup>329</sup> See Tribune Comments at 12-13.

<sup>330</sup> See *id.* at 13.

its goal of maximizing the amount of spectrum reclaimed for flexible use.<sup>331</sup> Moreover, by eliminating the need for broadcasters to factor their tax burdens into their reverse auction bids, the Commission can promote a more efficient auction where reverse auction bids more accurately represent demand.

### C. Secondary Means Secondary.

Secondary licenses must not impede the clearing and repacking process. Secondary licenses are not secondary to only some primary licenses, but secondary to *all* primary licenses. By longstanding Commission rule and practice, secondary licenses “receive no protection against interference from primary users and must resolve any interference caused to new, existing, or modified primary users, including going off the air if necessary.”<sup>332</sup> Therefore, secondary licenses must give way to primary licensees old and new.<sup>333</sup>

As secondary licenses, lower power television stations are not entitled to receive the same protection as primary licensees during or after the repacking process.<sup>334</sup> Nevertheless, a handful of commenters claim that secondary stations are secondary only to full-power television licenses, rather than secondary to all licenses, including newly awarded mobile broadband licenses.<sup>335</sup>

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<sup>331</sup> *Id.* at 12.

<sup>332</sup> *NPRM* ¶ 74 (citing 47 C.F.R. §§ 74.703 and 74.709; Digital Low Power Television, Television Translator, and Television Booster Stations and Digital Class A Television Stations, *Report and Order*, 19 FCC Rcd 19331, 19332 ¶ 2 (2004) (“*DLPTV Report & Order*”).

<sup>333</sup> *DLPTV Report & Order*, Appendix B ¶ 7.

<sup>334</sup> See e.g., CTIA Comments at 37; PISC Comments at 6, 52-55; TIA Comments at 7-8; Comments of the Wireless Internet Service Providers Association, GN Docket No. 12-268, at 21-22 (Jan. 25, 2013); TIA Comments at 8 (citing 47 U.S.C. §§ 303, 306) (“noting the Commission’s “longstanding statutory authority to distinguish between primary and secondary [spectrum] uses” and asking the Commission to “rescind the licenses of non-Class A low-power TV stations or other secondary users where doing so facilitates efficient repacking” in order to maximize the amount of reclaimed broadcast spectrum.”).

<sup>335</sup> See e.g., Comments of the Advanced Television Broadcasting Alliance, GN Docket No. 12-268, at 2, 5 (Jan. 25, 2013); Comments of DTVAmerica Corporation, GN Docket 12-268, at 2 (Jan. 25, 2013); Comments of Mako Communications, LLC, GN Docket 12-268, at 3 (Jan. 25, 2013); Comments of MSGPR Ltd. Co., GN Docket No. 12-268, at 2 (Jan. 25, 2013).

These claims are baseless. The Commission’s rules make no such distinction.<sup>336</sup> On the contrary, the Commission made clear more than three decades ago that secondary, low power television stations “may not cause interference to, and must accept interference from, full-service television stations, certain land mobile radio operations *and other primary services*.”<sup>337</sup> Low power television stations are secondary stations with secondary status to *all* primary services in the spectrum.

**D. Authorizing Unlicensed Use of 600 MHz Bands Prior to Commercial Deployment Will Decrease Auction Revenues and Delay Broadband Deployment.**

Allowing whites space and other unlicensed devices to operate on newly cleared spectrum before wireless companies have had the full opportunity to deploy services will increase uncertainty surrounding the value of spectrum to be auctioned, decrease auction revenues, and complicate as well as delay broadband deployment. The Commission discussed “whether, following the build-out term, [it] should permit third parties to make use of unused spectrum on a localized basis until a licensee deploys service in those areas”—a “use-it-or-share-it” build-out requirement.<sup>338</sup> Tellingly, the Commission did not seek comment regarding such a “use-it-or-share-it” approach to spectrum during the licensee’s build-out term. This refusal likely shows that the Commission recognized the many problems a “use-it-or-share-it” regime would create for carriers building out their spectrum. Rather, the Commission only “contemplate[d] applying ‘use it or share it’ after the licensee’s build-out term [is] concluded.”<sup>339</sup>

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<sup>336</sup> See 47 C.F.R. § 74.703; see also *DLPTV Report & Order*, 19 FCC Rcd at 19333 ¶ 2 (noting that “[s]tatements in the low power television service are authorized with ‘secondary’ frequency use status.”).

<sup>337</sup> *Id.* (citing 47 C.F.R. §§ 74.703, 74.709, 90.303) (emphasis added).

<sup>338</sup> *NPRM* ¶ 405.

<sup>339</sup> *Id.* ¶ 405 n.625 (citing Letter from Michael Calabrese, PISC, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 04-186, WT Dockets No. 12-70, 12-69, 10-4 at 3 (filed August 20, 2012)).

Nevertheless, a small group of commenters ask the Commission to authorize unlicensed use of the newly purchased and cleared spectrum prior to the end of the build-out term.<sup>340</sup> Google and Microsoft, for example, ask for the Commission to “enable unlicensed spectrum operations in areas where a licensee has yet to deploy its network or has ceased operations.”<sup>341</sup> These proposals are misguided.

For one, the white space-model is ill-suited for commercial broadband deployment. Cellular terrestrial systems use many more base stations than single-transmitter broadcast systems. During the construction and deployment of services, mobile companies are required to test many different geographic areas, whereas broadcast stations remain stationary. As CTIA explains, “[r]equiring the licensee to share its spectrum with other uses while in the process of expanding into new geographic areas would undermine or delay the provision of service in these areas.”<sup>342</sup> In particular, operation of unlicensed devices “would interfere with a licensee’s ability to test and build out its network,” two integral steps in commercial deployment.<sup>343</sup> Even when the geographic area is not technically built out, mobile companies need that spectrum to be available for testing throughout the area.

Furthermore, identifying and using “white spaces” in a nascent terrestrial wireless band, such as the 600 MHz band, would impose new notification and clearance challenges on auction winners. The uncertainty surrounding how any notification system would work and the significant and complicated expenses associated with such notification will decrease the value of

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<sup>340</sup> See Google and Microsoft Comments at 44; Comments of the White Space Database Administrators, GN Docket No. 12-268, at 3 (Jan. 25, 2013); Comments of WhiteSpace Alliance, GN Docket No. 12-268, at 19-23 (Jan. 25, 2013); Comments of Spectrum Bridge, Inc., GN Docket No. 12-268, at 2 (Jan. 25, 2013).

<sup>341</sup> Google and Microsoft Comments at 44.

<sup>342</sup> CTIA Comments at 40.

<sup>343</sup> *Id.*

the spectrum. Moreover, there is further risk that once operating on the licensed spectrum, unlicensed devices will not leave the spectrum, whether because the devices can potentially operate under the radar for a period of time, the device owners never received notification, or companies commenced legal and lobbying battles for a continued right to use the spectrum. In any event, as the National Telecommunications Cooperative Association explains, “use-it-or-share-it” proposals are of limited utility.<sup>344</sup> For these reasons, CTIA properly concluded that the “substantial uncertainty . . . as to whether” the band would be available when needed would result in delayed broadband deployment to consumers.<sup>345</sup>

## VI. CONCLUSION

The incentive auction of television broadcast spectrum offers the potential for many improvements to the wireless market, including enhanced competition and more efficient deployment of services to consumers. However, it also poses numerous challenges – from the myriad logistical and technical issues posed by any given plan to the competing interests of the various market participants, including wireless providers, broadcasters, and equipment manufacturers. In striking a balance, the Commission should adopt those options that have emerged from the comments as best achieving the Commission’s goals with the least trade-offs. Specifically:

***The band plan:*** A band plan that incorporates at least 35x35 MHz of paired spectrum through uplink and downlink bands in paired 5x5 MHz blocks above Channel 37 provides the most advantages with the fewest and most manageable shortcomings. This plan maximizes the availability of paired spectrum, draws on currently-existing technology while providing room for

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<sup>344</sup> Nat’l Telecom. Coop. Ass’n Comments at 6.

<sup>345</sup> CTIA Comments at 40.

innovation, limits harmful interference, and promotes competition. Neither the Commission's lead plan nor alternative plans advanced by various commenters can accommodate as many of these goals with as few countervailing issues.

***The forward auction:*** A successful auction requires robust participation in both the forward and reverse auctions. The market power of the nation's two largest carriers could compromise broad participation in the forward auction unless the Commission institutes safeguards to prevent these two carriers from further spectrum aggregation. The Commission should adopt forward auction policies that enhance competition and bidder participation, including a spectrum cap on the high-value low-frequency "beachfront" spectrum below 1 GHz.

***The reverse auction:*** A simplified reverse auction that sets forth a clear process for participation will provide the transparency necessary to mitigate broadcaster concerns about participation and therefore result in an auction that maximizes the amount of available spectrum for broadband use. The more certainty the Commission can provide the reverse auction process (and the more quickly the Commission can provide it), the better.

***The repacking:*** The Commission can undertake "reasonable efforts" in the relocation of broadcasters following the reverse auction that will sufficiently protect those broadcasters while also serving the Spectrum Act's primary goal of reallocating spectrum for broadband deployment. The Commission need not – and cannot – achieve a "perfect" outcome in which each broadcaster has the same coverage and population it had prior to the auction. However, the comments have identified numerous safeguards the Commission can apply to ensure that broadcasters are made whole for their relinquishment of spectrum and reasonable relocation expenses.

The Commission should move swiftly to finalize its band plan, auction rules, and repacking methods in anticipation of delivering much-needed low-frequency spectrum to the wireless market in 2014.

Respectfully submitted,

/s/ Thomas Sugrue

Ari Fitzgerald  
Trey Hanbury  
Phillip Berenbroick  
AJ Burton  
**Hogan Lovells US LLP**  
555 Thirteenth Street, NW  
Washington, DC 20004  
(202) 637-5600

*Attorneys for T-Mobile USA, Inc.*

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Thomas Sugrue  
Kathleen O'Brien Ham  
Steve Sharkey  
Christopher Wieczorek  
Indra Chalk  
Joshua Roland  
**T-Mobile USA, Inc.**  
601 Pennsylvania Avenue, NW  
Washington, DC 20004  
(202) 654-5900