Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
Comment Sought on Competitive Bidding Procedures for Broadcast Incentive Auction 1000, Including Auctions 1001 and 1002	)	AU Docket No. 14-252
	)	
Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions	)	GN Docket No. 12-268

COMMENTS OF T-MOBILE USA, INC.

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EXECUTIVE SUMMARY

T-Mobile supports the vast majority of auction procedures proposed in the *Comment Public Notice.* The modest modifications proposed here seek to increase the availability and utility of the 600 MHz band, encourage informed and truthful bidding, promote competition, and accelerate the competitive bidding process. Wireless providers need access to 600 MHz spectrum as scheduled in early 2016 to keep pace with burgeoning consumer demand. Delay will only stifle innovation, reduce consumer choice, and limit wireless broadband features and services.

Ensuring Pro-Consumer License Diversification. The spectrum reserve promises to inject new competition into the wireless broadband market. The Commission can increase the pro-competitive effects of the reserve by increasing the size of the reserve to 40 megahertz. Moreover, the Commission can strengthen pro-competitive benefits of the reserve by limiting reserve block purchases to 20 megahertz. Doing so would ensure that at least two reserve-eligible bidders can acquire reserve spectrum. The need to ensure a diverse distribution of reserve licenses is especially important should the Commission choose not to adopt the request of T-Mobile and other stakeholders to increase the size of the reserve. The Commission should also adopt a more flexible definition of which licenses qualify as reserve blocks. Under the proposed rules, the spectrum reserve will consist of only Category 1 spectrum, which would leave a market with no Category 1 licenses with no reserve spectrum. Ensuring the definition of Category 1 licenses includes the three (or, if the reserve is expanded to 40 megahertz, four) least impaired licenses in the partial economic area ("PEA") would avoid subordinating competition policy to the vagaries of inter-service interference. Relatedly, the number of blocks reserved in a PEA should be based on demand for both categories of spectrum by reserve-eligible bidders at the time the auction reaches the reserve trigger, rather than only on the amount of reserve-eligible bidding activity on Category 1 spectrum.

Positioning Impairments in the Broadband Spectrum. Placing broadcasters that cannot be relocated into the UHF or VHF bands in the 600 MHz uplink, rather than the 600 MHz downlink, will increase the utility of the 600 MHz broadband spectrum by mitigating the impairment of broadband operations. Placing a DTV channel in the 600 MHz LTE uplink will interfere with fewer channels than placing a DTV channel in the downlink. While the uplink impairment may cover more territory, uplink impairments may or may not cover more population, depending on the precise population distribution within a market area. Even where the uplink impairment extends to a greater population than a downlink impairment would, downlink spectrum remains substantially more useful and valuable to broadband operators than uplink spectrum. Positioning impairments in the uplink wherever feasible will occupy less spectrum overall and allow carriers to employ the more useful downlink spectrum to satisfy consumer broadband needs to a greater extent than feasible with a downlink impairment.

Assessing Impairments When Setting the Initial Clearing Target. The Commission should assign different weights to uplink and downlink impairments. A county with uplink impairments above a 15% threshold should be considered no more than 50% impaired. The unimpaired downlink of the spectrum block would retain substantial value because it could rely

on existing equipment and technology to provide supplemental downlink for broadband services. T-Mobile has successfully overcome interference concerns that adjacent-channel DTV operations posed to 700 MHz A Block uplink operations. By contrast, even wholly unimpaired uplink spectrum would have few practical uses within the context of a contemporary wireless broadband system and, in any case, the demand for supplemental *uplink* is nearly non-existent for most network operators. A county with downlink impairments above a 15% threshold should be considered wholly impaired.

Setting the Initial Spectrum Clearing Target. The Commission sensibly proposes a "near-nationwide" standard that would limit impairments on a nationwide aggregated basis to less than 20% of value-weighted units of spectrum. The Commission should also ensure most major markets have a sufficient amount of spectrum available for broadband use. If the proposed spectrum-clearing target would result in more than one of the top ten markets having fewer than four licenses available (of either Category 1 or 2), then the Commission should pursue a lower spectrum-clearing target if that would increase the number of licenses available in those markets. To maximize value, the Commission should choose the initial clearing target that will maximize the number of licenses in the top 10 markets by value-weighted pops. In addition, the Commission should adopt a 10% nearly-nationwide MHz-POP standard for spectrum clearing targets of more than 84 megahertz, and retain the 20% nearly-nationwide standard for clearing targets of 84 megahertz or less. These modifications to the proposed impairment standard will have two beneficial effects. First, the use of an additional constraint on impairment will mitigate the possibility that the national market will lack the scale necessary to support a high level of industry-wide investment and innovation in the 600 MHz band. Second, adjusting impairment thresholds based on the spectrum-clearing target would help avoid a situation where too little spectrum is available in critical major markets to allow non-dominant carriers to offer a consistent user experience.

Accounting for Impaired Spectrum in the Forward Auction. Impairments are unpredictable given the voluntary nature of the incentive auction and in light of other nations' different use for their spectrum resources. Under these circumstances, limiting Category 1 spectrum to only those blocks that are completely unimpaired could lead to auction results that damage the prospects for wireless broadband competition. Moreover, excluding lightly impaired downlink-only resources from the forward auction would deny interested carriers an opportunity to acquire assets through competitive bidding and exclude additional forward-auction revenue that could prove important to meeting higher spectrum-clearing targets. By contrast, the proposed one-to-one assignment round price adjustments will adequately preserve the generic nature of each license category, which will simplify bidding and accelerate the auction. Where incumbents in Canada or Mexico impair a domestic license, however, smaller assignment round discounts should apply because both nations have stated their intent to reconfigure their respective 600 MHz band spectrum for broadband use. For the same reasons, when determining impairments in setting the spectrum-clearing target, spectrum impaired by incumbents in Canada and Mexico should be categorized according to a discount formula that reflects the time-limited nature of these impairments. Finally, licenses with greater than 50% inter-service impairment should be offered in a separate auction following the close of the incentive auction, rather than using a separate clock in the forward auction or leaving the spectrum to be sold at some uncertain future date.

Refining Clock Phase Bidding Procedures. Expanding the time between auction phases will allow for more informed bidding. The auction should allow for additional time between the cessation of reverse auction bidding and the start of forward auction bidding as well as between the end of forward auction bidding and the start of the assignment round. Meanwhile, the Final Stage Rule should not condition closing of the auction on requirements not required to meet Congressionally mandated expenses. Although adopting an additional price floor for the spectrum reserve is unnecessary—and will have no impact on the revenues paid to broadcasters in the reverse auction—the Commission's proposals rightly limit the scope of the price trigger. In particular, the pricing benchmark should not exceed $1.25 per MHz-POP, because higher prices could undermine competition and increase the risk of auction failure, and remain based on gross, rather than discounted, bids. The price per MHz-POP trigger should be based on the top 25 PEAs, which cover approximately half of the U.S. population.

Adopting Activity Rules and Promoting Fair and Truthful Bidding. The proposed activity rules in the forward auction will promote truthful bidding and promise a swift auction; however, the aggressive activity rules, and the eligibility requirements that support those rules, will prove much less useful if some bidders are allowed to evade the activity requirements under loosely defined rules. The auction rules should not allow entities to coordinate bids unfairly, and the Commission's competitive bidding rules should be strengthened to reduce the risk of such behavior. Limiting bidders to one bidding entity rather than allowing bidders to participate through multiple bidding entities, each with its own eligibility, will make the activity rules more meaningful and result in a more equitable competitive-bidding process.

Re-establishing Prices If a Spectrum-Clearing Target Is Reduced. If the Commission lowers its spectrum-clearing target, or any time an extended round fails to satisfy the Final Stage Rule, clock prices in the new stage should not exceed either (i) the bids of the last normal bidding round prior to the extended round, or (ii) the amount necessary to satisfy the Final Stage Rule of the current auction stage, whichever is less. Extended rounds allow bidders one last opportunity to achieve a high clearing target that the standard clock auction did not meet before the auction falls to a smaller spectrum-clearing target. If the extended round fails to meet a large spectrum-clearing target, bid amounts tendered during the extended round could nonetheless involve substantial price escalations. If an extended round inflated by the prospect of securing a large spectrum-clearing target were permitted to establish a new price floor for subsequent stages of the auction, bidders may drop out of active bidding to cover the costs of a spectrum-clearing target that the auction is no longer attempting to meet. Such unnecessary demand suppression can occur any time the Commission lowers its spectrum-clearing target. Adopting a mechanism to prevent artificial inflation of the clock price beyond that necessary to satisfy the Final Stage Rule in the current clock round would allow the Commission to pursue an aggressive spectrum-clearing target without frustrating the auction process.

Refining Bidding Procedures in the Assignment Phase. The assignment round should enable bidders to identify preferred channels within a geographic area because implementing same-channel assignments of licenses to winning bidders within a geographic area can reduce the complexity and cost of network deployment. At the same time, however, any common channels awarded during the assignment round should not be more expansive than 20 contiguous

PEAs or three Major Economic Areas ("MEAs"). The deployment efficiencies associated with same-channel deployments will not outweigh the demonstrable risk of anti-competitive exclusionary conduct that comes with a carrier acquiring exclusive control of a substantial share of a group of the same spectrum resources nationally or in very large regions of the country.

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COMMENTS OF T-MOBILE USA, INC.

I. INTRODUCTION

T-Mobile USA, Inc. ("T-Mobile")[1] broadly supports the auction procedures the Commission proposes in its *Comment Public Notice*.[2] The auction format the Commission proposes to implement – with clock rounds in the forward auction that allow bidders to express a preference for a certain number of generic licenses at a given price; extended rounds that allow bidders to improve their bids from the clock phase; and assignment rounds that allow bidders to express preferences for particular licenses within generic categories – promises a timely and efficient distribution of licenses to support wireless broadband services. Meanwhile, the proposed descending clock auction procedures offer a clear and comprehensible mechanism to permit broadcasters to choose to maintain their stations in their current configuration or pursue alternative strategies. The limited number of changes T-Mobile recommends in these comments build on the strong foundation established in the *Comment Public Notice*. Adopting these

[1] T-Mobile USA, Inc. is a wholly owned subsidiary of T-Mobile US, Inc., a publicly traded company.
[2] Comment Sought on Competitive Bidding Procedures for Broadcast Incentive Auction 1000, Including Auctions 1001 and 1002, *Public Notice*, AU Docket No. 14-252, GN Docket No. 12-268, 29 FCC Rcd 15750 (2014) ("*Comment PN*").

policies without further delaying the start of the broadcast incentive auction will allow competitive carriers to begin deploying on low-band spectrum as soon as possible.

II. THE PRO-CONSUMER SPECTRUM RESERVE AND A 20 MEGAHERTZ LICENSE DIVERSIFICATION REQUIREMENT

A. The 600 MHz Auction Represents the Last Chance for Wireless Facilities-Based Competition in the United States.

The 600 MHz incentive auction represents the last, best chance for effective facilities-based competition in the United States in a market that policymakers have expressed a preference for four carriers to compete.[3] A timely auction that incorporates meaningful competitive safeguards will encourage investment, accelerate innovation, and increase the speed, reach and function of wireless broadband services. By contrast, a drawn-out assignment process that permits the two dominant carriers to seize most or all of the available resources will establish a new broadband bottleneck for edge providers, enterprise customers, small businesses, and consumers. Without meaningful access to low-band spectrum resources, competitors are simply circling the drain.

Consistent with the recommendations of the Antitrust Division of the Department of Justice and its own repeated findings about the highly concentrated nature of the wireless broadband market in the United States, the Commission adopted a spectrum reserve for the 600 MHz incentive auction to protect competitors without access to substantial quantities of low-band spectrum against anti-competitive foreclosure by the two dominant carriers that control 73% of the available low-band resources.[4] While helpful, the reserve of 30 megahertz is too

[3] A policy that allows one reserve-eligible carrier to acquire all available reserve-eligible spectrum would not advance the Commission's stated preference for four nationwide wireless broadband providers in the United States. *See, e.g.*, Statement from FCC Chairman Tom Wheeler on Competition in the Mobile Marketplace, FCC News Release (Aug. 6, 2014), *available at* http://fcc.us/1sk17dV.

[4] *See* Policies Regarding Mobile Spectrum Holdings, Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, *Report and Order*, 29 FCC Rcd 6133, 6196-6203 ¶¶ 153-171 (2014) ("*Mobile Spectrum Holdings Report and Order*"); *see also* Ex Parte Submission of the U.S. Department of Justice,

small to support robust competition. For reasons outlined in T-Mobile's Petition for Reconsideration in the related *Mobile Spectrum Holdings* docket, the best means of promoting competition in the 600 MHz incentive auction is to expand the spectrum reserve from 30 to 40 megahertz.[5] Indeed, the recent AWS-3 auction highlights the fact that without Commission intervention AT&T ($18.2B) and Verizon ($10.4B) will again dominate the Incentive Auction, limiting the ability of competitive carriers to acquire vital, low-band spectrum.[6]

The Communications Act directs the Commission to promote the public interest, not arbitrary revenue goals.[7] A robust reserve advances the public interest through the greater availability of broadband service offerings, expanded consumer choice, and increased investment. With FirstNet and other public interest goals already fully funded, moreover, revenue should no longer be a consideration for the incentive auction. Even if it were, considerable evidence exists that expanding the size of the reserve would increase auction revenues.

In the 2014 auction of the Canadian 700 MHz band, for example, the regulator implemented a spectrum-aggregation limit under which no bidder could win more than two of the five available paired blocks, and none of Canada's Big 3 operators could win more than one

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WT Docket No. 12-269 (Apr. 11, 2013); Letter from William J. Baer, Assistant Attorney General, U.S. Department of Justice to Marlene H. Dortch, Secretary, Federal Communications Commission, WT Docket No. 12-269 (May 14, 2014).

[5] *See* T-Mobile USA, Inc., Policies Regarding Mobile Spectrum Holdings, *Petition for Reconsideration*, WT Docket No. 12-269 (Aug. 11, 2014) ("*T-Mobile Spectrum Petition*").

[6] *See AWS-3 Auction Results: AT&T leads with $18.2B, Verizon at $10.4B, Dish at $10B and T-Mobile at $1.8B*, Fiercewireless.com (Jan. 30, 2015), *available at* http://www.fiercewireless.com/story/aws-3-auction-results-att-leads-182b-verizon-104b-dish-10b-and-t-mobile-18b/2015-01-30. *See also* John Legere, *Speak Up for America's Wireless Future*, T-Mobile (Feb. 18, 2015), *available at* http://newsroom.t-mobile.com/issues-insights-blog/wireless-future.htm (asking the Commission to level the playing field in the auction to sustain a competitive market by adopting rules that, among other things, reserves 40 megahertz or at least half of the available spectrum for competitors).

[7] *See 47* U.S.C. § 309(j)(3) (requiring the FCC to adopt competitive bidding rules that, among other things, "avoid[] excessive concentration of licenses" and "disseminat[e] licenses among a wide variety of Applicants").

of the paired blocks unless it included a block subject to considerable initial impairments.[8] This auction design ensured the availability of at least one paired block for smaller, competitive carriers. With these spectrum-aggregation limits in place, the Canadian auction produced revenues that were more than double preliminary market estimates, and the total of US$4.8 billion in revenues was the most ever raised by a wireless auction in Canada—a nation with approximately 1/10th of the population of the U.S. Increasing the size of the reserve to 40 megahertz in the incentive auction will similarly require more vigorous and sustained bidding by dominant providers that will be forced to compete against each other for the available non-reserve spectrum.

B. No One Bidder Should Be Allowed to Acquire All of the Reserve Spectrum.

Whether the reserve is left at 30 megahertz or expanded to 40 megahertz, no reserve-eligible bidder should be permitted to purchase more than 20 megahertz of reserve spectrum in any PEA.[9] If the reserve remains limited to 30 megahertz of spectrum, the Commission has stated its intention not to allow reserve-eligible bidders to acquire more than 20 megahertz of reserved spectrum in a PEA unless there is another bidder for reserved spectrum in that PEA.[10] This policy focuses on adjusting resources between reserve and non-reserve bidders, but does nothing to protect license diversification among reserve-eligible bidders. Regardless of the number of reserve-eligible bidders participating, a single reserve-eligible bidder should not be allowed to acquire all of the reserve spectrum in a given market.

Limiting reserve-eligible bidders to 20 megahertz of spectrum will satisfy the Commission's statutory requirement to maximize license diversification and benefit consumers

[8] *See* Letter from Trey Hanbury, Counsel to T-Mobile USA, Inc., to Marlene Dortch, Secretary, Federal Communications Commission, GN Docket No. 12-268, WT Docket No. 12-269 at 2-3 (Apr. 3, 2014).
[9] Any spectrum eliminated from the reserve as a result of this mechanism should be made available to satisfy demand in the non-reserve spectrum pool.
[10] *Mobile Spectrum Holdings Report and Order*, 29 FCC Rcd at 6209 ¶ 187.

by increasing the number of competitive carriers able to acquire low-band spectrum. The Communications Act directs the Commission to diversify license holdings.[11] That statutory principle is especially salient in low-band spectrum auctions, such as the incentive auction, where spectrum resources are highly concentrated and competitive entry has proven exceptionally challenging. The results of the recently completed AWS-3 auction, for example, illustrate the importance of well-designed, pro-competitive auction rules. Despite substantial discounts secured by designated entities, the majority of the most valuable paired broadband licenses went to the two largest nationwide carriers. As a result, the competitors to AT&T and Verizon most likely to deploy new technologies and services rapidly and foster economic growth were not able to win substantial AWS-3 licenses.[12]

Adopting a limitation on spectrum reserve acquisition will permit at least two potential competitors to acquire important low-band resources, giving them at a fighting chance to gain a foothold in this valuable spectrum.[13]

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[11] 47 U.S.C. § 309(j)(3)(directing the Commission to promote economic opportunity and competition by disseminating licenses among a wide variety of applicants).

[12] The two largest nationwide service providers acquired 63% of all paired spectrum on a MHz-POP basis in the AWS-3 auction. *See* Comments of T-Mobile USA, Inc., Updating Part 1 Competitive Bidding Rules; Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions; Petition of DIRECTV Group, Inc. and EchoStar LLC for Expedited Rulemaking to Amend Section 1.2105(a)(2)(xi) and 1.2106(a) of the Commission's Rules and/or for Interim Conditional Waiver; Implementation of the Commercial Spectrum Enhancement Act and Modernization of the Commission's Competitive Bidding Rules and Procedures, WT Docket Nos. 14-170 and 05-211, GN Docket No. 12-268, RM-11395 at 21 (Feb. 20, 2015) ("*Competitive Bidding Comments*").

[13] A reserve-eligible bidder seeking to acquire 30 megahertz of spectrum both inside and outside of the reserve blocks would face the potential for foreclosure by the two dominant providers when seeking to acquire a 5+5 MHz license in the non-reserve blocks; however, that bidder would not be nearly as affected by foreclosure risk as if it attempted to acquire 30 megahertz without access to any spectrum in the reserve. Notably, AT&T or Verizon are eligible for reserved spectrum in markets covering over 40% of the population, and with their vast resources could run the table on both the reserve and non-reserve spectrum in those markets. *See* T-Mobile USA, Inc., Policies Regarding Mobile Spectrum Holdings, *Reply to Oppositions to Petition for Reconsideration*, WT Docket No. 12-269 at 11 (Oct. 6, 2014) ("*T-Mobile Spectrum Holdings Reply to Oppositions*").

C. Allocating the Least Impaired Licenses in Each PEA to the Reserve Incentivizes Bidding, Increases Fungibility, and Prevents Elimination of the Reserve in the Congested Markets that Are Also Likely to Feature Highly Concentrated Spectrum Holdings.

Modest adjustments to the definition of Category 1 licenses will help ensure that variable spectrum availability across geographic area licenses offered in the incentive auction does not run counter to the pro-competitive policies the Commission embraced in the recently adopted *Mobile Spectrum Holdings Order*. As currently proposed, the spectrum reserve would consist entirely of Category 1 spectrum; therefore, a market with no Category 1 licenses would have no reserve spectrum available to prevent anti-competitive foreclosure.[14] To avoid forcing consumers in markets without Category 1 licenses to suffer the effects of possible anti-competitive foreclosure in heavily impaired markets, the Commission seeks comment on including Category 2 blocks in the reserve in PEAs with fewer Category 1 blocks than the maximum spectrum reserve, assuming sufficient demand by reserve-eligible bidders at the time the auction reaches the reserve trigger.[15] However, the incorporation of additional price clocks into the reserve would increase the complexity of the auction process and could slow the pace of the auction.[16] The complications of managing four simultaneous auction clocks – two in the reserve and two in the non-reserve blocks – across the large number of licenses expected to be offered in this auction might be worth exploring if no other options were available to prevent elimination of the spectrum reserve in congested markets.

Fortunately, simpler alternatives exist. The Commission can protect consumers in all geographic market areas from anti-competitive foreclosure by expanding Category 1 licenses to include the least impaired licenses in any given PEA, up to the reserve established by the initial

[14] *Comment PN* ¶ 151.
[15] *Id*.
[16] *Id.* ¶ 144.

spectrum-clearing target. The proposed rule reduces complexity and accelerates the auction by eliminating the need for a second clock in the reserve.

Equally important, relaxation of the categorical definitions is unlikely to disrupt bidder expectations about the types of licenses they are acquiring. First, the Commission has emphasized its expectation that "most licenses offered in the forward auction will fall into Category 1."[17] Therefore, most licenses offered in the incentive auction should not vary from the standard categorical definitions.[18] Second, in those few markets that lack sufficient Category 1 licenses to support the spectrum reserve determined by the initial spectrum clearing target, the categorical definitions of impairment would only be relaxed for the few blocks of spectrum needed to make up the spectrum reserve. If the reserve were comprised of four blocks and three Category 1 blocks existed in a PEA, for example, the definition of a Category 1 license would be relaxed for only one additional license in that PEA; no other licenses would be affected. Third, any licenses for which the categorical definition is relaxed would continue to receive a discount based on their specific degree of predicted impairment. A license that is 16% impaired, in other words, would receive a 16% discount from the Category 1 clock price during the assignment phase.[19] The availability of discounts at the end of the assignment phase based on degree of impairment will help ensure that all winning bidders derive value from the licenses they acquire regardless of the specific amount of the impairment.[20] For these reasons, slightly relaxing the

[17] *Id.*¶ 143.
[18] In those cases, Category 1 licenses would remain limited to any license with potential impairments that affect zero to 15% of the population of the PEA; Category 2 would remain limited to any license with potential impairments that affect greater than 15% but less than or equal to 50% of the population. *Id.* ¶ 145.
[19] *See infra* Section IV.C.
[20] *Comment PN* ¶ 147.

definition of categories in areas of severe impairment where needed to promote the competitive intent of the spectrum reserve would not meaningfully affect the fungibility of licenses.[21]

Allowing the spectrum reserve to shrink or disappear because the available blocks of spectrum were more impaired than expected would arbitrarily and unnecessarily risk the consumer harm the Commission adopted the spectrum reserve to combat.[22] Defining the least impaired licenses in a PEA as Category 1 licenses, as needed, preserves the benefits of the pro-competitive spectrum reserve for all consumers without delaying the bidding process or complicating the auction.

D. Basing the Reserve on All Activity by Reserve-Eligible Bidders Strikes the Proper Balance Between Promoting Competition and Allowing Bidders to Take Advantage of the Most Attractive Pricing Opportunities.

If the reserve is to be no greater than the amount of spectrum reserve-eligible bidders are pursuing at any given round during the auction, all of the reserve-eligible bidders' activity – both in Category 1 and Category 2 spectrum – should count toward the amount of activity necessary to protect the spectrum reserve. Under the procedures proposed in the *Comment Public Notice*, the number of blocks reserved in a PEA will be based on demand for Category 1 blocks by reserve-eligible bidders at the time the auction satisfies the Final Stage Rule.[23] If this rule were adopted, the size of the reserve could be set at an amount lower than the full 30 (or, if the reserve is expanded, 40) megahertz if some of these bidders are bidding on Category 2 spectrum at the time of the Final Stage Rule trigger.[24] Limiting the size of the reserve to the size of Category 1 activity by reserve-eligible bidders does not account for the many different reasons a reserve bidder may bid on licenses in Category 2 during any given round.

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[21] Even if a limited relaxation of the categorical definitions were to upset bidder expectations about what they were acquiring, which seems doubtful, this disruption would fall on reserve-eligible bidders that are the very beneficiaries of the proposed rule.
[22] *See generally Mobile Spectrum Holdings Report and Order*.
[23] *Comment PN* ¶ 151.
[24] *Id*.

The Commission should maintain the size of the spectrum reserve based on all activity by reserve-eligible bidders, regardless of the category of spectrum on which they are bidding. A reserve-eligible bidder that switches bidding to Category 2 spectrum does not necessarily signify a lack of interest in bidding on the spectrum reserve. For example, the price of Category 2 spectrum could potentially be lower than Category 1 spectrum in a given PEA, and a bidder might elect to pursue more encumbered blocks before switching eligibility back to Category 1 once the spectrum reserve becomes effective. Alternatively, a reserve-eligible bidder might identify a highly impaired Category 2 license that, notwithstanding its impairments, complements other spectrum resources the bidder holds in the market that the Category 2 discount outweighs the pricing differential, if any, between the Category 1 and Category 2 blocks. Or reserve-eligible bidders may be bidding at Category 2 licenses in a given area at the prices at which the reserve is triggered, but later in the auction, as relative prices change, may prefer to obtain the reserved Category 1 licenses. None of these bidding decisions reflects any intrinsic lack of interest in the reserve. Reducing or eliminating the reserve under these circumstances would penalize the wholly rational bidding behavior of switching back and forth between Category 1 and Category 2 spectrum depending on price differentials and the degree of impairment of any given license.[25]

The total demand of reserve-eligible bidders – not just their demand for Category 1 spectrum – should determine the size of the spectrum reserve. A comprehensive calculation of all reserve-eligible bidder activity in both categories of spectrum offers a more accurate expression of bidder interest and better accounts for the many different reasons that a reserve-eligible bidder may wish to bid on Category 2 spectrum in a given geographic market area.

[25] For example, a Category 2 license might be only 16% impaired but might be much less expensive than a Category 1 license that is 15% impaired.

III. INITIAL SPECTRUM CLEARING TARGETS AND DETERMINING IMPAIRMENTS

A. Locating Repacked Broadcasters in the 600 MHz Uplink Band Helps Avoid Harmful Interference, Increases the Utility of Broadband Spectrum, and Mitigates the Impairment of Broadband Operations.

Placing DTV operations that cannot be accommodated in the UHF or VHF bands into the 600 MHz LTE uplink spectrum would make the 600 MHz band more useful to broadband providers, reduce the scope of the impairment on a MHz-POP basis in many situations, and offer more options for overcoming interference than impairing the 600 MHz LTE downlink blocks.

The Commission's proposed approach for repacking broadcasters will prioritize finding channels in the remaining TV bands for as many stations as possible.[26] When this outcome is not possible, as in areas that are constrained due to factors such as lack of broadcaster participation in the reverse auction or international border-related issues, the auction system will assign stations a channel in the 600 MHz band.[27] The Commission proposes to assign TV stations using its optimization procedure to minimize the total impaired weighted pops, which would allow a station to be assigned to any frequency in the 600 MHz band and could lead to assignments in the uplink portion in some markets and the downlink portion in others.[28]

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[26] *Comment PN* ¶ 32.

[27] *Id*. The Commission has previously placed TV stations located in the 600 MHz band on notice that the Commission is not required to resolve international coordination prior to the incentive auction, and the subsequent elimination of cross-border interference may require an additional move to newly available lower-frequency UHF channels. *See* Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, *Report and Order*, 29 FCC Rcd 6567, 6679 ¶ 254 (2014) ("What is required to undertake the repacking process is a mutual understanding with Canada and Mexico as to how the repacking in the United States will be conducted to protect border stations in all countries from interference, and how any possible repacking *could* be conducted in Canada and Mexico should either of those countries ever determine that they might want to undertake such a process.") ("*Incentive Auction R&O*"); *see also* 47 C.F.R. § 27.57 ("Wireless operations in the 512-608 MHz, 614-763 MHz, 775-793 MHz, and 805-806 MHz bands are subject to current and future international agreements between the United States and Canada and the United States and Mexico."). These secondary relocation costs should be borne by the licensee; the Spectrum Act's reimbursement mandate applies only to broadcast stations that are involuntarily reassigned to new channels *in the repacking process*, and the Commission has expressly provided that it will not reimburse winning reverse auction bidders for voluntary UHF-to-VHF reassignments. *Incentive Auction R&O*, 29 FCC Rcd at 6813 n.1694 (noting that this policy avoids a result where a winning high-VHF-to-low-VHF bidder would receive cost reimbursement, but UHF-to-VHF winners would not).

[28] *Comment PN* ¶ 35.

Alternatively, the Commission seeks comment on whether it should assign TV stations in the 600 MHz band to the downlink band whenever feasible to do so.[29]

DTV operations that cannot be accommodated in the UHF band should appear in the 600 MHz LTE uplink band rather than the downlink band.[30] First, placing a DTV channel in the 600 MHz LTE uplink will overlap a *maximum* of two five-megahertz uplink blocks. By comparison, placing a DTV channel in the 600 MHz LTE downlink would cause interference to a mobile device on any frequency supported by the device's 600 MHz duplexer, which could easily render 25 megahertz of spectrum unusable based on a reasonable assumption of duplexer bandwidth. Indeed, if the amount of spectrum repurposed for mobile broadband were small enough to be covered by a single duplexer, then locating DTV in the 600 MHz LTE downlink spectrum would effectively eliminate the entire 600 MHz band in the vicinity of a DTV transmitter location in the 600 MHz LTE downlink.[31]

Second, unlike an LTE downlink impairment, creating an LTE uplink impairment would allow a measure of flexibility to determine the optimal placement of the impairment within the uplink band, based on specific market conditions. For example, if a DTV station impaired the

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[29] *Id*. ¶ 36.

[30] Wherever the Commission ultimately decides to place broadband impairments, the record in this proceeding demonstrates the importance of ensuring that there are no Channel 51 stations left in the 600 MHz band. Existing broadcast operations at Channel 51 already pose deployment challenges for mobile broadband providers in the Lower 700 MHz A Block, which give rise to significant adjacent-channel interference challenges. *See* Comments of Verizon and Verizon Wireless, Docket No. 12-268 at 37-38 (Jan. 25, 2013); *see also* Comments of AT&T, Inc., Docket No. 12-268 at 37 (Jan. 25, 2013); Supplemental Reply Comments of Cellular South, Inc., Docket No. 12-268 at 2 (June 28, 2013); Supplemental Comments of the Competitive Carriers Association Regarding the 600 MHz Band Plan, GN Docket No. 12-268 at 5 (June 14, 2013).

[31] Depending on the outcome of the auction, carriers may not need to use overlapping duplexers for any other purpose than to overcome broadcast interference in the downlink in certain encumbered blocks of spectrum in a limited number of encumbered markets. Because only those licensees facing downlink impairments would have an incentive to deploy multiple duplexers, few, if any, opportunities for scale economies would exist and the impaired LTE licensees would either have to absorb the costs of installing multiple duplexers on a near-custom basis, which could increase those operators' costs, or forgo the deployment of broadband services in the vicinity of the DTV station. A downlink impairment would pose fewer challenges if mobile devices possessed the capability to dynamically filter out unwanted signals based on the area in which the device was operating; however, while this type of location-specific filtering may one day prove feasible, this technology does not exist today.

first usable block of 600 MHz uplink spectrum (viz., the A Block), then the DTV station could overlap part of the duplex gap and five megahertz of the first uplink block – a configuration that would reduce the encumbrance on licensed spectrum made available for broadband use.[32]

Alternatively, if a DTV station impaired two blocks in the uplink, the overlap would fall into one of the following configurations: (a) five megahertz in one block and one megahertz in the other; (b) four megahertz in one block and two megahertz in the other; or (c) three megahertz in each block. Depending on the precise overlap situation, carriers could employ different types of LTE base station filtering to prevent strong DTV signals from overloading the unimpaired uplink blocks. Commercially available base station filtering would allow use of uplink blocks that are not directly overlapped by DTV. These mitigation measures are possible and cost effective because the LTE base stations are fixed in location and limited in number. Operators could also use LTE techniques like uplink resource block blanking or work with broadcasters to manage DTV out-of-band emissions to further reduce the impact to base stations operating in adjacent channels. These interference-mitigation techniques have a proven track record: T-Mobile, for example, has successfully employed these techniques to overcome interference concerns that adjacent-channel DTV operations posed to 700 MHz A Block uplink operations.[33]

If DTV operations impaired the downlink rather than the uplink spectrum, however, 600 MHz LTE operators could not employ any of the above interference-management techniques. The following diagrams illustrate these points:

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[32] In this example, the co-channel interference in adjacent markets would be minimal due to distance separation. Meanwhile, adjacent channel interference in the same market due to the TV station's out-of-band emissions can be managed with similar techniques as those used in the concurrent operation of 700 MHz A Block and DTV channel 51.

[33] *See, e.g.*, Promoting Interoperability in the 700 MHz Commercial Spectrum; Requests for Waiver and Extension of Lower 700 MHz Band Interim Construction Benchmark Deadlines, *Report and Order and Order of Proposed Modification*, 28 FCC Rcd 15122 (2013) (detailing filtering mechanisms used to avoid inter-service interference).

Diagram 1 – DTV Operations in Downlink Band

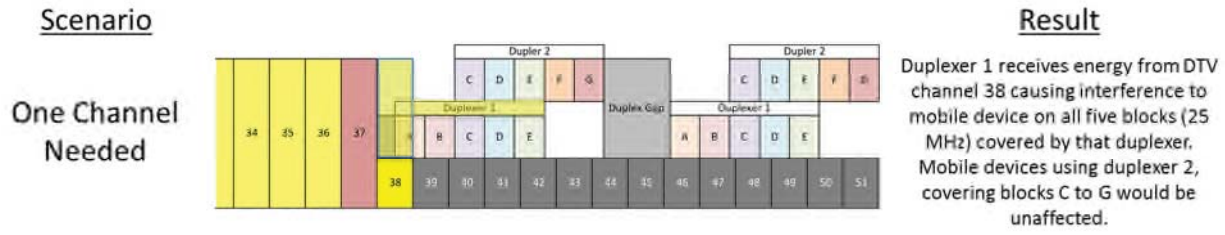

Diagram 2 – DTV Operations in Uplink Band

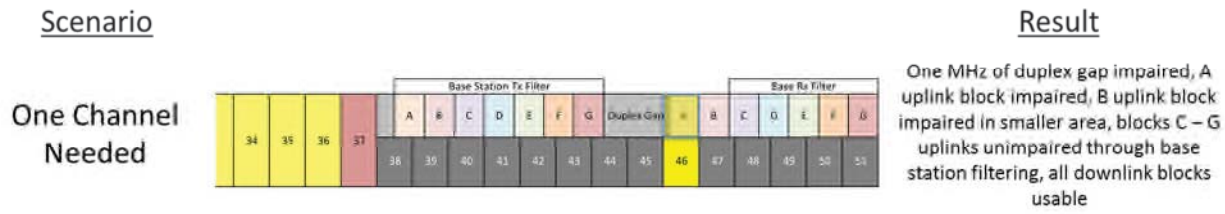

Diagram 1 shows the impact of DTV operations in the downlink band (*i.e.*, to mobile receivers). Because mobile devices will have duplexers that seek to maximize the use of contiguous spectrum, interference caused to block A will also impair the use of blocks B, C, D, and E. For the same reason, reducing out-of-band emissions from DTV operations in the downlink band would not mitigate interference to mobile devices. The diagram also shows that there can be no strategic placement of the impairment.

By contrast, as illustrated in Diagram 2, network operators can install targeted base station receiver filters or use LTE interference management techniques in those limited number of base stations affected by nearby, interfering DTV operations in the uplink band and work with DTV stations to reduce their out-of-band emissions, all of which would mitigate the interference to base station receivers. Also, DTV operations can be located strategically over part of the duplex gap, further mitigating the amount of harmful interference. Similar strategies apply, as discussed above, in scenarios where more than one DTV channel is operating in the same geographic area.

Third, downlink spectrum is much more highly valued than uplink spectrum because downlink traffic far surpasses uplink traffic.[34] Placing excess broadcast incumbents in the LTE uplink will impair the less useful – and less valuable – segment of the band pair, which will increase the utility of remaining spectrum as well as the revenue generated by the forward auction, which will increase the total amount of spectrum cleared. Impairing the 600 MHz LTE uplink in lieu of the downlink also means that the associated downlink will remain unimpaired and available to convey downstream broadband traffic from base stations to end users. In addition, the downlink blocks that are made useful from placing the impairment in the uplink would include not only the downlink blocks that correspond to the uplink blocks that the DTV encumbrance overlaps, but also those blocks adjacent to DTV stations that may experience smaller areas of impairment depending on filtering and the relevant DTV out-of-band emissions. Although the required co-channel separation distances may be larger when DTV shares the uplink band with DTV to LTE base station interference,[35] a mobile operator has the flexibility to solve the interference problem by adapting its network design or accepting a reduced level of performance in certain areas because it is the "victim" in this scenario.[36] In short, placing DTV

[34] *See, e.g.*, Kostas Liopiros, *Asymmetry and the Impending (US) Spectrum Crisis*, Financial Times, May 28, 2013, http://on.ft.com/1uye5ll ("Wireless data is typically very bursty and highly asymmetric or 'downlink heavy.'").

[35] Because interference with DTV in the downlink is not base to base (as it is in the uplink) the distances and areas of exclusion found in a downlink impairment will be smaller than in the uplink. As explained below, however, the amount of spectrum impaired will be greater. This favors sharing with the uplink where DTV transmitters are located in urban centers because sharing in either the uplink or downlink will impair most of the market's POPs but sharing with downlink will impair more five MHz blocks and thus more MHz-POPs.

[36] Because DTV would be in the uplink spectrum and only subject to potential interference from mobile user equipment, DTV service will not be impacted if a mobile operator deployed base stations closer to DTV contours than the OET-74 methodology would otherwise suggest. *See* Office of Engineering and Technology ("OET"), *Proposed OET Bulletin No. 74: Longley-Rice Methodology for Predicting Inter-Service Interference to Broadcast Television from Mobile Wireless Broadband Services in the UHF Band* (2014), attached as App'x E to Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, *Second Report and Order and Further Notice of Proposed Rulemaking*, GN Docket No. 12-268, ET Docket Nos. 13-26, 14-14, 29 FCC Rcd 13071 (2014) ("*ISIX Second R&O and FNPRM*").

operations in the downlink will usually impair many more blocks than placing DTV operations in the uplink.[37]

B. Adopting Different Standards for Uplink and Downlink Spectrum Better Accounts for Differences in Value and Allows for a More Accurate Assessment of When Demand Has Satisfied the Final Stage Rule.

Wherever it has the discretion to choose the location of a 600 MHz band encumbrance, the Commission generally should impair the uplink band to maximize the amount of spectrum available for broadband use. In certain locations such as the borders with Canada and Mexico, however, the Commission will not have discretion to determine the location of the impairment. Where it lacks discretion to place the impairment (or if the Commission takes a case-by-case approach to placing impairments in the uplink and downlink), the Commission should recognize the differences between uplink and downlink impairments in assessing the Final Stage Rule.

The threshold for determining whether a county is "impaired" for purposes of determining impairments for a given clearing target should differ depending on whether uplink or downlink spectrum is the subject of the impairment. In the *Comment Public Notice*, the Commission recognizes that "there is less demand for unpaired uplink frequencies."[38] Reflecting the higher importance and value of downlink access, the Commission proposes to designate a 10-20% impairment in the downlink band as rendering an individual block in a county as wholly impaired (i.e., deeming both the downlink and uplink as impaired), but to designate a 10-20% impairment in the uplink as only 50% impaired (i.e., deeming only the uplink as impaired).[39] As the Commission observes, the presence of a television station in the uplink portion of the 600 MHz band would still allow unimpaired use of the downlink portion of a paired 5+5 MHz

[37] A downlink impairment could, in theory, impair the same or potentially even fewer blocks than an uplink impairment, depending on the band plan and duplexer configuration. In the cases presented by the 600 MHz band plan and its likely duplexer configurations, however, a downlink impairment is very unlikely to occupy less spectrum than an uplink impairment.
[38] *Comment PN* ¶ 34 n.88.
[39] *Id.* ¶ 29.

license, while the reverse would not be true for TV stations located in the downlink.[40] Because access to downlink spectrum is crucial for mobile broadband network deployment, the Commission should consider a county with uplink impairments above a 15% threshold to be no more than 50% impaired, but a county with downlink impairments above a 15% threshold to be wholly impaired.[41]

C. Adopting Additional Constraints on Impairment Levels Will Encourage Scale Economies and Promote Competition.

Adopting targeted supplemental constraints on impairments in addition to the proposed 20% nearly-nationwide threshold will allow for a more efficient and competitive post-auction wireless broadband market. Specifically, the Commission should choose the initial clearing target that will maximize the number of licenses in the top 10 markets by value-weighted pops. To compete successfully, nationwide carriers such as T-Mobile that have either little to no low-band spectrum or inconsistent amounts of low-band spectrum nationally will need access to spectrum in multiple major markets not only to benefit from the volume purchasing, reduced operating expenses, and increased operational efficiency associated with carrier-specific economies of scale, but also to consistently meet consumer performance expectations for wireless broadband service. Taking into consideration the geographic distribution of impairments, as well as the relationship of total impairments to the spectrum clearing target, will mitigate the possibility that the U.S. market will fall below the scale necessary to support a high level of investment and innovation and increase the likelihood that all carriers will have the ability to offer a more consistent user experience inside buildings and over large geographic areas.

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[40] *Id.*

[41] These thresholds would only apply for purposes of setting a clearing target. As the Commission explains, more detailed data would be used when categorizing blocks for bidding. For T-Mobile's views on the impairment standards that should apply during license categorization of licenses, *see infra* Section IV.C.

Although the 600 MHz auction will seek to achieve a uniform band plan in every market in the country, the voluntary nature of the incentive auction makes some degree of variation in the available spectrum nearly inevitable.[42] A broadcaster's choice of whether or not to make spectrum available for broadband use is a multivalent, voluntary decision that will rest on the licensee's assessment of, among other things, the ongoing broadcast operation, the future of the broadcast industry, the likelihood and timing of regulatory change, and, of course, the prices offered to the incumbent during the forward auction.

The 20% near-nationwide weighted-POP standard provides an important safeguard to prevent impairments from thwarting the value of any given spectrum-clearing target on an aggregate basis; however, this standard does not impose reliable constraints on how broadly or how narrowly the impairments to the 600 MHz band plan will be distributed by geography. Nor does this standard constrain the amount of spectrum encumbered in the forward auction relative to a spectrum-clearing target that can vary over the course of the incentive auction. Restraining the geographic distribution of impairments and limiting the scope of impairment in relationship to the spectrum-clearing target will offer greater certainty to prospective bidders and allow them to make more informed and more accurate price offers in the forward auction than possible using a single, aggregate 20% near-nationwide weighted MHz-POPs standard.

1. *Geographic distribution of impairments.*

Adopting a requirement limiting the amount of impairment for any spectrum-clearing target to at most 20% of nationwide weighted-POPs provides certainty that the aggregate

[42] Few, if any, bands in the United States market are wholly unencumbered. But the 600 MHz band represents the first occasion in which an unknown – and largely unknowable – set of variable impairments will emerge as a part of the competitive bidding process in each of 416 separate geographic PEA markets. *See* Wireless Telecommunications Bureau Provides Details about Partial Economic Areas, *Public Notice*, GN Docket No. 12-268, 29 FCC Rcd 6491 (WTB 2014).

impairments will not prove excessively large in absolute terms.[43] At higher clearing targets, the MHz-POP weighting requirement could nevertheless allow for an auction to close where several large markets are unavailable for broadband deployment even as large swaths of the country exhibit virtually no impairments.

Would a U.S. band plan that omitted several of the nation's largest cities provide sufficient economies of scope and scale to encourage investment and innovation? Perhaps more importantly, would an auction based on such a band plan attract enough bidders to support the revenue necessary to compensate the broadcasters and achieve the other revenue goals the Commission has identified? The answers are unclear. But inconsistent availability of low-band spectrum in the major markets threatens to impair competition and auction revenue by preventing non-dominant carriers from acquiring the resources necessary to offer the type of consistent end-user experience critical to attracting and retaining customers.

As a modification of the aggregate 20% impairment rule to achieve these goals, the auction system should ensure that there are at least four licenses available in at least nine of the top 10 PEAS regardless of the clearing target.[44] This bright-line constraint is relatively "soft" in the sense that not all blocks would have to be available in all top markets and those blocks that are available could remain subject to substantial impairments. At the same time, ensuring that there are a minimum number of licenses in at least nine of the top markets would have especially meaningful consequences at higher levels of spectrum clearing, because the auction would have to move to a lower spectrum-clearing target if the auction could not satisfy one of these objectives. On balance, the benefits of a less fragmented market with greater economies of scale and scope outweighs the cost of achieving a nominally lower spectrum-clearing target.

[43] *Comment PN* ¶¶ 38-39.
[44] If no clearing target is consistent with this objective, then the Commission should choose a spectrum-clearing target that minimizes the violations of this goal.

2. *Relationship to the spectrum-clearing target.*

For similar reasons, the Commission should consider adjusting the 20% weighted MHz-POP threshold downward for higher spectrum-clearing targets. At spectrum-clearing targets of 84 megahertz and below, the 20% nearly-nationwide weighted MHz-POPs impairment threshold strikes a sensible balance between making more spectrum available, on the one hand, and increasing scale and reducing the potential for harmful interference, on the other, provided the aggregate weighted MHz-POP target is refined to protect against the possibility that an aggregate target may impair critical markets in ways that damage overall economies of scale and competition as discussed above.

At spectrum-clearing targets of greater than 84 megahertz, however, the absolute value of a 20% variation is greater. At the 144 megahertz target (12 paired licenses), for example, the 20% variation would allow for an average of 2.4 licenses to be completely impaired *in every PEA*. By contrast, at a lower 84 megahertz target (7 paired licenses), a 20% standard would on average only allow only 1.4 licenses to be impaired. With an average of 2.4 licenses impaired per market, the 20% threshold at 144 megahertz allows for substantially more variation in clearing across markets than the average of 1.4 licenses per market. This high degree of variation could compromise the ability of operators to achieve minimally efficient scale nationally or regionally.

At spectrum-clearing targets of greater than 84 megahertz, moreover, the cost of accommodating market-by-market variations in the band plan increases relative to the cost of accommodating market-by-market variations in band plans of 84 megahertz or less. At clearing targets above 84 megahertz, for example, the duplex spacing is different for the pairs of blocks

located partially below channel 37 than for those located above channel 37.[45] This variation in duplex spacing is manageable, but increases costs and complexity. Similarly, expanding the size of the bandwidth a mobile antenna must cover to include the large bandwidth of spectrum-clearing targets above 84 megahertz is also feasible; however, the current antenna designs of many phones may not readily accommodate large expanses of spectrum with a single antenna, which could also increase costs, at least until such time as production economies emerge.[46] These and other additional expenses uniquely associated with spectrum-clearing targets above 84 megahertz will likely prove worthwhile, but only so long as operators are able to reach a sufficiently large portion of the country's population using the expanded pool of spectrum.

Rather than establish a one-size-fits-all weighted MHz-POP threshold, therefore, the weighted MHz-POP threshold should recognize the increase in costs that accompany spectrum-clearing targets of greater than 84 megahertz and respond to it by tolerating fewer aggregate departures from the clearing target at higher levels of clearing. Adopting a 10% nearly-nationwide weighted MHz-POP standard for spectrum-clearing targets of more than 84 megahertz and a 20% nearly-nationwide weighted MHz-POP standard for spectrum-clearing targets of 84 megahertz or less would recognize the materially different costs of variation from the band plan that operators will incur depending on whether the 600 MHz band plan extends below channel 37 or is confined to the spectrum above it. Alternatively, the Commission could adopt a rule that would not allow more than 1.4 license impairments in a market on a value-weighted MHz-POP average basis. This rule would, in effect, result in permitting a 20% value-weighted MHz-POP impairment if there were seven licenses available, a 14% impairment if there were 10 licenses available, and a 12% impairment if there were 12 licenses available. This

[45] *Incentive Auction R&O*, 29 FCC Rcd at App. C, para. 27.
[46] *Id.*, para. 22.

alternative formulation of a variable value-weighted MHz-POP nearly-nationwide standard would not only allow for more gradations among different clearing targets, but also may prove easier to define and implement than a uniform formula.

Whatever the precise formula, the nearly-nationwide standard should take into account different costs associated with different spectrum band plans. The additional costs and complexity of incorporating bandwidths of greater than 84 megahertz does not mean that auction design should not aggressively pursue the highest possible clearing targets. Every available megahertz of low-band spectrum that can be repurposed for broadband use is valuable, and the auction design rightly seeks to establish the highest possible initial clearing target to meet burgeoning consumer demand for wireless broadband services and help redress non-dominant carriers' lack of access to the low-band spectrum they need to compete against the nation's two dominant providers.[47] But the benefits of a higher clearing target are diminished if the effective band plan in many markets is highly variable, and the additional costs of accommodating plans of larger than 84 megahertz will require additional economies of scale and scope to encourage timely and widespread deployment of services in the band. Establishing one or more differentials in the nearly-nationwide weighted MHz-POP standard depending on the applicable spectrum-clearing target will help address the differences in cost and complexity arising from band plan variations and help avoid a situation where too little spectrum is available in critical major markets to allow non-dominant carriers to offer a consistent user experience.

[47] *Comment PN* ¶ 25.

IV. IMPAIRED SPECTRUM IN THE FORWARD AUCTION

A. Establishing Functional Categories of Spectrum Blocks, as the Commission Has Proposed, Will Simplify Bidding, Mitigate the "Cliff Effect" Caused by Specific Numerical Thresholds, and Better Reflect Real-World Wireless Deployment.

A zero percent tolerance for impairments is impractical and unnecessary to encourage informed bidding in the incentive auction. The Commission proposes to offer spectrum blocks in two different functional categories of licenses, Category 1 and Category 2.[48] Category 1 would include licenses with zero to 15% impairment, and Category 2 would include licenses with greater than 15%, but no more than 50% impairment.[49] As an alternative, the Commission seeks comment on whether, rather than defining Category 1 spectrum as including licenses that are up to 15% impaired, it should limit this least-impaired category to spectrum that will not be subject to any inter-service interference—a zero percent impairment threshold.[50]

Bidders do not require a zero-tolerance policy on impairments to make informed bids in the incentive auction. Setting a zero percent impairment threshold would reduce the number of Category 1 licenses offered and lead to unpredictable and anomalous auction results, with some congested but high-value PEAs having little or no Category 1 spectrum. Moreover, a zero percent impairment level is not necessary for licenses to be fungible and instead creates a cliff effect where spectrum that is only one percent impaired is treated the same as spectrum 49% impaired even though it is much more similar to the zero percent impaired spectrum. Especially

[48] Although the Commission only names two license categories, the *Comment PN* effectively proposes three categories of licenses—zero to 15% impaired (Category 1); greater than 15% and no more than 50% impaired (Category 2); and an unnamed category with greater than 50% impairment. For simplicity T-Mobile refers to the heavily impaired category as "Category 3." *See id.* ¶¶ 143-145.

[49] *Id.*

[50] *Id.* ¶ 145 ("As an alternative, we seek comment on whether to limit the proposed Category 1 to licenses that are not predicted to be subject to any inter-service interference, that is, with potential impairments that affect zero percent of the PEA population.").

if only Category 1 licenses will be made available in the reserve blocks,[51] adopting a bright line zero percent impairment standard would limit the spectrum reserve and thus harm competition without taking into account market concentration.[52]

Network operators readily manage impairments in their networks today, and from a network engineering perspective there is no reason to draw a bright line at zero percent impairment. To the contrary, even impaired licenses can command tremendous value. Much of the AWS-1 band, for instance, was subject to considerable deployment constraints at the time of auction, yet the spectrum nonetheless generated then-record revenues and became the source for a robust broadband deployment by numerous carriers.[53] The results of the AWS-3 auction are also instructive here. Despite considerable use by the Department of Defense and long periods of time required to relocate incumbent users—some of which will remain in the band indefinitely—bidders have demonstrated in Auction 97 that they are still willing to pay handsomely for what is, in some cases, significantly impaired spectrum.[54]

B. Spectrum Impairment Categorizations That Take Into Account the Different Value of Uplink and Downlink Spectrum Will More Accurately Reflect Provider Deployment Needs.

Carriers with no or limited low-band spectrum holdings need access to both downlink and uplink spectrum. If 600 MHz uplink frequencies are unavailable in certain heavily congested markets, however, even impaired downlink spectrum will likely retain considerable

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[51] *Id.* ¶ 151.
[52] *See supra* Section II.C (discussing the importance of ensuring the spectrum reserve is not jeopardized by a lack of Category 1 spectrum and proposing that the three least impaired licenses in each PEA be treated as Category 1).
[53] At the time of auction, the AWS-1 bands were being used for a variety of Government and non-Government services and relocation was required and, indeed, remains ongoing to this day. The lower half of these paired frequencies, i.e., 1710-1755 MHz, were occupied by a variety of incumbent federal entities. The upper half of these paired frequencies, i.e., 2110-2155 MHz, was used by private services (including state and local governmental public safety services), common carrier fixed microwave services, and the Broadband Radio Service ("BRS"). For a discussion of the AWS-1 incumbent issues and protections, *see generally, e.g.*, Auction of Advanced Wireless Services Licenses Scheduled for June 29, 2006, AU Docket No. 06-30, *Public Notice*, FCC 06-47 (Apr. 12, 2006).
[54] *See* Auction of Advanced Wireless Services (AWS-3) Licenses Closes; Winning Bidders Announced for Auction 97, *Public Notice*, DA 15-131 (rel. Jan. 30, 2015).

value for 600 MHz auction participants including T-Mobile. To capture this value and increase the amount of broadband spectrum available to support next-generation wireless services, the Commission should auction lightly impaired downlink spectrum in the forward auction even though it does not have a corresponding uplink channel available.

Carriers will assign value to lightly impaired downlink spectrum in the 600 MHz forward auction even though the uplink is unavailable.[55] Under the current proposal, however, the Commission would only offer downlink blocks that are entirely unimpaired when no uplink channel is available.[56] In other words, the Commission will auction a block that has 100% uplink impairments so long as the block has no downlink impairments, but it will not auction a block that lacks access to an uplink channel if the downlink is even one percent impaired. This policy is too proscriptive. A policy of excluding even minor downlink impairments from the forward auction when the corresponding uplink is unavailable ignores the value of downlink spectrum in an operator's network and overlooks the feasibility of combining even impaired downlink-only blocks with other blocks where both uplink and downlink channels are available. The Commission should make downlink spectrum that has a wholly impaired uplink available as Category 2 spectrum in the forward-auction phase of bidding so long as the downlink channel is not more than 25% impaired. Including lightly impaired downlink-only resources in the forward auction instead of placing them into either an assignment round or a follow-on auction of more seriously impaired licenses allows interested carriers an opportunity to acquire assets through competitive bidding and captures additional forward-auction revenue that could prove important to meeting higher spectrum-clearing targets.

[55] *See supra* Section III.B.

[56] *Comment PN* ¶ 29; *see also id.* ¶ 145 n.259 (noting that the auction system will apply the same approach for weighting uplink and downlink impairments in categorization as in setting the extent of initial impairments).

C. Adjusting Prices by One Percent Per Percent of Impairment to Account for Varying Degrees of Impairments Makes Spectrum Blocks More Fungible and Increases the Revenues Available to Clear Spectrum for Broadband Use.

1. *The proposed impairment discount should apply to both Category 1 and Category 2 spectrum.*

All categories of spectrum offered in the incentive auction should remain eligible to receive price adjustments during the auction's assignment phase that reflect varying degrees of impairment from other licensed operations.[57] Under the formula proposed in the *Comment Public Notice*, provisionally winning bidders for both Category 1 and Category 2 licenses would receive discounts during the assignment phase of the forward auction equating to one percent of the bid amount for each one percent of predicted impairment.[58] The Commission also sought comment on an alternative proposal that would restrict the available impairment discounts only to Category 2 spectrum.[59]

Subject to exceptions in the case of foreign-origin impairments described below, the Commission should make one-to-one price adjustments in the assignment round for impairments associated with both Category 1 and Category 2 licenses. In other words, every percent of impairment of a license should result in a percentage discount from the provisionally winning bid during the assignment round regardless of whether the license is Category 1 or Category 2. Absent some type of equitable discount for both categories of spectrum, bidders would rationally bid no more than the value of the most impaired license offered in the forward auction to ensure they could save their remaining budget to compete for their preferred license during the assignment phase. Holding back bids during the forward auction in this manner, however, would

[57] *Id.* ¶ 147.
[58] *Id.*
[59] *Id.*

reduce the amount of forward auction revenue available to clear broadcast spectrum. Reduced forward-auction revenue would, in turn, risk clearing less spectrum for wireless broadband use.

2. *Licenses subject to temporary international border impairments should be auctioned regardless of impairment and subject to a proportionate discount, but not counted against the nationwide impairment threshold.*

Temporary impairments caused by operations originating in foreign countries should not receive the full one-to-one discount associated with impairments originating in the United States. Similarly, the identification of licenses as Category 1, 2, or 3 should reflect the adjustments of the standard discount that would apply to foreign-generated impairments. The *Comment Public Notice* does not propose to distinguish between those 600 MHz band impairments caused by foreign broadcast allotments located in Canada and Mexico from those impairments caused by domestic broadcast operations that do not exit the 600 MHz band and cannot be relocated to lower frequency spectrum.[60] To promote fungibility and efficient license assignment, however, both the assignment-round discounts and the license-categorization process should account for the likelihood that Canada and Mexico will eventually reconfigure their 600 MHz broadcast spectrum to support broadband operations.

i. *License categorization*

Foreign-generated impairments should affect the categorization of licenses as Category 1, 2, or 3. Given the consequences of categorization for the auction process, the assignment of any given license to a category should reflect the most accurate account of impairments possible.

Applying adjustments for foreign-origin impairments to license categorization similar to those proposed for the impairment discounts in the assignment phase would help ensure similarly

[60] *But see id.*, Statement of Commissioner Jessica Rosenworcel (suggesting that the Commission might distinguish between "short-term interference along the Canadian border and longer-term encumbrances").

impaired licenses fall into the proper generic license category.[61] In the *Incentive Auction Order*, the Commission recognized the need to undertake a comprehensive assessment when determining how to group license blocks into categories for bidding.[62] As explained above, foreign impairments are unlike domestic impairments in that they are time limited, and Canadian-origin impairments appear likely to face a nearer-term and more certain expiration than Mexican-origin impairments. The categorization process should reflect these differences by applying an 85% adjustment to Canadian-origin impairment calculation and a 60% adjustment to Mexican-origin impairment calculation.[63] If a license were 55% impaired by a Canadian broadcast incumbent, for example, the license would be deemed only 8.25% impaired (55% x 0.15 = 8.25%) and qualify as a Category 1 license. Similarly if a license were 55% impaired by a Mexican broadband incumbent, the license would be deemed 22% impaired (55% x 0.4 = 22%) and be treated as a Category 2 rather than a Category 3 license.

Alternatively, in determining license categorization the Commission could wholly disregard international border impairments and consider only any underlying domestic encumbrances that will remain even after agreements with Canada and Mexico are finalized. Under this alternative, a Canadian- or Mexican-impaired license that would also be subject to no more than 15% inter-service impairment would be classified as Category 1 for purposes of the forward auction, while if the same license would retain more than 15% but no more than 50% impairment after the border issues are resolved it should be auctioned as Category 2.

Depending on the precise effect of the impairments at the border on the licenses that are the subject of the forward auction, properly accounting for impairments originating in Canada

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[61] *Id.* ¶ 147.
[62] *Incentive Auction R&O*, 29 FCC Rcd at 6775-76 ¶ 506.
[63] As with the assignment discounts, *see infra* Section IV.C.2.ii, the categorization adjustments reflect the different degrees of certainty of intention to relocate broadcast operations from the 600 MHz band to other frequencies in a manner similar to the United States plan.

and Mexico would achieve numerous benefits. First, the impairment adjustments during license categorization will ensure that generic bidding categories are truly generic and not distorted by the absence of licenses that are no less impaired than other licenses in the category. As the Commission previously recognized, increasing the degree to which licenses within a category resemble one another will help accelerate the auction process and achieve other public interest goals.[64] The same benefits could be expected here. Second, adopting these impairment adjustments could result in additional Category 1 spectrum, which could prove useful not only in helping to assign resources to reserve-eligible bidders, but also in accurately calculating whether or not the forward auction has satisfied the price threshold of the Final Stage Rule.[65] Third, the impairment adjustments could move additional spectrum from Category 3, which will not be sold in the forward auction, to Category 2, which will. The introduction of additional Category 2 spectrum could increase forward-auction revenue and at least marginally increase the likelihood of achieving a higher spectrum-clearing target by creating an even larger pool of funds available for use in the reverse auction.

One important goal of the incentive auction is to maximize the availability of spectrum for wireless broadband and another is to ensure timely and informed bidding. Properly categorizing the blocks of spectrum with time-limited impairments along the Mexican and Canadian borders promises to accelerate the pace of bidding, increase the availability of broadband spectrum, and promote the efficient and informed deployment of resources in the 600 MHz band.

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[64] *See, e.g., Incentive Auction R&O*, 29 FCC Rcd at 6572 ¶ 10 ("[B]y conducting bidding for generic or interchangeable spectrum blocks rather than specific frequencies, we can condense the time required for bidding significantly.").

[65] If reserve licenses are comprised of the three least impaired licenses in any market as T-Mobile has recommended, the additional Category 1 spectrum would not be needed to ensure the availability of sufficient spectrum resources to reserve-eligible bidders.

ii. *Assignment-round discounts*

Altering impairment discounts from the standard one-to-one ratio to reflect the likely temporal limits on foreign-generated impairments will better reflect the actual limitations on broadband licenses in the vicinity of the United States' international borders. Impairment discounts are intended to "accommodate a range of values among generic licenses within a proposed category, while minimizing the number of bidding categories in the interest of simplicity."[66] Foreign-generated impairments exhibit a major difference from domestically generated impairments: they are very likely to cease in the relatively near future.

Canada, for example, recently opened a consultation to repurpose 600 MHz broadcast spectrum for wireless broadband licensing.[67] In its December 18, 2014 *Consultation on Repurposing the 600 MHz Band*, Industry Canada observed that "Canada has traditionally aligned its mobile broadband spectrum allocations with other large countries or economic areas, in particular the United States," because "access to the latest wireless devices and network technologies" only occurs "at competitive prices where there is sufficient scale."[68] Indeed, the Canadian entity charged with overseeing broadcast policies, the Department of Canadian Heritage, has proposed to repurpose the 600 MHz spectrum to commercial mobile use and establish a new allotment plan based on repacking over-the-air television broadcasting stations more tightly in lower frequencies just as the Commission has proposed to do.[69] Meanwhile, the Mexican telecommunications regulator, *El Pleno del Instituto Federal de Telecomunicaciones*

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[66] *Comment PN* ¶ 147.
[67] Industry Canada, *Consultation on Repurposing the 600 MHz Band* (Dec. 18, 2014), *available at* http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10891.html ("*IC Consultation*").
[68] *Id.* at 4 ¶ 16. The *IC Consultation* also noted the benefits of coordinating Canada's relocation plan to coincide in time with that of the United States: "Doing so would see both countries benefit from the reallocation as the repacking would take into consideration broadcasters on both sides of the border, resulting in a more efficient reassignment of broadcasting channels and more spectrum being made available for mobile services in both countries." *Id.* at ¶ 17.
[69] The consultative document pointedly noted that "[a] decision on whether to repack [simultaneously] with the United States will be released prior to the start of the U.S. [600 MHz incentive] auction." *Id.* at 18 ¶ 80.

("Ifetel"), recently reduced the number of planned over-the-air television station assignments available in the Mexican 600 MHz band. According to Ifetel officials, this action is intended to allow flexibility to release 600 MHz band spectrum for broadband use in Mexico in the near future.[70]

Discounts for impairments should respond to the stated intentions of Canada and Mexico to repurpose their respective 600 MHz television spectrum bands for broadband use. While the Commission could create separate license designations, each with its own auction clock, to reflect the time-limited nature of the foreign-generated impairments, this approach is not practical because the introduction of additional clocks would slow the pace of bidding and greatly complicate the auction design.[71] At the same time, however, simply ignoring the time-limited nature of the foreign-generated impairments is not pragmatic because licenses with foreign-generated impairments may not resemble licenses with domestically generated impairments closely enough to allow for reliable and efficient bidding on these licenses as generically the same within their respective categories.

Rather than adopt separate clocks for foreign-generated license impairments or ignore the reduced likelihood of impairment associated with foreign-generated impairments, the Commission should alter the one-to-one discount ratio for impairments to reflect cross-border conditions at the time of the auction as follows:

- To the extent a license impairment results from inter-service interference from a broadcast allotment located in Canada, only 15% of the standard one-to-one impairment discount should apply. In other words, impairments originating from broadcast allotments in Canada would receive a 0.15% discount from the provisionally winning bid for every one percent of inter-service impairment originating from Canada. This modification would recognize the likely sunset of

[70] *See* "Abrueba Ifetel programa de licitación de cadenas de TV," El Universal, Dec. 18, 2013, *available at* http://bit.ly/IVHzYZ ("*Estas acciones permitirán realizar el eventual despeje de la banda de 600 MHz en un futuro próximo.*").
[71] *Comment PN* ¶ 144.

Canadian-based impairments in light of Canada's pending Consultation and its tentative conclusion that Canada can repack its 600 MHz broadcast band to free spectrum for broadband without necessarily losing any over-the-air television channels.

- To the extent a license impairment results from inter-service interference from a broadcast allotment located in Mexico, only 40% of the standard one-to-one impairment discount should apply. In other words, impairments originating from broadcast allotments in Mexico would receive a 0.4% discount from the provisionally winning bid for every one percent of inter-service impairment originating from Mexico. This modification would recognize the likely sunset of Mexican-based impairments, but would be set higher than the Canadian modification to acknowledge the greater degree of uncertainty over whether and when the Mexican regulatory authorities will repurpose the Mexican 600 MHz for broadband use.

The adjusted discount rates are not intended to represent an all-encompassing and precise assessment of the progress Canada and Mexico have made toward resolving cross-border interference concerns in the 600 MHz band, but rather seek to acknowledge the effects of different cross-border conditions with the goal of maintaining the generic quality of license categories that will simplify and accelerate bidding.[72]

A simple example demonstrates how the proposed modifications would operate in practice. Suppose, for example, that the provisionally winning bid on a license with evenly distributed MHz-POPs were $100. Suppose further that inter-service interference generated by Canadian broadcast stations impaired 50% of the license and domestically generated inter-service interference impaired an additional 10% of the license. The license would receive a $7.50 discount for the Canadian-generated impairments ($100 x 0.50 x 0.15 = $7.50) and a $10 discount for the domestically generated impairments ($100 x 0.10 x 1.0 = $10) for a total discount of $17.50. A similar calculation would apply to inter-service interference generated by

[72] As with other impairments, different measurements of foreign-origin impairments should apply for different purposes. Broadly discounting foreign-origin impairments when categorizing licenses helps ensure that temporarily limited foreign-origin impairments do not preclude the selection of an otherwise feasible spectrum-clearing target. By comparison, using granular discounts of foreign origin impairments when assessing forward-auction values helps preserve generic license categories and permits a more equitable distribution of similarly situated blocks among provisionally winning bidders.

Mexican broadcast stations. Using the same scenario of a $100 provisionally winning bid for a license with evenly distributed MHz-POPs, but assuming the 50% inter-service interference impairment came from Mexico rather than Canada, the license would receive a $20 discount as a result of the Mexican-generated impairment ($100 x 0.50 x 0.4 = $20) and, again, a $10 discount for the domestically generated impairment ($100 x 0.10 x 1.0 = $10) for a total discount of $30.

These proposed discount adjustments for international impairments acknowledge two simple facts: (1) license impairments caused by foreign countries' broadcast allocations are expected to be different than impairments caused by domestic broadcast operations; and (2) while both Canada and Mexico have stated an intent to reorganize their 600 MHz spectrum in ways that will eliminate cross-border inter-service interference to U.S. 600 MHz broadband licenses, Canada has taken more concrete measures than Mexico to eliminate the potential for interference and noted the benefit and desirability of transitioning its broadcast operations to lower frequencies simultaneously with those of the United States. Adopting these discount modifications for foreign-originated inter-service interference would improve the fungibility of licenses and promote more informed and active bidding during the forward round of the auction.

D. Offering Licenses with More than 50% Inter-Service Impairments in a Follow-On Auction Will Help Ensure Auction Winners Put the Available Spectrum to Good Use Without Needlessly Complicating the Auction.

Holding a "remainders" auction shortly following the conclusion of the 600 MHz incentive auction promises to ensure an efficient, equitable and timely distribution of licenses that are too heavily impaired to be considered fungible with Category 2 licenses. The Commission seeks comment on whether to make licenses that are subject to more than 50% inter-service impairment available in the forward auction or to bundle these licenses in the assignment round with the most impaired frequency-adjacent licenses sold during forward round

bidding.[73] A well-designed follow-on auction for heavily impaired licenses shortly following the close of the incentive auction would allow these licenses to go to the entities that value them the most and help promote the public interest in robust competition. Carriers are likely to bid competitively for this spectrum, which may be heavily impaired on a POPs basis but not on a geographic basis.

As a threshold matter, spectrum that is subject to greater than 50% inter-service impairment should not be included in the forward auction. Heavily encumbered spectrum blocks can be valuable, but are not fungible with less encumbered licenses. In the context of the incentive auction, moreover, adding a new, heavily impaired category of licenses to the forward auction would greatly increase auction complexity by requiring an additional clock in the forward auction.

Rather than allowing highly impaired spectrum blocks to remain idle, however, the Commission should designate licenses that are more than 50% encumbered for a subsequent "remainders" auction to be held shortly following the close of the incentive auction.[74] Competitive bidding would allow the market to determine a fair price for these spectrum blocks, which could enable expanded and accelerated network deployment by mobile broadband providers. A "remainders" auction would also have the benefit of allowing bidders to incorporate final information about prices and assignments from the primary 600 MHz incentive auction into their bidding and make more accurate assessments of the value of any individual assets within the context of their and other bidders' purchases. As noted above, heavily impaired licenses are not ready substitutes for licenses offering the ability to serve larger numbers of

[73] *Comment PN* ¶¶ 146-148.

[74] These "overlay" licenses would not include blocks where temporary impairments attributable to Canada or Mexico result in more than 50% impairment, as discussed above in Section IV.C.2. The "remainders" auction could, however, also include any licenses that had not sold in the incentive auction, or on which winning bidders defaulted.

MHz-POP in a given PEA and hence there is little need to auction them off at the same time. In addition, the heavily encumbered licenses could not have been sold in the primary auction both due to the complexity associated with introducing an additional clock into the auction process and the risk that bidders would "park" eligibility on Category 3 licenses during the auction, which could distort prices, increase the risk of delay, and create opportunities for gaming.

That said, spectrum in the 600 MHz band – even heavily encumbered spectrum – holds value for wireless broadband providers. Low-band spectrum is uniquely valuable for broad coverage over large areas, including rural areas. Because of the method the auction system employs to calculate impairment, licenses may be more than 50% impaired on a POP basis but considerably less impaired on a geographic basis and thus still represent a valuable resource for carriers seeking to expand their coverage footprint. Bidders in numerous Commission auctions, including the recently concluded AWS-3 auction, have demonstrated their willingness to bid on potentially encumbered spectrum, and an auction of "remainder" 600 MHz spectrum following the close of the incentive auction is likely to attract a wide range of bidders seeking a complement to or a compensation for the outcome of the forward auction. Moreover, to the extent broadcasters that do not exit the band and cannot be accommodated in the UHF or VHF frequencies are relocated into the 600 MHz uplink band rather than the downlink, the value of heavily impaired spectrum for use as supplemental downlink could prove substantial.[75] Finally,

[75] *See supra* Section III.B; *see also ISIX Second R&O and FNPRM* ¶ 23 ("An 'infringed' area is one where wireless operation is predicted to receive harmful interference from a television station that is placed in the 600 MHz Band. . . A "restricted" area is one where wireless operations would be predicted to cause harmful interference to a television station that is placed in the 600 MHz Band."). Although the Longley-Rice methodology used by the auction system may predict large areas of impairment in a market, if these impairments are primarily driven by "infringements" (LTE is the victim) rather than "restrictions" (DTV is the victim), then the licensee will have the flexibility to engineer its network using this spectrum without negatively affecting broadcasters. As discussed above, moreover, network reengineering is easier when broadcasters are relocated to uplink spectrum because in that scenario the primary interference is a base-to-base issue in which LTE uplink is the victim and mobile broadband providers can adjust their networks accordingly. The mobile-to-DTV interference scenario will generate a much smaller "restricted" area than the "infringed" area resulting from base-to-base interference. As a result, mobile

even significant impairments that are present at the time of the auction may be lessened or resolved altogether as the market for 600 MHz spectrum continues to evolve, further increasing this spectrum's value.

By comparison, awarding Category 3 spectrum to high bidders in the incentive auction that acquired spectrum in the same market would not necessarily put this resource with the operators that value these assets most highly.[76] Assignment round bidding will be confined to winners of Category 1 and Category 2 licenses in the forward auction phase.[77] Yet for any number of reasons a bidder without any Category 1 or Category 2 licenses in the relevant PEA may place a higher value on the heavily encumbered licenses in that PEA than the higher bidders for less encumbered licenses within the PEA. For example, a bidder without licenses in the PEA may place special importance on having a presence in that market no matter how impaired or irregular that footprint might be. Alternatively, a bidder without licenses in the PEA may find that the heavily encumbered spectrum in one market complements the bidder's other spectrum holdings in geographically adjacent markets. Awarding heavily impaired licenses to only the holders of Category 1 and Category 2 spectrum in that PEA would not allow a bidder without assets in the market to realize these efficiencies through the auction process.

Worse still, awarding heavily impaired licenses as a bonus to the winners of the assignment round may reinforce the manifest trend to spectrum resource concentration in the

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broadband providers will have relatively small areas of interference to address through engineering solutions even using heavily impaired spectrum, and providers will benefit from the expanded capacity and enhanced network robustness.

[76] To be clear, awarding the spectrum to the winner of adjacent-channel bids during the assignment round would put the available spectrum to a limited market test because this award would increase the prices paid by the provisionally winning bidders as a result of competition to capture both the primary and "bonus" license. However, bidders that are provisionally winning bidders within a PEA will not necessarily place the highest value on the license of all forward-auction participants. On the contrary, licensees that did not secure spectrum in the PEA may value even a heavily impaired license in a PEA in which they have no spectrum more than provisionally winning bidders that already hold licenses within the PEA.

[77] *Comment PN* ¶ 201.

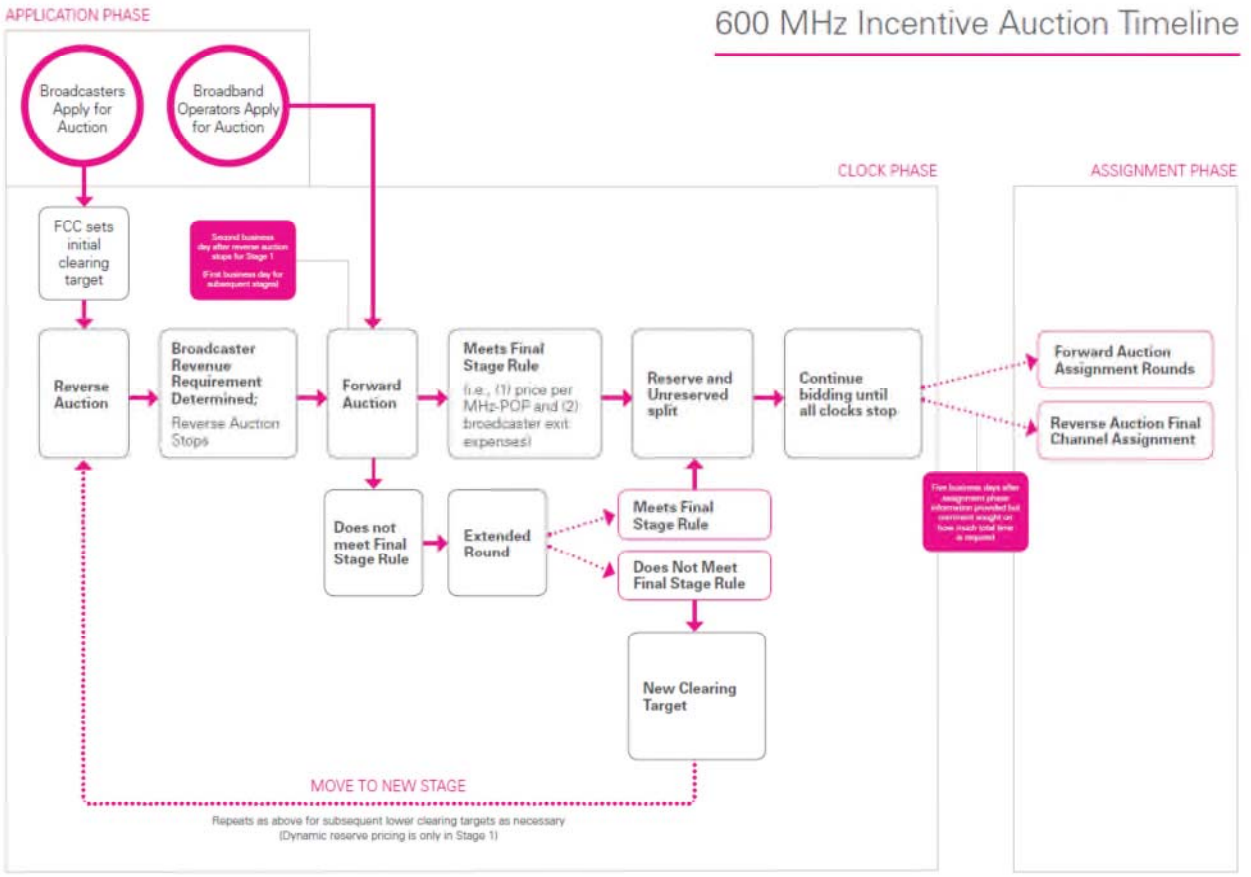
United States. The adoption of limitations on spectrum concentration in the *Mobile Spectrum Holdings Order* offers some modest measure to begin mitigating the risk of anti-competitive conduct by the nation's two dominant wireless providers, but continues to fall short of the actions necessary to stimulate meaningful facilities-based wireless broadband competition over the long run. So long as mobile spectrum holdings policies remain inadequate to the need at hand, awarding bonus licenses – evenly heavily encumbered ones – to the largest license winners in a PEA seems likely to strengthen the ability of the dominant operators to drive competitors from the market and recoup costs on the backs of consumers in the future. Auctioning any heavily impaired Category 3 licenses not offered in the incentive auction in a subsequent "remainders" auction will allow for the most efficient license assignments and avoid bolstering the industry trend toward greater resource concentration in the wireless broadband market.

V. CLOCK PHASE BIDDING PROCEDURES

A. Extending the Time Between Auction Phases Will Allow for More Informed Bidding.

Allowing somewhat more time between auction phases will permit bidders in the forward auction to make more informed, accurate and reliable decisions during the clock and assignment phases of the 600 MHz incentive auction. As shown below, the incentive auction involves a series of three discrete phases: (i) the application phase; (ii) the clock phase; and (iii) the assignment phase. In the interest of concluding the auction as swiftly as possible, the Commission proposes rapid-fire transitions from one phase to the next. The *Comment Public Notice* proposes to provide forward-auction bidders with two days between the cessation of bidding in the reverse auction and the start of bidding in the first stage of the forward auction and

just one day of transition for all subsequent stages of forward auction bidding in the incentive auction.[78]



During this transition period, forward auction bidders would have to assess every license available within the geographic area the bidder wishes to cover to determine the degree of impairment. Nationwide bidders such as T-Mobile will have to perform detailed, independent calculations on virtually every license in the country that has an impairment and adjust the internal valuations of each such license based on an assessment of the degree of the impairment relative to the carrier's coverage and capacity objectives in that market and across the nation. The *Comment Public Notice* similarly proposes just five business days following the close of the

[78] *Id.* ¶ 66.

clock phase of the forward auction before the assignment round bidding would commence.[79] During this period, bidders would have to identify adjacent and contiguous blocks and assess their relative preferences for a variety of combinations among and between the licenses based on a complex, multi-market assessment of known impairments, possible frequency assignments, existing spectrum holdings, and potential competitors. The Commission, too, will need time to prepare initial assignments for bidders on the criteria it has established, such as assigning Category 1 licenses to the reserve and, from that basis, tentatively aligning winning bidders with adjacent and contiguous blocks so as to reduce the need for all bidders to participate in the assignment round phase of the auction.[80]

While T-Mobile strongly supports bringing the incentive auction to a swift conclusion, the proposed time periods between phases are likely too brief to allow bidders to meaningfully assess potential impairments, the available bidding options, and any financial constraints that may have emerged during the auction process. The novel auction format as well as the potential for fairly dramatic shifts in the amount of spectrum available and its relative degree of encumbrance will require the financial, business, engineering, and legal teams to collaborate during the transitions between phases and adjust tactics in response to changing conditions. Allowing additional time for processing and consultation would lead to more informed bidding decisions and reduce the possibility for costly errors by the bidders and Commission staff that may prove exceptionally difficult, if not impossible, to correct.

The additional time between phases should not be overly extensive, but should provide for at least five business days between the cessation of reverse auction bidding and start of the

[79] *Id.* ¶ 70. Specifically, bidding in the assignment phase of the forward auction will start five business days after the auction system provides more detailed information about the assignment phase.
[80] *Id.* ¶ 199 (noting that the assignment phase is voluntary, and winning bidders in the clock phase of the forward auction need not participate to be assigned a number of licenses corresponding to the outcome of the clock phase); *see also id.* at Appendix H.

forward auction in the initial stage and at least three business days in all subsequent stages. Bidders should also have at least five business days between the close of the clock phase and the start of the assignment phase. The additional time will not materially prolong the incentive auction, but will permit bidders to make more informed choices about their license bids and assignments and have greater confidence in the overall accuracy and reliability of the auction.

B. If an Arbitrary Price Floor Is Deemed Necessary, It Should Be Based Only on Gross Bids in the Top 25 Markets to Reduce the Risk of Foreclosing Competition.

Auctions are unpredictable, as the results of the AWS-3 auction demonstrate. Trying to set the minimum price at which the seller is willing to part with an item at the presumptive market price is foolhardy: the seller could easily guess wrong about the price the market can bear and place the price floor at a level too high to secure a sale. Put simply, the best judge of the market is the market, not the seller.

The Commission should not try to guess the market price of spectrum. Although the minimum opening bid in each PEA will be $0.50 per MHz-POP (in itself a high bar for some markets based on historical prices), the Commission has proposed to set a higher price to satisfy the first component of the Final Stage Rule.[81] Specifically, the Commission would establish a price floor for the Final Stage Rule at an average price of $1.25 per MHz-POP as measured in the top 40 PEAs.[82] T-Mobile sees no need for an arbitrary price per MHz-POP prong of the spectrum reserve trigger. Such an artificial mechanism is unnecessary to ensure robust bidding on this valuable spectrum.[83]

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[81] *Id.* ¶ 48.
[82] *Id.* ¶ 47.
[83] *See T-Mobile Spectrum Petition*; T-Mobile USA, Inc., Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, *Petition for Reconsideration*, GN Docket No. 12-268 (Sept. 15, 2014) ("*T-Mobile Incentive Auction Petition*");*T-Mobile Spectrum Holdings Reply to Oppositions*; T-Mobile USA, Inc., Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, *Reply to*

As T-Mobile has explained previously, using an average price per MHz-POP minimum requirement that is set too high or covers too many markets risks delaying the introduction of the spectrum reserve to the point that it no longer offers a meaningful safeguard against anti-competitive conduct.[84] An aggressive trigger price could result in reduced spectrum-clearing targets as well as lower auction and broadcaster revenues.[85] For broadcast incumbents, the risk is that the price floor will be so high relative to demand that the quantity demanded in the forward auction is reduced or the clearing target is lowered, which will result in less revenue available for broadcasters, or less forward auction demand for broadcast station purchases, or both.

The Commission can ensure that any negative effects of a price per MHz-POP spectrum reserve trigger are limited by capping the threshold at no more than $1.25 per MHz-POP; basing the threshold on gross, rather than discounted, bids; and limiting its application to the top 25 PEAs by population.[86] As discussed in the *Comment Public Notice*, the price per MHz-POP benchmark needs to reflect a "floor" for competitive pricing.[87] Setting the minimum price requirement as low as possible mitigates the risk of harm to forward- and reverse-auction bidders and helps address the inherent price uncertainty associated with a resource whose price has fluctuated over time to reflect market conditions, the availability of financing, and broader

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Oppositions to Petition for Reconsideration, GN Docket No. 12-268 (Nov. 24, 2014) ("*T-Mobile Incentive Auction Reply to Oppositions*").

[84] *See T-Mobile Incentive Auction Petition* at 6-7; *T-Mobile Incentive Auction Reply to Oppositions* at 2; *T-Mobile Spectrum Holdings Reply to Oppositions* at 9.

[85] *See* T-Mobile USA, Inc., Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, Policies Regarding Mobile Spectrum Holdings, *Ex Parte Letter*, GN Docket No. 12-268, WT Docket No. 12-269 (Dec. 19, 2014); T-Mobile USA, Inc., Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, Policies Regarding Mobile Spectrum Holdings, *Ex Parte Letter*, GN Docket No. 12-268, WT Docket No. 12-269 (Dec. 4, 2014); T-Mobile USA, Inc., Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, Policies Regarding Mobile Spectrum Holdings, Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Services, *Ex Parte Letter*, GN Docket No. 12-268, WT Docket Nos. 12-268, 05-265 (Nov. 20, 2014).

[86] *Comment PN* ¶¶ 47-54.

[87] *Id.* ¶ 49.

consumption patterns in the industry. Consistent with that approach, the Commission should ensure designated entity discounts on a bid in subsequent phases of the auction are not factored into the price per MHz-POP trigger. Designated entity discounts do not reflect a lack of sufficient return on public resources, but represent a policy choice by the government to stimulate bidding by awarding discounts to small businesses.

In addition, the trigger should also examine only Category 1 licenses when assessing the average price per MHz-POP threshold. As the Commission recognizes, by only considering bids for spectrum blocks in Category 1, the measurement will be more consistent with the price index derived from past auctions, which did not include licenses impaired in a manner comparable to Category 2 licenses.[88] Finally, as proposed, the benchmark should be based on a clearing target of no more than 70 megahertz of spectrum for the forward auction.[89] As reflected in the *Comment Public Notice*, a higher clearing target would produce an expected decline in per MHz-POP prices (due to increased supply), necessitating a lower price benchmark.[90] Moreover, the 70 megahertz clearing target is consistent with the Commission's goal of enabling multiple bidders to obtain low-band spectrum.[91] In sum, spectrum is notoriously hard to value. The auction process, rather than the Commission, should determine the prices for 600 MHz band spectrum.[92]

C. Effective Activity Rules Must Apply Equally to All Bidders to Promote Timely, Truthful Bidding.

As T-Mobile has proposed in response to the *Competitive Bidding NPRM*,[93] the Commission should prohibit the use of multiple bidding entities in a manner that would thwart

[88] *Id.* ¶ 52.
[89] *Id.* ¶ 47.
[90] *Id.* ¶ 50.
[91] *Id.*
[92] *See* Paul de Sa, *Weekend Media Blast: Spectrum, Metaphors and Megahertz*, Bernstein Research (July 18, 2014) ("[S]pectrum prices are largely unrelated to any kind of fundamental value.").
[93] Updating Part 1 Competitive Bidding Rules, *Notice of Proposed Rulemaking*, 29 FCC Rcd 12426 (2014) ("*Competitive Bidding NPRM*").

the activity rules.[94] Activity requirements promote truthful bidding and encourage a rapid pace in an auction where time to conclusion remains a priority. The activity rules will be meaningless, however, if entities can maintain eligibility through strategic control of more than one bidder in the forward auction, and can collaborate with related entities during the auction.

If the Commission allows multiple bidding entities in the forward auction to be controlled by the same individual or set of individuals, the controlling entity could ensure that its jointly controlled entities bid on the same license at the same time at the same amount. Both entities would retain eligibility because they had satisfied the activity requirement during the round, and the controlling entity would have preserved eligibility for both bidders without substantially increasing expenditures.[95] This behavior would allow the controlling party to retain the flexibility to introduce higher bids in what would otherwise have been the closing round of the auction at a time when truthful, single-entity bidders had exhausted their eligibility. These tactics would distort the auction process and place a premium on clever corporate organizational strategies rather than intelligent auction and deployment strategies.

One way to help eliminate this coordinated behavior in the incentive auction is to require individuals and entities that are listed as disclosable interest holders on more than one short-form application to expressly certify that they are not privy to, or involved in, the bidding strategy of

[94] *See Competitive Bidding Comments* at 6-10.

[95] This effect may be less pronounced where an auction participant bids on multiple units of a homogeneous good because, unlike a simultaneous multiple round auction, a clock-auction bidder could actually win both sets of bids for the same product. Nevertheless, allowing a single bidder to participate in an auction through more than one bidding entity can threaten the integrity of a clock auction, too. Suppose, for example, that the Final Stage Rule has been satisfied and there are three reserve licenses available in a PEA. If a party that controls two separate bidding entities directs each entity to bid for three reserved licenses, the controlling entity will not lose eligibility during the round, nor will it risk acquiring more spectrum than the three total licenses desired. For this reason, prohibiting a single party from using multiple bidding entities remains as relevant to the 600 MHz clock auction as it does to simultaneous multiple-round auctions.

more than one auction participant.[96] As explained in comments filed in the *Competitive Bidding NPRM*, this proposed modification would improve the transparency of the auction process and ensure that entities sharing cognizable interests, whether controlling or non-controlling, do not derive some advantage in the auction process by coordinating their bidding actions.[97] In contrast, no changes need to be made to the Commission's rules regarding properly disclosed joint bidding agreements, which provide immense public interest benefits, such as stimulating investment, promoting competition, and accelerating broadband deployment.[98]

D. Reverting to the Previous Clock Price When the Spectrum-Clearing Target Is Reduced Allows the Auction to Respond to Reduced Clearing Costs that May Have Fallen Considerably.

Reducing the spectrum-clearing target can help close the auction, but allowing prior failed bidding in the forward auction to establish an artificially inflated price floor for subsequent stages of the auction risks frustrating efficient bids. Setting the clocks to the amount no higher than necessary to satisfy the newly established Final Stage Rule will ensure that the relationship between bidder demand and spectrum supply is respected.

A pricing problem could occur any time the spectrum-clearing target is reduced, but is perhaps most likely following an extended round of bidding. As proposed in the *Comment Public Notice*, extended rounds would interrupt the clock phase of the forward auction and be used in an attempt to meet the Final Stage Rule.[99] Under the Commission's proposal, the extended round would be implemented only in the top 40 PEAs when a round of the forward auction ends and both (a) the demand for Category 1 licenses in these "high demand" PEAs does

[96] *See Competitive Bidding Comments* at 9-10. In addition, requiring that authorized bidders on a short-form application be unique to that applicant would ensure that no individual could serve as an authorized bidder for more than one auction participant. *See id.*
[97] *See id.* at 10.
[98] *Competitive Bidding NPRM*, 29 FCC Rcd at 12469-12475 ¶¶ 120-140.
[99] *Comment PN* ¶ 189.

not exceed available supply and (b) the Final Stage Rule has not been met.[100] Because the Commission does not expect each of the 40 participating markets to satisfy its portion of the Final Stage Rule individually, the extended round prices would be set higher than the amount necessary to meet the Final Stage Rule.[101] If the extended round satisfies the Final Stage Rule, the auction is successful and closes. If the extended round proves unable to meet the Final Stage Rule, however, the Commission proposes to continue to the next stage of the auction with the price in each PEA equal to the price in the extended round at which the first bidder dropped out in that PEA or at the level of the extended round price if no bidder dropped out in that PEA.[102]

Any time the spectrum-clearing target is reduced, forward auction prices for the next stage should reflect the reduction in broadcast payments and relocation expenses. Suppose, for example, that satisfaction of the Final Stage Rule corresponds to $5.00 per MHz-POP. Suppose further that forward auction bidding ends at $2.00 per MHz-POP and the extended round asks for prices of $6.00 per MHz-POP. The ensuing extended round increases prices to $4.00 per MHz-POP, which is $1.00 per MHz-POP less than the price necessary to close the auction. Unable to satisfy the Final Stage Rule, the auction would reduce the spectrum-clearing target. Prices in the reverse auction would then fall as a result of (1) the need to acquire fewer broadcast stations because less spectrum would need to be cleared; and (2) the increase in competition among the remaining broadcast stations. In this example, the drop in reverse auction prices may mean that

[100] *Id.* ¶¶ 189-191 (proposing to conduct extended round bidding only for Category 1 blocks in the "high demand" PEAs with no excess supply); *see also id.* ¶ 189 n.324 (noting that the Commission has proposed defining the "high demand" PEAs as the 40 largest PEAs by population because they cover geographic areas that have generated the highest average prices per MHz-POP in prior spectrum license auctions). In the *Comment Public Notice*, the Commission seeks comment regarding the appropriate number of PEAs that should be considered "high demand." *Id.* ¶ 51. Rather than deciding the number of top markets at this time, the Commission should retain the flexibility to revisit and amend the number of top markets until the start of auction.

[101] *Id.* ¶ 190. Specifically, the Commission proposes to increase the extended round clock prices in aggregate by 33% more than the additional proceeds needed to meet the Final Stage Rule. The Commission proposes setting this revenue target to account for the possibility that in some top 40 PEAs demand may not be sufficient to increase prices to the minimum amount required to trigger the Final Stage Rule, whereas in other top 40 PEAs demand may be more than sufficient to meet the minimum.

[102] *See id.* Appendix G § 8.

only $2.20 per MHz-POP would be required to satisfy the new Final Stage Rule. In this case and others like it, allowing bidding based on one spectrum-clearing scenario to determine prices for subsequent stages of the auction, where spectrum-clearing costs will likely be much lower, will price out some bidders even though they could have provided winning bids for the next spectrum-clearing target.

The Commission can address the problem of frustrating efficient bidding following a reduction in the spectrum-clearing target when it finalizes its auction policies. Specifically, the Commission should ensure that the amount needed to trigger the Final Stage Rule does not frustrate the establishment of the spectrum reserve at the next spectrum-clearing target. If the spectrum-clearing target is reduced, the next clock round should revert to starting prices for that clock round that are just sufficient to satisfy the Final Stage Rule for the subsequent spectrum-clearing target or the bids at the end of the current round, whichever is less.

As a logical corollary to this proposal, only the Commission should be able to see extended round bids, which should remain confidential until the close of the auction. Provided that access to information on bids placed in the extended round is limited to the auction administrator, dropping the prices after an extended round that failed to satisfy the Final Stage Rule back to the previous clock price will not give auction participants any material information about the market for licenses, and so will not have a negative impact on bidding in subsequent rounds.

In sum, adopting a mechanism to reset the price clock following a reduction in the spectrum-clearing target to a price no greater than necessary to satisfy the Final Stage Rule in the current clock round or the bids at the end of the current round, whichever is less, would allow the

Commission to pursue aggressive spectrum-clearing targets without damaging the bidding process.

VI. BIDDING PROCEDURES IN THE ASSIGNMENT PHASE

A. Contiguous Frequency Assignments Promote Efficient Spectrum Use, and Winning Bidders Should Also Be Assigned Consistent Channels Within a Limited Geographic Area.

Prioritizing the assignment of contiguous blocks of spectrum as well as prioritizing – within limits – the assignment of consistent blocks across geographically adjacent markets will increase maximum data rates, improve spectrum efficiency, and reduce the need to incur costs in secondary-market transactions following the close of the incentive auction.

The auction system should prioritize the assignment of contiguous blocks of spectrum within a PEA. Following the close of bidding on generic licenses in the clock phase of the forward auction, a winning bidder will have the option of assigning a price to specific blocks of spectrum based on the bidder's preferred frequency and, where applicable, the bidder's tolerance for different levels of impairment.[103] The auction system will attempt to maximize contiguity of spectrum assignments when a bidder wins more than one license in a PEA, but not all demands for contiguity will be met due to constraints in the categories of spectrum winners receive and other factors.[104] Therefore, the Commission proposes using an optimization approach to determine the winning frequency assignments.[105] As proposed, the auction system will pursue three objectives in the following order of priority: (1) maximize the number of multiple-block winning bidders that receive at least two contiguous blocks; (2) minimize the number of assigned blocks that are non-contiguous to the bidder's other blocks for bidders that won two or more

[103] *Id.* ¶¶ 205-206.
[104] *Id.* ¶¶ 200, 207.
[105] *Id.* ¶ 207.

blocks; and (3) maximize the number of bidders that are assigned only contiguous blocks.[106] Encouraging the assignment of contiguous blocks within a PEA will reduce deployment costs and operating expenses and permit broadband operators to deploy spectrum resources more efficiently than non-contiguous, five-megahertz channels would allow.

The auction system should also prioritize the assignment of the same channel blocks across geographically adjacent markets to a point. Assigning the same channel in geographically adjacent markets offers several benefits. First, such an assignment will reduce the need for licensees with the same channel block in adjacent markets to negotiate power flux density ("pfd") limits at the border. Eliminating this constraint will allow broadband operators to more readily provide consumers with greater coverage and capacity in areas along the geographic boundaries than would be possible if the operator had to observe a stringent pfd limit in those locations. Second, assigning the same channels to winners in geographically adjacent markets will allow for less complex and more reliable inter-cell handoff at the license boundaries. As a mobile end-user device crosses from a cell site in Market A to a cell site in Market B, that device is forced to return to a new set of channels that are potentially covered by a different duplexer in the radiofrequency chain. This configuration places strenuous demands on network engineering and adds complexity that can reduce the success of inter-market handovers. Third, assigning the same frequencies across geographic markets can allow for a somewhat more efficient handset design. Many of the likely band plan options for the 600 MHz band will require multiple duplexers in the mobile device because only the smaller spectrum-clearing targets can be implemented with a single duplexer. However, a mobile handset can only use one duplexer at a time, even if it is covering the same band. If the channels in Market B differ from those in Market A and are covered by a different duplexer, then the mobile device will need to assess the

[106] *Id*.

RF conditions of the target channels and quickly switch to the new duplexer when it hands over to the adjacent cell site.

While common frequency assignments across market areas can reduce complexity, lower costs, increase the reliability of devices, and accelerate network deployment, an excessively uniform spectrum assignment can produce extremely negative consequences for consumers and competition. Following the 700 MHz band auction, for example, AT&T acquired the vast majority of Lower 700 MHz B and C Block frequencies, but no spectrum in the A Block, and subsequently developed a subsidiary band class that excluded the A Block from devices.[107] The resulting lack of interoperability among systems slowed the deployment of wireless broadband services and impeded competition by artificially raising competitors' equipment costs.[108] With the harmful and costly experience of the Lower 700 MHz interoperability crisis in mind, the Commission adopted a robust interoperability requirement for the 600 MHz band spectrum.[109] But even a robust interoperability requirement is subject to waiver and prohibitions against measures intended to defeat hardware interoperability would not necessarily eliminate software-based limitations that frustrate interoperability. Limiting the degree to which any one carrier can

[107] Specifically, AT&T acquired nearly all the lower 700 MHz band B Block spectrum in Auction 73 and already owned most of the adjacent C Block from previous transactions, and then established a new 3rd Generation Partnership Project ("3GPP") Band Class 17 that covered only AT&T's spectrum. *See* 700 MHz Block A Good Faith Purchaser Alliance, *Petition for Rulemaking Regarding the Need for 700 MHz Mobile Equipment to be Capable of Operating on All Paired Commercial 700 MHz Frequency Blocks*, RM-11592 (Sep. 29, 2009); Promoting Interoperability in the 700 MHz Commercial Spectrum, Interoperability of Mobile User Equipment Across Paired Commercial Spectrum Blocks in the 700 MHz Band, *Notice of Proposed Rulemaking*, 27 FCC Rcd 3521 (2012); Promoting Interoperability in the 700 MHz Commercial Spectrum, Requests for Waiver and Extension of Lower 700 MHz Band Interim Construction Benchmark Deadlines, *Report and Order and Order of Proposed Modification*, 28 FCC Rcd 15122 (2013). By excluding the A Block spectrum and not supporting existing Band Class 12, which covers the A, B, and C Blocks, AT&T effectively prevented licensees of the A Block spectrum from using the same standards, chip sets and devices developed for Band Class 17. This approach slowed the network development of other providers and effectively rendered data roaming across Lower 700 MHz band networks technically infeasible.

[108] *See, e.g.*, Comments of RCA—The Competitive Carriers Association, WT Docket No. 12-69, RM-11592 (June 1, 2012) (observing that lack of interoperability in the lower 700 MHz band hindered facilities deployment, competition, and innovation).

[109] *See Comment PN* ¶ 143 (noting that the Commission adopted a strong interoperability rule in the 600 MHz band).

acquire the same frequency within a geographic region will establish a durable incentive for interoperable communications that offer greater safeguards against anticompetitive conduct and may, over time, obviate the need for an interoperability requirement. For this reason, any common channels awarded during the assignment round should not be any larger than 20 contiguous PEAs or three adjacent MEAs. Establishing common channels across broader geographic areas would risk creating incentives for discriminatory conduct in hardware design or software function.

Assigning consistent channels across no more than 20 contiguous PEAs or three MEAs will promote interoperability and discourage anti-competitive, exclusionary practices that can delay broadband deployment, raise rivals' costs, and ultimately harm consumers.

VII. CONCLUSION

The incentive auction is a critical opportunity to reinvigorate the competitive wireless broadband market in the United States, which should not be overlooked by the Commission. Many of the auction procedures the Commission proposes advance the public interest goals of competition, investment and innovation. Modest adjustments to the *Comment Public Notice* proposals and the incentive auction and mobile spectrum holdings dockets will lead to a more

efficient and successful 600 MHz auction and, ultimately, promote the deployment of fiercely competitive wireless broadband services throughout the United States. Especially in light of the results of the AWS-3 auction, the Commission needs to adopt rules and procedures for the incentive auction that are focused on promoting competition, first and foremost, without allowing any further delays for the start of the auction.

Respectfully submitted,

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