

**Before the
Federal Communications Commission
Washington, D.C. 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 SPRINT CORPORATION

Dr. David J. Salant
Professor Associé
Toulouse School of Economics
Co-founder
Auction Technologies, Inc.

Dr. Gregory Attiyeh, Ph.D.
Managing Director
FTI Consulting

Lawrence R. Krevor
Vice President,
Legal and Government Affairs – Spectrum

Richard B. Engelman
Director, Legal and Government Affairs

Rafi Martina
Counsel, Legal and Government Affairs

SPRINT CORPORATION
900 7th Street NW, Suite 700
Washington, DC 20001
(703) 433-4140

SUMMARY

In its recent Public Notice soliciting comments on competitive bidding procedures for the 600 MHz Broadcast Television Spectrum Incentive Auction (the “Incentive Auction”), the Federal Communications Commission (the “Commission”) proposes a broad range of detailed policies, procedures and processes for conducting both the reverse and forward phases of the planned Incentive Auction. The *Comment Public Notice* is one of at least six ongoing Commission proceedings intended to build upon, enhance and complete the basic incentive auction structure framework the Commission adopted in its *Incentive Auction Report and Order* in May 2014.

Sprint Corporation (“Sprint”) appreciates the Commission and its staff’s extraordinary efforts to bring these proceedings to a timely conclusion, thereby enabling the Incentive Auction to commence in early 2016 as planned. The *Comment Public Notice*, in particular, evidences the Commission’s continuing effort to achieve its statutory mandate of creating an Incentive Auction structure that promotes *auction design simplicity, auction participant certainty, spectrum efficiency*, and – as a discrete overarching objective – *long-term, robust wireless broadband competition*.

In much the same way one solves a Rubik’s cube puzzle, discovering that previously-set pieces are out-of-place only after setting subsequent pieces, the iterative process that produced the *Comment Public Notice* reveals certain difficulties in the proposed structure and processes for the forward auction that undercut the statutory goals articulated above. As the Commission has consistently recognized, the wireless broadband market is characterized not only by a tremendous competitive disparity in the distribution of critical inputs such as low-band spectrum, but also in the relative profitability of competitors within the wireless market. The competitive operators with the greatest dearth of low-band spectrum – and thus the greatest need for access to high-utility 600 MHz spectrum – are also the operators least able to shoulder the risk of a competitively-harmful auction outcome. Sprint’s comments offer the Commission an opportunity to adopt certain alternative procedures and processes that will simplify the forward auction’s design, provide bidders greater bidding certainty, promote spectrum efficiency and

better sustain a competitive wireless marketplace featuring innovative, high-quality wireless broadband communications services for consumers.

Sprint's greatest concern with the Commission's proposed auction design is that bidders will not know what they are bidding on. In particular, the Commission proposes auctioning the cleared 600 MHz spectrum blocks in two broad "generic" categories based on relatively imprecise interference risk predictions. The Commission proposes this approach largely because it cannot know in advance the ultimate extent of broadcaster participation in the reverse auction, and thus whether it can repack all remaining broadcasters *out* of the 600 MHz band. The remaining broadcasters pose interference risks to wireless broadband operations resulting in "impairments" to certain spectrum blocks -- both within markets where broadcasters remain in the band (adjacent channel interference to wireless licenses) and in adjacent markets (co-channel and potentially adjacent channel interference). The Commission proposes treating these blocks as essentially substitutable within two broad ranges: Category 1 licenses with impairment to 0-15% of the license-area population; and Category 2 licenses with 15.1-50% impairment of the license-area population.

Sprint's analysis, using a more granular measure of interference risk better representative of a broadband network's interference tolerance, demonstrates that the spectrum blocks cleared in the reverse auction will be far less substitutable than the Commission's proposal assumes; their impairment risk will vary widely both within and across the two categories. Moreover, the population-based interference risk percentage the Commission proposes to provide a forward auction participant will not enable the bidder to identify the areas of a PEA subject to significant interference risk and thus evaluate a blocks' utility to that bidder given its underlying network, coverage requirements and business strategy. This situation is very much like a home buyer knowing that the property he desires to bid on has an easement for a road to access a neighboring property, but not knowing whether that easement runs across a far corner of the property far removed from the house -- or runs right through the kitchen! Even with more accurate information (or even categories *defined* by the more accurate information), Sprint cannot consider blocks in the proposed categories 'relatively substitutable' under the proposed interference thresholds. Nor does an impairment discount, as proposed by the Commission, remotely equalize these differences.

In other words, because forward auction participants cannot bid on specific spectrum blocks during the “clock phase” of the forward auction (the majority of the auction), they risk being stuck with the more impaired licenses in a category when they really wanted a less impaired license in that category. This risk is compounded by the Commission’s proposed rule to assign at least two contiguous blocks to each high bidder for more than one block (after the end of the clock phase and prior to the assignment round). This otherwise positive and desirable approach could assign a winning bidder heavily impaired blocks to achieve contiguity, even though the bidder may in certain markets have preferred blocks with little or no impairment even at the sacrifice of contiguity. The proposed assignment round, offering clock phase high bidders a one-time, sealed bid opportunity to express preferences (if any) for alternative results under the contiguity-preference rules, does not correct the problem of bidders not being able to express their utility and valuation preferences among spectrum blocks concerning the risk of interference from remaining broadcasters, the actual areas of that risk, and their desire for contiguity versus a higher or lower risk of interference (which may vary between markets). In short, because of the significant – and unpredictable – variability between licenses *within* a single bidding category, compounded by the uncertain relative value unpredictable impairments create *between* bidding categories, bidders effectively must bid with tremendous conjecture and uncertainty – and without clues as to the relative valuation of other bidders as to these characteristics.

Sprint observes that all of the above stems from the assumption that the cleared spectrum blocks are essentially substitutable or fungible. That not being the case, the forward auction process and procedures detailed in the *Comment Public Notice* create undue auction complexity and concomitant bidder uncertainty, leading to potentially inefficient auction outcomes undermining long-term competition because this last low-band spectrum does not go to the bidders that value it the most.

To correct this problem, Sprint respectfully proposes that the Commission revise the forward auction process to enable forward auction bidders to bid on specific spectrum blocks. In every significant Commission auction of commercial wireless spectrum to date, bidders have been able to bid on specific spectrum blocks. Under this approach, the Commission would provide forward auction participants with detailed, granular impairment projections (F(50,10) or its equivalent information), based on the actual outcome of the reverse auction in a PEA. An

auction design incorporating block-specific bidding during the normal course of auction activity will enable bidders to express value for contiguity, their impairment-appetite, and their relative value *as between* impairment and contiguity in each market. It will promote auction efficiency (that is, matching licenses with bidders who value them most) by permitting bidders to *react* to the revealed preferences of rival bidders as regards this same information. It avoids having to select essentially arbitrary impairment ranges to divide spectrum blocks into Category 1 and Category 2 and eliminates the uncertainty and complexity of blocks crossing those categories when evaluated under a more precise impairment analysis. In addition, arming bidders with detailed impairment information allows the Commission to *sell all of the spectrum blocks cleared in the reverse auction*, rather than limiting the forward auction to blocks with 50 percent or less impairment, thereby increasing revenue and bidder choices.

Sprint also recommends that the Commission begin the forward auction with reserve block designations in place in a PEA, rather than deferring them until the Final Stage Rule. This will allow reserve-eligible bidders to clearly express their demand for reserve blocks while also permitting them, as in “normal” auctions, to focus on high-demand markets in early bidding rounds, shifting their demand to mid- and small markets as bidding progresses. After some lapse of time – specifically, once the bidding has normalized such that demand in larger markets reflects true demand (and not eligibility-preserving bidding) – the Commission can then evaluate whether the supply of reserve blocks exceeds reserve-eligible demand and adjust the reserve amount accordingly.

The compelling lesson of the recent AWS-3 auction is that the competitive imbalance between wireless operators remains formidable, and the Commission’s pro-competitive goals *remain* unachieved. For competitive wireless carriers that currently lack access to competition-enhancing low-band spectrum, the Incentive Auction’s success cannot simply be measured by whether the auction is *completed*. Rather, to such carriers – and to future policymakers charged with ensuring competition in the market for wireless broadband services – the success of the Incentive Auction will be measured by the extent to which it provides these carriers the low-band spectrum essential to sustaining long-term competition, which in turn incents carriers to offer new and innovative services to consumers.

Accordingly, Sprint recommends that the Commission advance its iterative Incentive Auction design process by adopting block-specific bidding in the forward auction, thereby enabling bidders to know what they are bidding on. It will produce an auction dynamic and auction output that achieves the Commission's statutory goals and promotes long-term wireless broadband competition.

Table of Contents

- I. INTRODUCTION AND SUMMARY 1**
- II. THE FORWARD AUCTION SPECTRUM BLOCKS WILL NOT BE SUFFICIENTLY
GENERIC TO SUPPORT THE AUCTION BIDDING PROCESS PROPOSED IN THE
COMMENT PUBLIC NOTICE 8**
 - A. The Incentive Auction Design Must Promote Long-Term Wireless Competition 8**
 - B. Unresolved Exposure Risks Threaten Forward Auction Success By Severely
Undermining Bidder Certainty..... 10**
 - i. Exposure Risk from Insufficient and/or Incapably Expressed Information on
Impairments Hinders Effective Auction Participation..... 13
 - ii. Problematic Bidding Categories 14
 - C. Dissimilarity Among Auction Blocks Prevents the Commission’s Proposed Auction
Design from Mitigating Auction Inefficiency, Exposure Risk, and the ‘Winner’s
Curse’ 23**
 - i. The Proposed Post-Clock Round Discount Does Not Cure the Exposure Problem
..... 24
 - ii. The Proposed Auction Structure Undermines the Ability of Forward Auction
Bidders to Express Their Impairment Tolerance Between Markets 31
- III. THE FORWARD AUCTION PROCESS CAN BE MODIFIED TO PROMOTE GREATER
BIDDER CONFIDENCE AND AUCTION EFFICIENCY, BETTER ENSURING THE
AUCTION’S OVERALL SUCCESS 33**
 - A. The Foregoing Discussion Demonstrates the Need for Frequency-Specific Bidding... 33**
 - B. Successful Auction Operation Requires Block-Specific Bidding 35**
 - C. Location of Impairments within the 600 MHz Band 39**
- IV. THE COMMISSION CAN FURTHER PROMOTE ITS COMPETITION GOALS AND
AUCTION DESIGN OBJECTIVES BY IMPLEMENTING THE SPCTRUM RESERVE
AT THE COMMENCEMENT OF THE FORWAD AUCTION 40**
 - A. New Information Sheds New Light on How the Commission Should Balance These
Goals..... 42**
 - B. The Commission’s Proposed Procedures Associated with the Reserve Frustrate the
Commission’s Competition Goals, Particularly in Light of Recent Developments..... 43**
 - i. Uncertainty Generated By the Reserve-Implementation Proposals..... 44
 - C. Resolving the Threat to Reserve-Eligible Bidding In A Way that Promotes Bidding
Certainty and Flexibility..... 46**

i. Implementing the Reserve Without Undermining Bidder Certainty and Flexibility 47

V. ADDITIONAL CHANGES WOULD IMPROVE THE PROPOSED FORWARD AUCTION PROCEDURES 49

A. Timing Between Reverse and Forward Auctions..... 49

B. Activity Rules..... 50

C. Activity Waivers..... 52

D. Bidding Units..... 53

E. Post-Auction Remedies..... 54

VI. CONCLUSION 55

Appendix 1

Appendix 2

**Before the
Federal Communications Commission
Washington, D.C. 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 SPRINT CORPORATION

I. INTRODUCTION AND SUMMARY

Sprint Corporation (“Sprint”) respectfully submits these comments in response to the Federal Communications Commission’s (“FCC’s” or “Commission’s”) recent Public Notice soliciting comment on competitive bidding procedures for the broadcast television spectrum incentive auction (“Incentive Auction”).¹ Sprint appreciates the Commission’s efforts, uniting the work of multiple bureaus and dedicated working groups, to formulate competitive bidding procedures to govern the Incentive Auction. As the Commission has consistently stressed, the repurposing of 600 MHz spectrum represents a unique opportunity for the Commission to promote economic growth, innovation and competition. Thus, the specific procedures adopted

¹ *Comment Sought on Competitive Bidding Procedures for Broadcast Incentive Auction 1000, Including Auctions 1001 and 1002*, AU Docket No. 14-252, GN Docket No. 12-268, Public Notice (rel. Dec. 17, 2014) (“*Comment Public Notice*”).

for this auction will have a direct impact on the extent to which the Commission can successfully realize the true potential of this auction.

The Commission's efforts to develop the framework for the Incentive Auction have involved various stages of deliberative proceedings. As the Commission described in the *Incentive Auction Report and Order*, the *Order* established the "basic framework for the incentive auction," with subsequent public notices such as the *Comment Public Notice* relied on to resolve outstanding issues and final auction procedures based on "additional public input."² While intended to operate sequentially, with subsequent proposals and decisions building on previous determinations, Sprint respectfully notes that some of the decisions made at one stage (owing perhaps to the "novelty and complexity" of this auction³) have added new details that suggest the emergence of problems or complexities not readily foreseen by commenters or the Commission at prior stages of this multi-faceted Incentive Auction development process.

In much the same way one solves a Rubik's cube puzzle, discovering that previously-set pieces are out-of-place only after setting subsequent pieces, the iterative deliberative process that produced the *Comment Public Notice* reveals a number of concerns with the proposed auction structure and processes. While these concerns could be problematic under current proposed procedures, this new information nonetheless presents timely *opportunities* to better effectuate the Commission's public policy objectives through targeted modifications or alternatives to some of the Commission's Incentive Auction procedures and processes.

With passage of the *Spectrum Act*, Congress charged the Commission with the complex and unprecedented task of allowing market forces to determine the highest and best use of the

² *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, GN Docket No. 12-268, Report and Order, 29 FCC Rcd 6567, 6574 (2014) ("*Incentive Auction Order*").

³ *Incentive Auction Order* ¶14.

600 MHz band through a two-sided auction. Over the course of myriad public notices, notices of proposed rulemaking, webinars, workshops, and orders, the Commission has articulated a number of key objectives and goals for the Incentive Auction, among the most overarching of which have been to promote *auction design simplicity*, *auction participant certainty*, *spectrum efficiency*, and – as both a discrete objective and an animating principle of its other objectives – to promote *competition*. From these goals flow a number of ancillary but still important Incentive Auction objectives, for instance *speed*, *transparency*, *minimizing impairment*, *robust participation*, and *bidder flexibility*.

The Commission knows that a successful auction requires balancing these often-competing objectives. In these comments, Sprint respectfully suggests instances in which an overarching objective may be inadvertently undermined in the development of specific auction procedures – almost undoubtedly an outgrowth of the iterative nature of this process. With a new (and previously-unavailable) appreciation for how the many ‘moving parts’ of the Incentive Auction fit together, the Commission can implement the proposals contained in the *Comment Public Notice* in the manner it had originally proposed: as a dynamically recursive process, meant to revisit the “basic framework” established in the *Incentive Auction Order* in ways that resolve newfound glitches, reinforce –and then build on – its foundation, and fulfill its overall objectives. The *Comment Public Notice* provides a critically important process that enables the Commission to improve upon its basic Incentive Auction framework by incorporating new information and new tools.

Successful realization of the “once-in-a-lifetime opportunity to expand the benefits of mobile wireless coverage and competition”⁴ through the Incentive Auction depends critically on adopting auction procedures that will maximize the spectrum’s prospective utility to potential bidders. Especially for competitive operators that currently lack access to competition-enhancing low-band spectrum, the success of the Incentive Auction cannot simply be measured by whether the auction is successfully *completed*. Rather, to such operators – and indeed, to future policymakers charged with ensuring competition in the market for wireless broadband services – *the success of the auction will be measured by the extent to which the licenses they win provide the low-band spectrum essential to rapidly deploying new, competitive and innovative services to consumers.*

Sprint submits that a number of key auction design elements seriously jeopardize auction efficiency and a successful post-auction 600 MHz spectrum deployment that promotes long-term wireless broadband competition.⁵ Individually and in the aggregate, these design choices significantly undermine bidder certainty, leading to forward auction bidders not knowing what they are bidding on. For instance, it has become increasingly apparent that the proposed generic block design of the clock phase masks a tremendous degree of underlying heterogeneity or dissimilarity among prospective 600 MHz spectrum blocks. Bidding on these highly dissimilar blocks within a single bidding category (or even two broad bidding categories) using a common ascending clock is simply unsustainable because the blocks are not truly generic and

⁴ Statement of Chairman Tom Wheeler, *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, GN Docket No. 12-268, at 1 (2014).

⁵ Within the context of these Comments, Sprint uses the term “auction efficiency” to mean awarding specific licenses to those that can most efficiently and intensively use them to introduce new services, which the Commission has equated with highest-valued use in several decisions. *See, e.g., Implementation of Section 309(j) of the Communications Act – Competitive Bidding*, Fifth and Final Report and Order, 9 FCC Rcd 5532, 5541-2 (1994).

substitutable; they are heterogeneous in ways not predictable in advance and that will vary significantly depending on the outcome of the reverse auction and the broadcaster repacking.

The assignment phase and discount for impairments – the two mechanisms the Commission has proposed to address underlying disparity or dissimilarity among spectrum blocks – simply do not solve the critical problem forward auction participants face: bidding in the clock phase without any confidence that they will receive the blocks they want and at prices that reflect the competitive market values bidders would assign to them in a more straightforward auction. By masking the extent of dissimilarity between blocks, and thus eliminating the ability of bidders to express their value for specific block characteristics and interdependencies, the Commission’s proposed auction design deviates from the fundamental auction objective of assigning licenses to those who most highly value them. Instead, these auction designs subject bidders to the exposure risk of winning insufficient or undesirable combinations of items, or alternatively the “winner’s curse” of paying more than a license’s competitive market value because of an inability – arising from the auction’s design – to appropriately gauge value signals of other bidders towards the same items.⁶

In every significant Commission auction of commercial wireless spectrum to date, bidders have been able to submit bids for specific spectrum blocks as they very precisely assess the utility, functionality and thus value of those individual blocks within their existing and planned future networks. Here, forward auction bidders would be bidding on a “grab bag” of licenses with no assurance of which one or ones they may ultimately be assigned. These factors, taken together, will retard bidding by forward auction participants, and particularly by carriers that need 600 MHz spectrum the most but can’t afford to suffer the risk of paying considerably

⁶ Paul Klemperer, “Auction Theory: A Guide to the Literature,” *Journal of Economic Surveys*, Vol. 13, No. 3 (1999).

more than the competitive value (“winner’s curse”) or receiving highly impaired licenses that will undermine competitive deployments.⁷

Most importantly, the Commission’s proposed auction design process denies bidders the opportunity to make bids that express reasonable business judgment tradeoffs about the relative value of impairment in each PEA and (as a hierarchy among desired markets) across PEAs. In short, the proposed generic block bidding design, though well-intentioned to further assure interoperability across 600 MHz and to follow-on expeditiously from the reverse-auction outcome and preliminary repacking plan, falls short in providing *auction design simplicity*, *auction participant certainty and spectrum efficiency*.⁸ With these disabilities, it is uncertain at best whether the outcome will promote long-term wireless *competition*.

Thus, as discussed below, the proposed auction procedures favor bidders that already have robust low-band spectrum, to the detriment of those that need it most to facilitate rapid, intensive 600 MHz deployment and sustainable, robust wireless competition. These procedures will lead to inefficient auction outcomes, with bidders dropping out prematurely because they don’t have the benefit of drawing inferences about the true value of a license from the

⁷ Under the Commission’s proposed assignment rules, carriers would be assured in most situations of obtaining contiguous spectrum for at least two licenses they have won. *Comment Public Notice* ¶ 207, Appendix H at 3 – Assignment Phase Efficiency Objectives. Because the Commission has proposed to pre-group PEAs (and especially ‘high-demand PEAs’) in the assignment round, however, bidders still may not be able to fully express their value for impairment on a market-by-market basis. For example, in some markets a carrier might have a tolerance for impaired, contiguous blocks (for instance, because the impairment is in non-critical locations or the carrier has alternative spectrum that alleviates the impact of having impairments to its 600 MHz licenses in those areas), but in other markets within the grouping the competitor may have no tolerance at all for impaired blocks. This counsels in favor of frequency-specific bidding that would allow bidders to express value for contiguity and their impairment-appetite within markets and as between markets.

⁸ Sprint notes that the Commission has already successfully averted the risk to bidders of obtaining 600 MHz licenses that are not interoperable with other portions of the band. *Incentive Auction Order* ¶ 732. Generic blocks, therefore, are not warranted on the basis of furthering that objective, particularly when they have the effect of undermining other core competition objectives.

observation of rivals' bids on it. With grave uncertainty about what they are bidding on – and lack of confidence in their ability to eventually win desired spectrum blocks at prices that reflect their true utility – bidders will likely reduce demand, bid less aggressively, drop out prematurely and increase the likelihood of extending the auction unnecessarily to lower and lower clearing stages.

To avert these risks, and facilitate the Incentive Auction achieving the statutory objectives of promoting competition, intensive spectrum usage, and deploying new services for consumers, Sprint encourages the Commission to structure its competitive bidding system in a manner that promotes bidder certainty and auction efficiency. Specifically, the Commission should adopt an auction design that facilitates bidding for specific spectrum blocks, with full impairment information available to bidders to make business choices, and which identifies the amount of reserve spectrum available to bidders early in the auction. With the adoption of frequency-specific bidding, bidders would have the ability to express value determinations on individual blocks (each, for instance, with its own ascending clock) and draw inferences on the value rival bidders assign to those blocks as expressed in their own bids. This would substantially enhance bidder confidence, enabling bidders to bid aggressively and consistent with their true values for specific licenses. It also has the benefit of enabling the Commission to offer all blocks for sale, rather than not offering blocks with more than 50 percent impairment. Bidders, armed with full information, can make their own business decisions as to the value of these blocks in their unique circumstances.

For the same reasons, Sprint encourages the Commission to designate the spectrum reserve licenses at the outset of the auction, allowing reserve-eligible bidders to bid in early rounds with the same flexibility as more dominant bidders. This would allow bidding to proceed

along traditional auction patterns (which focus on large, high-demand markets) without unnecessarily shrinking the spectrum reserve in specific PEAs simply because reserve-eligible bidders are following conventional bidding strategies. If, as the Commission has expressed concern, the supply of reserve blocks exceeded reserve-eligible demand such that the auction risked not meeting the Final Stage Rule, the Commission could at that time decide to remove spectrum blocks from the reserve.

In the course of these comments, Sprint explains the reasons for recommending these modified auction design elements as an alternative to observed problems in the currently-proposed framework and provides support for this evolution of the auction structure and its processes. These design and process modifications can be readily developed (as they are common to prior Commission spectrum auctions) and would not delay commencing the Incentive Auction in early 2016.

II. THE FORWARD AUCTION SPECTRUM BLOCKS WILL NOT BE SUFFICIENTLY GENERIC TO SUPPORT THE AUCTION BIDDING PROCESS PROPOSED IN THE COMMENT PUBLIC NOTICE

A. The Incentive Auction Design Must Promote Long-Term Wireless Competition

The *Spectrum Act* does not direct the Commission to develop and conduct the 600 MHz Incentive Auction in a vacuum; in particular, as the Commission itself recognizes, “we must ensure that our policies and rules facilitate access to spectrum in a manner that promotes competition.”⁹ For example, in the context of the Commission’s current proceeding, it concluded that “the auction of spectrum below 1 GHz [through the Incentive Auction] presents a once-in-a-generation opportunity to promote competition *as specifically required by Section*

⁹ *Policies Regarding Mobile Spectrum Holdings*, Report and Order, 29 FCC Rcd 6133, ¶ 3 (2014) (“*Report and Order*” or “*Order*”).

309(j).”¹⁰ Indeed, the Commission found that its responsibility to promote competition under Section 309(j)(3)(B) – the statutory provision governing the Commission’s design of systems of competitive bidding such as those under consideration in the *Comment Public Notice* – is *uniquely* robust, with a “forward-looking” mandate that “requires the Commission to rely upon its predictive judgment”¹¹ to “proactively guard against factors that potentially could harm consumers in the future.”¹² Stated another way, Section 309(j) requires the Commission to safeguard future economic opportunity and competition by ensuring that new and innovative technologies are readily accessible through deterrence of excessive concentration of licenses.¹³ The Commission’s Incentive Auction design must focus on resolving – and preventing— structural market conditions that undercut robust *long-term* mobile broadband competition.

The fact is that even the current spate of low-priced retail wireless offerings – while offering consumers lower rates and new service models– cannot itself overcome the structural input market realities for wireless services that point incontrovertibly towards an ever-increasing

¹⁰ *Id.* ¶ 48.

¹¹ *Id.* ¶ 6. (“Section 309(j)(3)(B) is forward-looking, and requires the Commission to rely upon its predictive judgment to proactively guard against potential harms.”).

¹² *Id.* ¶ 17, n. 55 (“We observe that Section 309(j)(3)(B) is broader than a standard antitrust review and is forward-looking, requiring the Commission to proactively guard against factors that potentially could harm consumers in the future.”).

¹³ *See, e.g., Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59)*, Report and Order, 17 FCC Rcd 1022, ¶ 5 (2001) (“Under Section 309(j)(3)(B) of the Act, the Commission must consider a bidding methodology that promotes a number of objectives, including new technologies, services for the public, economic competition and growth, commercial use, and time for interested parties to develop their business plans.”); *Implementation of Section 309(j) of the Communications Act – Competitive Bidding*, Second Report and Order, 9 FCC Rcd 238, ¶ 227 (1994) (“Another provision, section 309(j)(3)(B), provides that in establishing eligibility criteria and bidding methodologies the Commission shall seek to promote the objectives of ‘economic opportunity and competition to ensur[e] that new and innovative technologies are readily accessible to the American people by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants...”).

concentration of the wireless broadband market in favor of the two entrenched incumbents.¹⁴

The Commission, as the expert agency charged with carrying out Congress' directives, must look further ahead to ensure that competitive bidding procedures associated with this last foreseeable opportunity to increase the supply of (and wider access to) low-band spectrum fully supports the pro-competitive goals enshrined in Section 309(j)(3)(B), as explained further below.

B. Unresolved Exposure Risks Threaten Forward Auction Success by Severely Undermining Bidder Certainty

As stated above, some of the bidding procedures proposed in the *Comment Public Notice* will disproportionately harm competitive operators, increasing the likelihood of auction inefficiency and even auction failure. Our concern here is not that the auction fails to sell the available cleared spectrum blocks or that it does not pay for its own administration costs and for repacking non-participating broadcasters. Sprint's concern is that these proposals create serious exposure risks for competitive carriers that could prevent them from obtaining the 600 MHz spectrum blocks they need to effectively, economically and sustainably compete with the carriers that already have robust low-band spectrum positions. Despite the Commission's best repacking efforts, *it is highly likely that the cleared 600 MHz spectrum blocks will not be fungible and interchangeable; i.e., they will feature significant but varying levels of impairment across different parts of their covered geography which bidders will value very differently depending on their existing networks and strategic priorities.* Under these circumstances, having forward

¹⁴ In myriad proceedings – and most prominently in its reports on the status of competition within the commercial wireless market – the Commission has observed that the *input* market (namely, for spectrum, special access, and roaming) are far less competitive than competition at the retail level. These structural imbalances are emblematic of the need for structural reforms that support sustainable, long-term wireless competition.

auction participants bid for “generic spectrum blocks” is unlikely to achieve the Commission’s mandate to promote long-term competition; in fact, it may do just the opposite.

An auction involving bidding on heterogeneous commodities need not, in itself, introduce unnecessary exposure risk for bidders.¹⁵ Indeed, where lots have various interdependencies and complementarities in their utilization, the auctioneer need only provide an effective mechanism by which bidders can express their value of the lots (*i.e.*, spectrum blocks cleared of broadcast incumbents) and their interdependence, as well as respond to the respective values of other bidders towards that same information.

Critical to the success of such an auction, however, is that bidders have *accurate* information on the spectrum blocks – and particularly the aspects of the blocks that relate to their interdependence and complementarity – *and* an effective means to process this information, express bids based on it, and respond to the apparent valuation of this information by rival bidders in the context of bidding. In other words, to ensure auction efficiency – *i.e.*, awarding specific licenses to those that can most efficiently and intensively use them to introduce new services, which the Commission has equated with highest-valued use,¹⁶ an auctioneer must be especially cognizant of the quality and reliability of information it provides *in conjunction* with the *timeframe* in which bidders can most effectively use this information to express their value

¹⁵ Even accepting, for the moment, that lots within one of the Commission’s proposed categories are ‘generic’ (a proposition Sprint finds problematic, as discussed *infra*), the Commission’s delineation of two categories creates, at a minimum, heterogeneity of lots even in the clock phase.

¹⁶ See, *e.g.*, *Implementation of Section 309(j) of the Communications Act – Competitive Bidding*, Fifth and Final Report and Order, 9 FCC Rcd 5532, 5541-2 (1994); *Implementation of Section 309(j) of the Communications Act – Competitive Bidding*, Second Report and Order, 9 FCC Rcd 2348, 2361 (1994); *Service Rules for the 698-746, 747-762 and 777-792 MHz Bands*, Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd 8064, 8150 (2007); *Amendment of Part 90 of the Commission’s Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band*, First Report and Order, 11 FCC Rcd 1463, 1601 (1996).

for available licenses. An auctioneer should, as much as bidders, value the dissemination and utilization of information contained in competing bids, as this process “reveals useful information to other bidders about [a bidder’s] demand and valuations for licenses” and “promotes an efficient auction process which increases the likelihood that the winning bidder will be the party that most highly values the license.”¹⁷ Where bidders have to express their value among differing spectrum blocks on the basis of *limited information*, or where bidders *can’t fully express their value for those blocks* even with complete information, auction efficiency will decrease.

This concern is highlighted by: the Commission’s proposed methods for generating critical bidder information concerning the level and extent of impairment for the spectrum blocks (statistical measure F(50,50)); its proposal for provisioning this information to bidders (which itself conveys the auctioneer’s mistaken perception of substitutability through overly-broad bidding categories); and generic block bidding with a final assignment round that limits the extent to which bidders can express their valuation of this information (implementing a *sequential* auction in which bidders can only imperfectly – if at all – express their relative values for impairments as between markets). Wireless broadband competition will not survive if competitive carriers emerge from the Incentive Auction facing an even more tilted competitive environment, in which their limited resources are diverted to make highly-impaired (and yet overpriced) spectrum usable instead of deploying innovative and competitive services to their customers on this spectrum. Neither outcome comports with the pro-competitive charge of Section 309(j)(3)(B) in the development of competitive bidding procedures.

¹⁷ *Motions for Stay of Auction No. 57 and Requests for Dismissal for Disqualification*, Order, 19 FCC Rcd 20482, 20487 (WTB 2004).

i. Exposure Risk from Insufficient and/or Incapably Expressed Information on Impairments Hinders Effective Auction Participation

The Commission's goal in selecting an optimal band plan has been to maximize the amount of spectrum auctioned, permitting market variability to advance this objective. Sprint has long supported this approach, as ensuring more spectrum can be made available nationwide promotes opportunities to acquire 600 MHz spectrum. Variability – and the associated impairments arising from variability - has unique implications for spectrum auctions, however. For an auction to reflect an efficient assignment of spectrum, the auction process must be simple, fair and transparent, allowing bidders to signal their valuation of particular items and respond to the valuations expressed by other bidders in their bids.¹⁸

One necessary condition under which market variability and associated impairments can be effectively managed is if bidders *know precisely how such impairments affect particular licenses*. In conjunction with other proposed procedures for the Incentive Auction, however, differing impairments among blocks can result in highly inefficient auction outcomes, as forward auction bidders will not have sufficient information to generate meaningful valuation data for how impairments affect particular blocks. More problematically, under the proposals in the *Comment Public Notice*, bidders will not have access to the mechanisms necessary to express – and respond to – preferences based on this information for the vast majority of the bidding process.

¹⁸ The expression of this information is not valuable solely in promoting auction efficiency (the focus of the discussion below). As a more general matter of policy and spectrum management (and consistent with the Commission's duty to promote the intensive use of spectrum resources), the Commission has concluded that "Auctions also provide valuable information about the opportunity cost of spectrum because they reflect the value that the next most efficient firm places on the spectrum license. This information allows both the private marketplace and policy makers to manage spectrum more effectively." *FCC Report to Congress on Spectrum Auctions*, Report, WT Docket No. 97-150, 1997 FCC LEXIS 7490, at 5 (1997).

Of course, auctions inevitably involve valuation complexity, with different bidders valuing even generic lots differently.¹⁹ Bidders express – and respond to – different valuations, however, through bidding. That’s the normal operation of a multiple round auction and it reduces the potential risk of the “winner’s curse,” in which a high bidder bids more than the ‘underlying true value’ of a lot that would otherwise be determined by the free flow of valuation information through bidding.²⁰

ii. Problematic Bidding Categories

Sprint recognizes that the Commission faces a difficult task in defining bidding lots for the forward auction. To avert the competitive harms associated with the 700 MHz auction, and to ensure that bidding decisions by dominant incumbents do not strand (and thus reduce the rapid deployment of) certain blocks, the Commission decided that all spectrum would be paired, used generic five megahertz blocks, delayed (and automated) facilitation of contiguity until an assignment phase, and imposed an interoperability mandate for the band.²¹ The Commission also developed its competitive bidding proposals to further its goal of “speeding up” the auction. Namely, the Commission’s proposed competitive bidding procedures relating to the definition of bidding categories were designed to avoid the “need to bid iteratively across rounds on several

¹⁹ *Implementation of Section 309(j) of the Communications Act – Competitive Bidding*, Second Report and Order, 9 FCC Rcd 2348, 2362 (1994) (“In a pure common value auction, the item up for auction has the same value to everyone, but bidders’ valuations at the time of the auction differ because they have different estimates of that underlying true value.”).

²⁰ *FCC Report to Congress on Spectrum Auctions*, Report, WT Docket No. 97-150, 1997 FCC LEXIS 7490, at 29 (1997) (“Auctions perform better when it is difficult for bidders to keep their information private. Since bidders’ private information affects their bids, a choice of open outcry or multiple-round auctions allows bidders to observe opponents’ bids and draw inferences about the private information that is driving the bids. This ability can reduce the phenomenon known as the *winner’s curse*, which arises when a high bidder fails to recognize that all the potentially well-informed rivals are more pessimistic about the future profitability of a license. If the high bidder does not downgrade estimates to take this fact into account, he risks paying more for the license than it is worth.”).

²¹ *Incentive Auction Order* §§ 57, 514-515, 60, 732.

substitutable license blocks, as they would if they were bidding for frequency-specific licenses.”²²

Impairments to certain lots (i.e. the creation of “heterogeneous commodities”), however, complicate and even distort this process. Lumping impaired blocks within two broad bidding categories effectively hides the nature and extent of impairments from bidders during the clock phase of the forward auction.²³ Bidders are thus confronted not only with the complexity of bidding on licenses that they, themselves, struggle to effectively evaluate – and value – based on limited information and constrained time (i.e., a bidder will value a lot with a 16% impairment radically different than one with a 49% impairment; it must also determine its valuation for a lot with a 2% impairment relative to one with a 14% impairment); bidders are also confronted with evaluating how the bids of others reflect the different values *they* attach to dissimilar blocks. The ability to pick up ‘clues’ of rival bidders’ valuations for specific characteristics (a hallmark of auction efficiency) is thus eliminated under the forward auction bidding process proposed in the *Comment Public Notice*.

In its *Incentive Auction Order* the Commission dismissed concerns voiced by commenters that licenses within a single category must be “truly fungible, or at least sufficiently similar” by noting that the Commission would “consider a number of factors” – including those developed through input from “potential bidders...on specific standards for categories of generic licenses” – in “defin[ing] whether particular licenses are ‘similar enough’ to be included in a single bidding category.”²⁴ Sprint respectfully notes, however, that the *Comment Public Notice*

²² *Incentive Auction Order* ¶ 505.

²³ *Comment Public Notice* ¶¶ 142-148.

²⁴ *Id.* ¶ 506.

proposes using only a single criterion for defining bidding categories – the percentage of a PEA’s population subject to impairment (risk of experiencing harmful interference) from the remaining or repacked broadcast stations.

The Commission’s proposed procedures to generate and circulate critical impairment information exacerbate this complexity. Specifically, the proposed F(50,50) statistical measure used to *define* the bidding categories will generate tremendous uncertainty about the true relative value of blocks both *within* a single bidding category and the relative values of blocks *across* bidding categories.²⁵ Where bidders both value spectrum blocks differently *and have uncertainty about other bidders’ valuations*, bidders are likely to contract their bidding activity.²⁶

In a pending Petition for Reconsideration, Sprint has urged the Commission to adopt a more accurate and relevant statistical measure to determine impairments (and thus bidding categories), or at the very least to supply forward auction participants with both F(50,50) and F(50,10)-based impairment information.²⁷ Merely providing additional F(50,10) information to bidders, however, will not sufficiently reduce their exposure risk. Because the Commission’s proposal would have bidders bid within broad bidding categories, they must be confident that the values of lots within each category are roughly commensurate. They must also be able, on the

²⁵ *Id.* ¶ 145 (“Specifically, we propose to calculate the percentage of population impaired in each block at a two-by-two kilometer cell level by applying the ISIX methodology [utilizing the F(50,50) statistical measure] to the assignment plan determined by the clearing target optimization procedure.”).

²⁶ *FCC Report to Congress on Spectrum Auctions*, Report, WT Docket No. 97-150, 1997 FCC LEXIS 7490, at 29 (1997) (“If other bids [that express rival bidders’ private information] cannot be observed, the concern raised by this possibility will induce bidders to reduce their bids by more than if other bidders’ activity can be monitored.”).

²⁷ Petition for Reconsideration of Sprint Corp. GN Docket No. 12-268, ET Docket Nos. 13-26, 14-14 (Jan. 22, 2015). Sprint’s Petition argues that the use of an F(50,10) statistical measure, which predicts interference levels that would occur at 50 percent of locations 10 percent of the time, is a far more useful and relevant indicator of impairment than the Commission’s adopted F(50,50) statistical measure, which predicts interference levels that would occur at 50 percent of locations 50 percent of the time.

basis of this information, to efficiently value the lots of one category *relative to the lots of the other category* (particularly where there are complementarities *or*, worse, reduced efficiencies among certain combinations of heterogeneous lots). In other words, an auction structure featuring common bidding within a specific bidding category through common ascending clocks structurally assumes that blocks within are similar.²⁸ Separate bidding categories based on the ISIX methodology creates the structural assumption that despite some heterogeneity between lots, the differences *between* the categories are relative and ascertainable.²⁹

When bidders have reason to believe that the relationships among lots *within* a category and the relationship *between* the categories do not track the Commission's structural assumptions, bidding complexity increases, bidder certainty declines, and auction efficiency declines substantially – potentially to the point of auction failure.

In its Petition for Reconsideration, Sprint provided a number of examples illustrating the ways in which the Commission's proposed approach to defining bidding categories could produce substantial uncertainty as to the relative values of all auctioned 600 MHz blocks. Further analysis has revealed even more troubling instances (likely to be present in and between PEAs throughout the nation) in which the Commission's procedures for defining bidding categories produce grave uncertainty, as detailed below.

²⁸ In other words, the Commission's proposal assumes that these blocks can be bid on together – and share a common ascending clock – because they are relatively fungible on the basis of impairment percentage and share the same relative difference from blocks in a separate bidding category. *As Sprint discusses herein, however, the basis upon which the Commission has determined their relative fungibility – a single criterion, using a blunt statistical tool – is flawed and will both underestimate and effectively hide the dissimilarity of spectrum blocks within a category.*

²⁹ The relative values of the lots are further reinforced under the Commission's uniform application of a discount methodology based on this impairment information, with impaired Category 1 and Category 2 blocks receiving the same linear discount of one percent off the final clock price for each one percent of predicted impairment. *See Comment Public Notice* ¶ 147.

Example 1:

Consider a clearing scenario in which a television station in Little Rock, Arkansas (PEA 46) remains within the 600 MHz band. (See Appendix 2 for a representative example.) Under the Commission's F(50,50) statistical measure and the Commission's 600 MHz base station interference threshold of 17.3 dBuV/m, a co-channel uplink frequency in Birmingham, Alabama (PEA 40) would have a predicted impairment of 0.0% -- making it a Category 1 block under the Commission's plans. Similarly, the same co-channel uplink frequency in Beaumont, Texas (PEA 135) would have a *de minimis* predicted impairment of only 0.8%.

- Using the more realistic F(50,10) statistical measure, however, the predicted impairment to that same co-channel frequency in Birmingham, Alabama (PEA 40) would be 14.2% – at the very threshold of Category 2.
- The predicted impairment to the block in Beaumont, Texas (PEA 135) would similarly increase unpredictably³⁰ – going from 0.8% to 12.9%.

In short, blocks that were predicted to be virtually unimpaired – and which could thus reliably share the same clock with other unimpaired blocks within the same PEA – become increasingly dissimilar from other blocks within the same 'generic' bidding category. Moreover this example does not even consider where the impairment would occur, *i.e.*, in areas of importance for reliable service or areas of less critical wireless service.

Example 2:

The previous example, although troubling as explained above, generally accords with the Commission's assumption³¹ that blocks with 0-15% predicted interference are generally substitutable and should fall within the same bidding category and rely on the same ascending clock. A bidder's ability to rely on this categorization is seriously jeopardized however, when

³⁰ As shown in Appendix 2 and Sprint's Petition for Reconsideration, the difference in impairment levels when using F(50,50) versus F(50,10) varies dramatically and unpredictably (without additional detailed information about the DTV station or stations causing the impairment), adding additional complexity to a bidder trying to evaluate how much it should bid within a PEA category for what are definitely not equivalent blocks. This variation, as well as the F(50,50) underestimation of impairment documents in these examples, provides a compelling reason for the Commission to move to frequency-specific bidding, as discussed further later in these Comments.

³¹ Sprint has found no support in the *Comment Public Notice* or other record in this proceeding to empirically support the proposition that blocks with 0-15% impairment are relatively 'substitutable' for forward auction bidding purposes. Indeed, as Sprint discusses *infra*, reductions in value may be driven more by factors other than a mere tabulation of the percentage of POPs within the PEA affected by the impairment.

more granular impairment data produces a different conclusion.

Consider a clearing scenario in which a television station in New York, New York (PEA 1) remains within the 600 MHz band. (See Appendix 2 for a representative example.) Under the Commission's F(50,50) statistical measure, a co-channel uplink frequency in Syracuse, New York (PEA 41) would have a predicted impairment of 3.1% – a minimally-impaired Category 1 block.

Similarly, the same co-channel uplink frequency in Rochester, New York (PEA 44) would have a *de minimis* predicted impairment of only 0.6%. In Elmira, New York (PEA 271), that frequency would have a predicted impairment of 10.1%. To the south, the same frequency in Fredericksburg, Virginia (PEA 140) would have a predicted impairment of 4.6%. *In short, all of these blocks in markets outside PEA 1 would be squarely within Category 1 under the F(50,50) measure.*

Using more realistic F(50, 10) measures, however, these blocks should be categorized as Category 2 for forward auction bidding purposes; the Commission's proposal would retain them in Category 1, however, in which they cannot realistically or practically be viewed as equivalent, substitutable, fungible or otherwise be auctioned as generic blocks within a PEA.

- The block in Syracuse (PEA 41) goes from 3.1% to 34.4%
- The block in Rochester (PEA 44) goes from 0.6% to 25.2%
- The block in Fredericksburg (PEA 140) goes from 4.6% to 31.1%
- The block in Elmira (PEA 271) goes from 10.1% to 40.1%

Thus, in this example, with impairment information more representative of the interference risk considerations that guide wireless broadband network design, these blocks should be included in Category 2 yet they will remain in Category 1, sharing the same clock as truly unimpaired blocks despite their significant heterogeneity.

In short, the Commission's well-intentioned attempt to manage dissimilarity among the blocks produced by the reverse auction, by placing them in one of two broad categories for the forward auction clock rounds, may mask disparities among blocks both within and across the categories that will impair bidder certainty, obscure forward auction transparency, and undercut auction efficiency.

Example 3:

The preceding examples illustrate cases in which blocks become exceedingly heterogeneous when evaluated with more granular and precise impairment information, thereby undermining

the notion that a single clock could represent the underlying value of all lots within that bidding category. Conceivably, however, if all bidders had this more detailed information, they could react rationally and incorporate it in their clock phase bidding. In this sense, higher-than-predicted impairments would temper bidding in the clock phase such that the clock price more accurately represented the impairments contained within the bidding category. Higher relative valuations for unimpaired spectrum could then be expressed in the assignment phase.

But it is not that simple. Consider the following scenarios:

Consider a clearing scenario in which a television station in New York, New York (PEA 1) remains within the 600 MHz band. Under the Commission's F(50,50) statistical measure, a co-channel uplink frequency in Williamsport, Pennsylvania (PEA 136) would have a predicted impairment of 26.7% – a Category 2 block.

- Using the more realistic F(50,10) statistical measure, however, the predicted impairment to that same co-channel frequency in Williamsport (PEA 136) would be 68.6% – beyond the threshold the Commission proposes as suitable for auction.

Similarly, under a clearing scenario in which a television station remains in Little Rock, Arkansas (PEA 46), the Commission's F(50,50) measure would predict impairment to a co-channel block in Sedalia, Missouri (PEA 178) of 25.1%.

- Again, using the more realistic F(50,10) measure, however, this block would face an impairment of 89.3% – in other words, base stations serving nearly 90% of the population would receive unacceptable levels of interference at least 10 percent of the time.

In these cases, an impairment discount (which would use the Commission's F(50,50) measure as its basis) would seriously underestimate the reduction in value the impairment causes. What's more, bidders could not adequately compensate for this risk across the clock and assignment rounds, or through interference mitigation steps taken during network deployment.

Example 4:

The *Comment Public Notice* proposal assumes that the forward auction clock and assignment rounds will function harmoniously (successfully cross-function) to adequately adjust winning bids to account for real differences in the utility (percentage interference risk based on population) of spectrum blocks within the two bidding categories. The following examples indicate that this assumption doesn't hold true.

A television station remains in the 600 MHz band in New York, New York (PEA 1). Under the Commission's F(50,50) statistical measure, a co-channel uplink frequency in Manchester, New Hampshire (PEA 60) would have a predicted impairment of 10.0% -- a Category 1 block.

- Using the more representative F(50,10) statistical measure, however, the predicted impairment to that same co-channel frequency in Manchester (PEA 60) would be 75.5% - beyond the threshold the Commission proposed as suitable for auction.

Similarly, assume a television station remains in Little Rock, Arkansas (PEA 46). Under the Commission's F(50,50) statistical measure, a co-channel uplink frequency in St. Louis, Missouri (PEA 24) would have a predicted impairment of 0.4% – a Category 1 block with *de minimis* impairment.

- Again, using the more representative F(50,10) statistical measure, however, the predicted impairment to that same co-channel frequency in St. Louis (PEA 24) would be 70.1% – again, beyond the threshold the Commission proposed to auction.

In these examples, a Category 1 block is so heavily impaired that, under the Commission's proposal, it should not be auctioned. Based on the Commission's structural assumptions, however, (*i.e.*, a blunt statistical measure and the categorization of heterogeneous lots within overly-broad arbitrarily-defined, bidding categories), these heavily-impaired blocks will share the same clock as totally unimpaired Category 1 blocks. Bidders will not be able to express their true valuation for this impairment – or for unimpaired blocks *relative* to this impairment – for the majority of the auction; *i.e.*, until the assignment phase and even then in a sub-optimal way with just one sealed bid. Moreover, at least one Category 1 winner will win a block containing impairments that may render it nearly useless; yet the bidder thought it was bidding on a Category 1 block with no more than 15 percent population impairment. This result does not meet the Commission's goal of auction simplicity, bidder certainty or auction efficiency.

As these examples suggest, the mechanisms which ensure that licenses go to the bidders that value them most and that winners pay the competitive market value of licenses rather than face the 'winner's curse' – will be frequently compromised under the Commission's proposed auction design, particularly the overly-broad definitions of bidding categories.³² Ideally, a bidder would like to express a preference for each block within a category and region, and to respond to

³² Furthermore, as shown in Appendix 2, the difference in impairment levels when using F(50,50) versus F(50,10) varies dramatically and unpredictably (without additional detailed information about the DTV station or stations causing the impairment), adding additional complexity to a bidder trying to evaluate how much it should bid within a PEA category for what are definitely not equivalent blocks. This variation, as well as the F(50,50) underestimation of impairment documents in these examples, provides a compelling reason for the Commission to move to frequency-specific bidding, as discussed further later in these Comments.

rivals offers for the same blocks within that category and region. This possibility is distressingly eliminated by the Commission’s proposed auction design for the clock phase, when bidders must decide about how much to offer for generic blocks. More importantly, even with the benefit of more granular information (and bidding categories *defined* by more granular information) to eliminate uncertainty about the impairment levels of specific blocks within a category, the *use* of broad impairment level bidding categories ineluctably creates valuation complexity – and exposure risk – for bidders who believe that a considerable difference in utility exists between the least impaired blocks within a category and the most impaired.³³

The Commission has stressed that it “must be able to distinguish between Category 1 and Category 2 licenses in order to achieve [its] auction goals.” In this sense, Sprint would consider the auction poised for relatively efficient functioning in the event that bidders shared the *same* value of impairments (*i.e.*, each understands very concretely what it is bidding for). As described above, the Commission’s proposed procedures undermine its – and forward auction bidders’ – ability to do just that. The Commission’s conception of the *Comment Public Notice* process – as an opportunity to build upon the basic framework of the *Incentive Auction Order* and (in the case of defining bidding categories) to solicit input from commenters – provides a unique chance to revisit previously-considered auction design elements to better effectuate the Commission’s key goals of auction design simplicity, auction participant certainty, spectrum efficiency, and competition. As Sprint describes in Section III, revising the forward auction bidding process to implement bidding on specific spectrum blocks would better ensure both the

³³ As discussed in greater detail below, the Commission has proposed to resolve any differences in value – and thus exposure risk – between such blocks by applying a linear impairment discount. As Sprint explains, this would only work if the discount could accurately reflect the true difference in value between blocks resulting from the impairment. For a number of reasons, it does not.

Incentive Auction’s completion and achieving the goals which define whether the auction is truly successful.

C. Dissimilarity Among Auction Blocks Prevents the Commission’s Proposed Auction Design From Mitigating Auction Inefficiency, Exposure Risk and the ‘Winner’s Curse’

The threats to auction efficiency and competition detailed above derive not from any inattention to detail by the Commission but rather as an outgrowth of the ‘Rubik’s Cube’ nature of this proceeding, *i.e.*, the ongoing “fleshing out” of rules and procedures that complicate previous design choices, as noted previously herein. Attentive to the fact that the specific 600 MHz license blocks would be “determined by the incentive auction process itself,” the Commission began the process with the concept of bidding on generic blocks.³⁴ Subsequent decisions built on this concept. For instance, the Commission sought comment on – and eventually adopted – a band plan that would maximize the generic (“interchangeable”) nature of the prospective auction blocks.³⁵ The Commission also established a spectrum reserve that would include generic blocks.³⁶ And the Commission developed an assignment round under the assumption that bidders could efficiently express preferences for frequency-specific licenses because they could bid “confidently for generic licenses in the clock rounds” with the premise that the generic categories truly contained substitutable blocks.³⁷

³⁴ *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Notice of Proposed Rulemaking, 27 FCC Rcd 12357, ¶¶ 56, 63-64 (2012) (“*Incentive Auction NPRM*”).

³⁵ *Wireless Telecommunications Bureau Seeks to Supplement the Record on the 600 MHz Band Plan*, Public Notice, 28 FCC Rcd 7414, ¶ 1 (WTB May 17, 2013); *Incentive Auction Order* ¶¶ 44-45.

³⁶ *Mobile Spectrum Holdings Order* ¶¶ 187, 192.

³⁷ *Incentive Auction Order* ¶ 515.

What complicates and effectively undermines these proposals, however, is the now-apparent fact that, as described above, channel blocks – even within the same Category – will likely vary tremendously in the amount or risk of impairment and thus utility and ultimately value. As a consequence, it is not just problematic that the Commission’s delineation of bidding categories uses a statistical measure providing *insufficient* (or unreliable) information to bidders. Even *with* the advantage of additional information,³⁸ the Commission’s proposed bidding categories – coupled with an auction process that essentially prevents bidders from expressing clear valuation differences for heterogeneity within a bidding category until the assignment phase – produce inefficient (and potentially competition-harming) auction outcomes. Sprint proposes a solution, *infra*.

i. The Proposed Post-Clock Round Discount Does Not Cure the Exposure Problem

To a limited extent, the Commission has proposed a mechanism to address heterogeneity between spectrum blocks. Specifically, it has proposed a one percent discount for each one percent of the population impaired. Even as a modest corrective mechanism, however, the Commission’s proposed impairment discount does not adequately rectify the exposure problem of winning a spectrum block that is significantly more impaired than another block within the same category.

The discount proposal assumes a linear relationship between impairment and value but provides no real justification for that assumption. In truth, the effect of impairment on spectrum block utility and thus valuation is more likely to be reflected by a step function, with some intervals of impairment levels having little if any difference in valuation and other intervals having steep effects. What’s more, the impact on value is likely to vary tremendously between

³⁸ For instance, if the Commission provided all bidders with supplemental F(50,10) data.

operators – though, as stated, the normal course of revealing this varying “private information” through bidding would not be available under the Commission’s decision to conduct a clock phase with broadly-defined bidding categories. In short, *any* attempt by the Commission to formulate specific impairment-price discounts involves the Commission making determinations it is uniquely unsuited to make – determinations which the Commission has previously entrusted to the auction process.³⁹

More broadly, the Commission’s proposed impairment discount reflects a peremptory conclusion that the percentage of unimpaired population covered within a license area is the driving – and sole – determinant of value. This categorical determination is not only unsupported in the *Comment Public Notice*, but it ignores important deployment considerations related to the *area* of the PEA that is impaired.

A narrow focus on the percentage of the license area population that is impaired overlooks a number of important factors. For instance, certain less-populated areas may hold significant utility value for operators – consider highway interchanges, sports stadiums and areas around them, or large shopping malls at a distance from population centers. For these areas in particular, low-band spectrum such as 600 MHz has *especially* significant value in cost-effectively covering areas in which network traffic is sporadic-but-heavy. Thus, a trivial discount for an impairment covering such an area would reflect only that few people live there, not the true value of foregoing 600 MHz coverage.

³⁹ *FCC Report to Congress on Spectrum Auctions*, Report, WT Docket No. 97-150, 1997 FCC LEXIS 7490, at 42 (1997) (“The Commission chose a simultaneous auction with multiple-round bidding instead of sequential bidding because this method provides more information to bidders about the values of other licenses up for bid and the opportunity to use that information to aggregate licenses or to shift their bidding from one license to another. In addition, it reduces the impact of the winner’s curse...”).

The area impaired also has significant influence on deployment given the needs of mobile network operators to deploy new frequencies such as 600 MHz on existing cell sites. The Commission’s decision to adopt Partial Economic Areas (PEAs) over existing licensing areas will already complicate how a network operator manages deployment if it wins, for instance, 600 MHz spectrum for parts of an encompassing EA but not the full EA.⁴⁰ The addition of impairment areas, in which 600 MHz deployment in an area is even *more* divergent from an operator’s existing deployment architecture, presents not only initial deployment (and upgrade) challenges but also continuing load-balancing challenges as an operator must consider unusually-distributed traffic-loading constraints across its license area. Indeed, impairments could be distributed such that one or two sectors of a cell site are unimpacted by the impairment but a third is, presenting complex deployment challenges and difficult predictive decisions about the utility and value of deploying 600 MHz spectrum in that location.

Irregular contours derived from 600 MHz impairments will be especially impactful to voice service (including VoLTE), which is much more latency-sensitive. Consider, for instance, the network management challenge for an operator as a subscriber leaves a cell site with 600 MHz deployed and approaches a cell site on which 600 MHz cannot be deployed because of broadcast- station-derived impairment. In this scenario, the subscriber could experience hand-off

⁴⁰ Sprint does not consider these costs prohibitive but the deployment scheduling and coordination costs presented by use of an atypical licensing area are nonetheless non-trivial. Sprint has extensively documented the challenges faced by an operator when using geographically-atypical spectrum licenses that must be collocated on an existing network grid. *See, e.g.*, Reply Comments of Sprint Nextel Corp., WT Docket No. 12-269, at 22 (Jan. 7, 2013) (describing the difficult process of “laying irregularly shaped geographic licenses” on existing footprint); Letter from Lawrence R. Krevor, Vice President, Sprint, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 12-269, at 13 (filed April 4, 2014) (describing the “time-consuming process of identifying sites and securing local zoning approvals, permits, and authorizations” when deploying new base stations).

problems because the network scheduler has to assign the user to a *different* frequency as she moves from an unimpaired area to an impaired area.

Notably, these performance and network management harms are less likely to be felt by carriers with ample existing low-band holdings, where the user can be more smoothly handed-off by the network scheduler to another frequency band with similar propagation characteristics (*i.e.*, 700 MHz and cellular). Carriers with limited low-band holdings, however, will suffer more noticeable performance degradation and load-balancing problems – both in the specific inter-cell hand-off situation described above and more generally in load-balancing across and within cells throughout an operator’s network. For precisely these reasons, carriers with dominant low-band spectrum holdings might have significantly less price-sensitivity to impairments, creating the valuation and bidding problems for competitive carriers described in greater detail below. The point isn’t that these deployment burdens and operational penalties are always enormous or unsustainable. They are, nonetheless, characteristics that a bidder should be able to respond to in formulating a bid for such licenses. *Stated more plainly, a bidder needs to know what it is bidding on so that it can account for such considerations in its bidding valuations and strategies.*

What’s more, the impairment discount proposal assumes that each percentage of the population impaired has the same loss of value, irrespective of the *level* of impairment above a certain designated impairment threshold (*e.g.*, 17.3 dBuV/m for 600 MHz wireless base station uplink frequencies). In reality, the varying *intensity of the impairment* (*i.e.*, incremental dBuV/m above the threshold) *within each location in a PEA* holds significant relevance for value.

Additionally, impairment levels close to the interference threshold could invite post-auction remedies (for instance, concurrent operation agreements or arrangements between a licensee and a broadcaster under which a broadcaster adopts interference mitigation techniques

to permit deployment within the predicted impairment area). In both cases, the value an operator attaches to 10% of the population impaired at just above the threshold (*e.g.*, 17.4 dBuV/m) will likely be very different than the value an operator attaches to 10% (and even portions of adjacent) population impaired at 10 dB above the threshold (55 dBuV/m).⁴¹ This difference is, however, not captured by the Commission’s impairment discount proposal.⁴²

Perhaps most problematic of all, the value of being able to deploy 600 MHz channels to cover particular segments of the population vary considerably – a factor the impairment discount does not take into account. Impairment of 33% of PEA 1 could conceivably cover the entire population of the City of New York. Impairment of that same extent – 33% – could instead cover the 14 New Jersey and six Pennsylvania counties located in PEA 1. No wireless operators would place comparable value on the two very different 33% percent impairment situations described above. While conceivably bidders could account for these differences in formulating

⁴¹ Sprint’s Petition for Reconsideration demonstrates that the an interfering signal level determined using F(50,10) statistical measure could be more than 10 dB stronger than a signal level determined using F(50,50) statistical measure.

⁴² Notwithstanding the above, the limited ability of bidders to (potentially) express their relative values for different levels of impairment in the assignment round provides an imperfect and unsatisfactory solution. Indeed, with a single-round sealed bid design, it provides almost no solution at all, as the bidding process does not reveal – nor allow rival bidders’ to react dynamically to -- private information on the value of different impairment levels (and the related predicted ability to mitigate them through arrangements with broadcasters).

This difference in impairment extent has especial relevance for vertically-integrated mobile operators. Retransmission consent negotiations are a paradigmatic ‘repeat player’ game, in which MVPDs and broadcasters routinely negotiate terms and conditions ancillary to carriage rights. *See* Jeff Baumbartner, “Verizon, Viacom Strike New Carriage Deal,” *MultiChannel News* (Oct. 1, 2014) (“Verizon Communications and Viacom have inked a renewal of their carriage agreement for FiOS that will allow the telco to distribute Viacom programming out of customers’ home [through the telco’s FiOS Mobile App] while also clearing the way for a new, national wireless distribution deal [for its separate mobile customers].”). A bidder with a parallel MVPD offering could conceivably secure a broadcaster’s reduction of transmit power, constrained antenna pattern, or other mitigation commitments as part of broader negotiations with more lucrative carriage terms. The relationships these integrated mobile operator-MVPDs have with broadcast stations in particular areas constitute precisely the kind of ‘private information’ certain bidders will have regarding the valuation of impairments that the Commission should, through the auction process, encourage the expression of to promote auction efficiency.

bids in the assignment round, the relative size of the clock price in the makeup of the final (*i.e.*, post-assignment phase and post-discount) price will likely make trivial the ameliorative effect of the impairment discount.⁴³

Overall, the Commission’s proposal to offer a post-clock phase discount to reduce exposure risks has at best a minimal benefit, at worst a distortive effect, and most likely no effect at all. Appendix 1 illustrates each in turn. Only where all bidders have the same valuations for impairments will the discount and assignment round produce efficient outcomes under the Commission’s proposed auction design. The larger and/or more *uncertain* the impairments between blocks in the same category (and thus the larger the potential valuation gap between blocks for rival bidders), the worse uncertainty and exposure risk becomes. In the presence of such uncertainty, and the possibility of having to bid higher than the value of an impaired block, a rational bidder with a high sensitivity to impairments will simply drop out of the auction sooner. The auction structure, in other words, tips the scales in favor of bidders who can tolerate significant (and potentially unanticipated and uncompensated) differences between purportedly ‘generic’ lots within the same bidding category.

A potential example of this is the case of a bidder with a dearth of existing low-band spectrum (and thus a significant need for clear, deployment-ready 600 MHz licenses), bidding against a bidder that, based on already holding an abundance of low-band spectrum, has less immediate need for advantageous 600 MHz spectrum and can thus tolerate higher levels of

⁴³ This problematic scenario is even conceivably worse at lower “Category 1,” impairment levels. For instance, imagine that there are six licenses in New York City: four with no impairment at all, one with a 15% impairment to the highest-valued portions of New York City (for instance, all of Manhattan and 83% of Brooklyn), and one with a 15% impairment over some subset of less-desired counties outside of New York City. The clock price for a high-demand PEA such as PEA 1 – especially with five licenses without impairment to the highest-valued New York City POPs – will likely be so high that even a 15% discount for the impaired license will fail to capture the loss in value to the eventual winner of that block.

impairment. Not only will the former bidder face the Hobson's Choice of continuing to bid above its normal drop-out value or dropping out entirely,⁴⁴ but the bidder will not have the advantage of receiving any cues from the latter bidder's activity that would have *indicated* that it was less price sensitive to impairment– information which would have been directly relevant to the former bidder's calculation of its drop-out price.⁴⁵

If impairments are not comparable across blocks within a category – as is highly likely after the reverse auction– then bidding on generic blocks during the clock phase of the auction with a subsequent assignment phase again favors bidders holding alternative low-band spectrum while disadvantaging bidders not holding alternative low band spectrum options. Thus, with this inherent bias, the proposed auction structure will be likely to produce inefficient results in which competitive carriers are less likely to obtain the low band spectrum they must acquire to support sustainable wireless broadband competition. Given the statutory directive to promote competition in designing the Incentive Auction, as discussed extensively above, this outcome would fail to do so.

⁴⁴ With variability in impairment levels between blocks in a bidding category, a bidder must calculate its drop-out value as a probability calculation relative to all blocks in that category. For a simplified example: if there are two blocks within Category 1, one of which has an impairment reducing the bidder's value of it to 80 and the other which has no impairment such that the bidder's value is 100, a bidder's rational drop-out price would be 90 in the absence of additional, private information.

⁴⁵ In other words, under normal circumstances in a multiple round auction with heterogeneity, the latter (dominant) operator's bidding with respect to the less impaired blocks would *express* its relative valuations, generating important information for both the auctioneer and for rival bidders and promoting auction efficiency.

ii. The Proposed Auction Structure Undermines the Ability of Forward Auction Bidders to Express Their Impairment Tolerance Between Markets

While the Commission at one time stressed the imperative to “provide [auction] bidders with ample opportunity to express the value of interdependent licenses,”⁴⁶ the proposed framework for the Incentive Auction provides an exceedingly limited opportunity to express such values. Indeed, with the only opportunity to express such values in the assignment round, the Commission has structured the auction in such a way as to rely on the submission of single, sealed bids in pre-defined *groups* of PEAs to successfully realize the *entire auction’s* efficiency.

With respect to toleration of impairment as between different markets, the current auction framework only provides bidders with the opportunity to express their relative preference once the clock phase is complete – substantially increasing unacceptable exposure risk. This approach, which contradicts the Commission’s own conclusions about the optimal auction structure where interdependencies exist between combinations of bundles, is a major failing of the current auction structure. That is, the Commission has noted that “[i]f license values are interdependent, sequential oral or electronic auctions are less likely than simultaneous auctions to award interdependent licenses to the parties who value them most highly and to result in the efficient aggregation of licenses, because bidders for licenses that are auctioned early must bid with less information about the value of licenses to be auctioned later, and they will have less opportunity to pursue backup bidding strategies.”⁴⁷ In the context of the Incentive Auction, the

⁴⁶ *Implementation of Section 309(j) of the Communications Act – Competitive Bidding*, Fifth and Final Report and Order, 9 FCC Rcd 5532, 5546 (1994).

⁴⁷ *Implementation of Section 309(j) of the Communications Act – Competitive Bidding*, Fifth and Final Report and Order, 9 FCC Rcd 5532, 5544-5 (1994). *See also FCC Report to Congress on Spectrum Auctions*, Report, WT Docket No. 97-150, 1997 FCC LEXIS 7490, at 29 (1997) (“Much of the debate centered on how to design auctions that appropriately take into account the interdependence of license values – that provide bidders with information about the prices of complementary and substitute licenses,

clock and assignment phases in effect represent a sequential auction, with generic lots auctioned in one stage and specific-frequency licenses (grouped across similar markets) auctioned in a subsequent stage.

This presents a number of conflicting objectives for bidders which cannot be resolved in the submission of a single round sealed bid. For instance, the Commission has proposed to pre-group PEAs for bidding in the assignment round in the interest of auctioneer simplicity.⁴⁸ This introduces a serious problem for a bidder who, in certain top-markets may find unimpaired spectrum *imperative* given its lack of alternative spectrum holdings or because the predicted impairment area covers critical population segments or service locations so significantly that the licenses' value is severely below even the post-discount price, but who, *in other markets*, might have less demand for unimpaired spectrum – or less demand for unimpaired spectrum relative to the anticipated assignment round cost of obtaining it. Such a scenario is more than conjectural; for example, bilateral spectrum sharing agreements reduce the limited amount of 800 MHz spectrum Sprint holds in areas close to the Mexican and Canadian borders.⁴⁹ In these areas, Sprint might place more value on obtaining a fully unimpaired 10x10 MHz channel, whereas in other areas its demand elasticity might be more affected by price, degree of impairment or other considerations.⁵⁰ Instead, bidders are confronted by an unsatisfactory choice of applying their

facilitate pursuit of backup strategies as more information becomes known, and promote aggregation of licenses into efficient bundles.”).

⁴⁸ *Comment Public Notice* ¶ 201-202.

⁴⁹ *See Improving Public Safety Communications in the 800 MHz Band*, Report and Order, 19 FCC Rcd 14969, n. 733 (2004) (noting the lower amount of 800 MHz spectrum Sprint would receive in border markets).

⁵⁰ Recall that the Commission has in the past celebrated the information-expression and response functions of an auction not simply with respect to bidding competition, but also with respect to revealing

preference for specific frequencies (and thus level of tolerance for impairment) evenly across all grouped PEAs, despite varying toleration for these characteristics between markets. In other words, the Commission’s proposed assignment round procedures, in conjunction with the clock phase, makes winning bidders unable to specify in which markets they might be willing to tolerate certain predicted impairments versus those in which they absolutely could not handle the predicted impairments and would be willing to pay more to avoid.

By narrowing bidder opportunity to express – and respond to – heterogeneity and interdependency among blocks and across markets, the Commission’s proposal substantially increases exposure risk, potentially subjecting bidders to ‘win-lose’ decisions.⁵¹ If, on the other hand, bidders have the opportunity to express and respond to preferences at earlier stages in the auction, specifying their levels of preference for specific impairments more accurately in each market, win-win, auction-efficient outcomes would be far more likely.

III. THE FORWARD AUCTION PROCESS CAN BE MODIFIED TO PROMOTE GREATER BIDDER CONFIDENCE AND AUCTION EFFICIENCY, BETTER ENSURING THE AUCTION’S OVERALL SUCCESS

A. The Foregoing Discussion Demonstrates the Need for Frequency-Specific Bidding

Instead of proceeding with the auction utilizing procedures that have a high likelihood of undermining forward auction bidder confidence – and, perhaps more importantly, resulting in auction inefficiency and non-competitive outcomes in assigning spectrum blocks – the

“valuable information about the opportunity cost of spectrum.” *FCC Report to Congress on Spectrum Auctions*, Report, WT Docket No. 97-150, 1997 FCC LEXIS 7490, at 5 (1997).

⁵¹ In other words, choosing to submit an assignment round bid (which, depending on the anticipated -- and eventual -- assignment round bids of rival clock-phase winners, could result in paying a significant premium) to ensure that it does not win impaired spectrum in a particular market (but then having that same configuration in all other pre-grouped PEAs). Or, alternatively, choosing *not* to submit a bid given the increased cost, but being consigned to consistently-impaired blocks in a number of critical PEAs.

Commission has an opportunity to adopt auction procedures that could greatly simplify and improve the incentive auction.

Sprint recognizes that in developing competitive bidding procedures for the Incentive Auction, the Commission is attempting to balance a number of important considerations. The Commission has emphasized that minimizing the number of bidding categories and using a sequential format would speed up the forward auction bidding process,⁵² purportedly promote “simplicity” for forward auction bidders,⁵³ and reduce the amount of time reverse auction participants would need to wait on the outcome of the forward auction.⁵⁴ These are important objectives. Sprint respectfully submits, however, that each reflects only a facet of the Commission’s overarching objectives of auction design simplicity, promoting participant certainty, increasing spectrum efficiency, and, most importantly, promoting competition. Unless the reverse auction and repacking result in *truly* generic spectrum blocks, and the assignment round allows winning bidders to express relative preferences between markets, the proposed auction structure will force many bidders to make sub-optimally-informed choices among very different spectrum blocks, thereby undercutting the pro-competitive goals that should drive the Incentive Auction’s structure and processes.

This outcome would be especially disappointing in the context of the Commission’s core competition and spectrum efficiency goals. Indeed, the Commission’s statutory mandate of designing competitive bidding mechanisms that promote competition and spur the rapid

⁵² *Comment Public Notice* ¶ 144.

⁵³ *Comment Public Notice* ¶ 147.

⁵⁴ *Incentive Auction Order* ¶ 10.

deployment of “valuable new services” and “efficient and intensive use of the spectrum” will be seriously undermined by this outcome.⁵⁵

Sprint respectfully submits that the Commission can successfully avert these risks – and better effectuate its key statutory and policy goals – by utilizing the opportunity presented by the *Comment Public Notice* to improve upon, and correct, underlying defects brought to light by the proposals therein. Fundamentally, this involves adopting competitive bidding procedures that allow bidders to express preferences for heterogeneous and interdependent lots so as to ensure that, as a matter of auction efficiency, auction prices reflect competitive market values associated with specific licenses. As the Commission explained in its *Incentive Auction Order*, “An objective common to all FCC auctions of spectrum licenses is that the auction prices generally reflect competitive market values for comparable spectrum licenses.”⁵⁶

B. Successful Auction Operation Requires Block-Specific Bidding

As detailed above, the “two-step process” of the clock and assignment phases do not “give bidders the benefits of price discovery in the clock rounds” and thus do *not* “permit[] them to shift bidding strategies as the relative price differences of different categories of licenses

⁵⁵ See, e.g., *Mobile Spectrum Holdings Order* ¶ 6 (describing the requirement, under the Communications Act, that the Commission’s design of systems of competitive bidding “must (1) ‘include safeguards to protect the public interest in the use of the spectrum,’ and must seek to promote various objectives, including (2) ‘promoting economic opportunity and competition and ensuring that new and innovative technologies are readily accessible to the American people by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants,’ (3) encouraging rapid deployment ‘including...in rural areas,’ and (4) promoting ‘efficient and intensive use’ of spectrum.”). See also 47 U.S.C § 309(j)(3) – Design of systems of competitive bidding; *Implementation of Section 309(j) of the Communications Act – Competitive Bidding*, Fifth and Final Report and Order, 9 FCC Rcd 5532, 5541-2 (1994).

⁵⁶ *Incentive Auction Order* ¶ 343.

change.”⁵⁷ Specifically, because of the significant – and unpredictable – variability between licenses *within* a single bidding category, compounded by the uncertain relative value these unpredictable impairments create *between* bidding categories, bidders effectively must bid with considerable conjecture and uncertainty – and without clues as to the relative valuation of other bidders as to these characteristics. Faced with uncertainty as to the relative value of blocks within and across these bidding categories, and no opportunity for critical private valuation information reflecting heterogeneity to be expressed or responded to, bidding during the clock phase will result in clock prices that do not reflect the competitive market values of licenses within each category.

Furthermore, the assignment phase auction format provides at best a *limited and belated* expression of these differences, as the single round format prevents bidders from dynamically *responding* to revealed preferences of other bidders.⁵⁸ The single round assignment phase format blunts the expression of multiple different preferences (degree of impairment, relative value for impairment as between similar ‘high-demand’ PEAs, and, to the extent possible in the case of winning three or more licenses, contiguity of all spectrum) by requiring bidders to express all of these different, potentially conflicting, preferences within a single sealed bid, across a grouping of ‘high-demand’ PEAs or Regional Economic Area Groupings (REAGs).

⁵⁷ *Incentive Auction Order* ¶ 515.

⁵⁸ An alternative approach that effectively eliminates exposure problems by merging the clock and assignment phase into a single multi-stage bidding process is the Milgrom Assignment Auction. See Paul Milgrom, “Assignment Auctions,” Working Paper (April 10, 2008), available at <http://web.stanford.edu/~milgrom/WorkingPapers/Assignment%20Auctions04102008.pdf> and Auctionomics, “Milgrom Assignment Auction,” available at <http://www.auctionomics.com/products/milgrom-assignment-auction/>

These considerable difficulties counsel in favor of a more traditional auction, in which bidders express their demand for specific blocks, knowing the extent and locations of impairments associated with each block and each block's conduciveness to aggregation into 10x10 MHz or larger channels. The integration of block-specific bidding over the course of the entire auction process will promote a number of critical auction design objectives. Chiefly, this approach would significantly improve bidder confidence regarding the extent and location of impairments on blocks bidders are bidding on. As a consequence, bidders would be encouraged to bid more candidly and aggressively, without the fear that a block they have won during the clock phase will be significantly more impaired than predicted, and not (based on more accurate information) largely similar (in terms of network utility) to a less expensive block in a separate bidding category.

An auction design which incorporates block-specific bidding during the normal course of auction activity will enable bidders to express value for contiguity, their impairment-appetite, and their relative value for impairment *as between* markets. More importantly, still, for auction efficiency (that is, matching licenses with bidders who value them most), this will permit bidders to *react* to the revealed preferences of rival bidders as regards this same information.

Sprint appreciates the Commission's concern that the proposed auction structure facilitates timely forward auction completion and its resultant choice of an ascending clock format. Sprint submits that a clock auction remains a suitable forward auction framework notwithstanding using block-specific bidding rather than a generic block approach.⁵⁹ As the Commission's economists have noted elsewhere, all that is necessary is to ensure that "[t]he

⁵⁹ Sprint notes that the Commission could, alternatively, adopt an SMRA format, with auction procedures tailored to achieve the Commission's objectives related to the speed of the auction.

number of clock prices is equal to the number of heterogeneous items.”⁶⁰ This approach would also eliminate the need to develop arbitrary bidding categories, as frequency-specific bidding would enable the Commission to auction *all* 600 MHz spectrum, regardless of the impairment level, in each market. With concrete information about the extent and location of impairments to each block, bidders would be able to submit bids that, in aggregate, express the true value of each block – without the need for an ineffective and arbitrary impairment discount to accomplish this task. What’s more, by more effectively managing exposure risk and the activity-chilling effects of the “winner’s curse,” this format will very likely *reduce* the entire duration of the Incentive Auction. Specifically, by bidding their genuine values under conditions of more-perfect information, forward auction participants will bid more confidently and aggressively, reducing the likelihood that the forward auction will have to move to a subsequent stage due to chilled bidding related to bidder uncertainty. This approach balances the Commission’s speed-related goal with its other overriding goals of promoting competition and a simpler, more transparent, certainty-promoting bidding process.⁶¹ Indeed, the Commission’s statutory mandate in designing competitive bidding systems under Section 309(j)(3) directs that the Commission give the highest priority to auction designs that promote competition, intensive and efficient spectrum use, and the deployment of new services.

⁶⁰ *A Market-Based Approach to Establishing Licensing Rules: Licensed Versus Unlicensed Use of Spectrum*, Office of Strategic Planning and Policy Analysis Working Paper No. 43, at 10 (rel. February 2008).

⁶¹ The Commission has in the past considered precisely this balancing test of speed vis-à-vis auction efficiency and concluded that where the value of such licenses is high (as will almost certainly be the case in the 600 MHz auction), the benefits of administrative simplicity and speed decrease (and vice versa). *See Implementation of Section 309(j) – Competitive Bidding*, Fourth Report and Order, 9 FCC Rcd 2330, 2332 (1994). (“We further explained that when the values of particular licenses to be auctioned are low relative to the costs of conducting a simultaneous multiple round auction, we may consider auction designs that are relatively simple, with low administrative costs and minimal costs to auction participants.”).

C. Location of Impairments within the 600 MHz Band

Utilizing a more efficient, frequency-specific bidding process will require the Commission to identify population percentage impairments to licenses prior to the commencement of the forward auction, the specific frequencies on which impaired licenses are located, and the geographic scope of the impairments.

Regarding the distribution of impairments within the repurposed 600 MHz band, Sprint urges the Commission to ensure that all impaired blocks within a market are contiguous, so as not to create a ‘checkerboard’ allocation in the licensed spectrum. Sprint encourages the Commission, to the extent possible, to put all remaining broadcasters side –by-side in any market in which multiple stations must remain within the 600 MHz Band. This not only limits the impairments within a PEA (obviating the possibility of a station causing impairments at frequencies both above and below it),⁶² but also prevents the creation of a disjointed band with fewer contiguous licensed blocks.

To minimize market variability, Sprint also encourages the Commission to locate remaining 600 MHz stations on common frequencies within the 600 MHz band. This deliberate placement promotes bidder confidence by allowing bidders to pursue common frequencies (with common degrees of impairment across different geographic areas). Further, this also better allows future 600 MHz licensees to build equipment to filter out harmful interference from broadcast stations with equipment targeted to filter specific frequencies.⁶³

⁶² For the same reason, this will limit impairments of blocks across PEAs, as adjacent markets have (for the same reason) fewer potentially impaired blocks related to placement of television stations within the 600 MHz band in an adjacent market.

⁶³ In the case of stations located in the uplink, this allows for the development of base station filters. While Sprint observes that technological solutions are less availing at the present time for impairments in the downlink (i.e. to UE receive), Sprint nonetheless believes that any decision the Commission makes

These two considerations – uniform assignment locations for any television stations remaining in the 600 MHz band (to the maximum extent below Channel 37 or in the impaired spectrum just above the guard band) and assignment contiguity in the event of multiple stations remaining in the band within a single market – best promote the Commission’s “goals of limiting the potential for inter-service interference and maintaining a generally consistent band plan.”⁶⁴

The *Comment Public Notice* offers the Commission the opportunity to adopt procedures that more effectively ensure that auction prices reflect the competitive market value of specific (and varyingly impaired) licenses and combinations of licenses. Specifically, the Commission should adopt block-specific bidding to address these significant concerns.

IV. THE COMMISSION CAN FURTHER PROMOTE ITS COMPETITION GOALS AND AUCTION DESIGN OBJECTIVES BY IMPLEMENTING THE SPECTRUM RESERVE AT THE COMMENCEMENT OF THE FORWARD AUCTION

Cognizant of structural imbalances in the wireless broadband market, the Commission developed the “spectrum reserve” to ensure that carriers with little or no low-band spectrum have a reasonable opportunity to bid for and win 600 MHz spectrum; in other words that the Incentive Auction design assure “access to below 1-GHz spectrum by multiple providers.”⁶⁵ In

should be done in consideration of improvements upon UE filtering capabilities that are currently in development and would likely be widely available by the time the 600 MHz band is ready for deployment.

⁶⁴ *Comment Public Notice* at ¶ 35.

⁶⁵ *Comment Public Notice* ¶ 152. The Commission’s spectrum reserve reflects one way of advancing the goal of promoting wireless broadband competition through broader access to competition-enhancing sub-1 GHz spectrum. Other, not necessarily mutually-exclusive, mechanisms exist to successfully promote this goal, such as auction-specific caps on bidders with dominant low-band spectrum holdings and (as Sprint has described in separate comments in the Commission’s Part 1 Rules proceeding), permitting joint bidding and deployment arrangements between or among carriers that lack critical low-band spectrum.

formulating the spectrum reserve, however, the Commission determined that it needed to balance its pro-competitive goals with what has been another central goal contained in the Spectrum Act: generating sufficient revenue to fund the nationwide interoperable public safety broadband network, the First Responder Network Authority (FirstNet). As a consequence, the Commission proposed a number of auction procedures to ensure that the Commission’s pro-competitive spectrum reserve policy does not negatively impact overall auction proceeds, a portion of which was deemed necessary to fund FirstNet.⁶⁶ Most notably, the Commission has proposed to “set the spectrum reserve trigger” at the point when the Final Stage Rule is satisfied,⁶⁷ and to determine the *size* of the reserve (up to its 30-20-10 MHz maximum ceiling) based on reserve-eligible demand “at the time the auction reaches the trigger.”⁶⁸

The recently completed AWS-3 auction generated over \$40 billion in auction revenues thus fully funding FirstNet and obviating the need to structure the Incentive Auction to assure such funding. Separately, the implementation proposals reflect the Commission’s preference for establishing the reserve in a manner that does not provide more reserve spectrum than demanded by reserve-eligible bidders in any PEA. As Sprint describes, however, this latter consideration presents a problematic and unnecessary auction design mechanism that reduces bidder confidence and severely threatens the bidding flexibility of the competitive carriers whose access

⁶⁶ *Mobile Spectrum Holdings Order* ¶ 151 (noting that the first component of the Final Stage Rule serves to ensure that forward auction revenues meet or exceed the price necessary for market-clearing of broadcasters, while the second component served to ensure sufficient revenue for FirstNet).

⁶⁷ *Mobile Holdings Order* ¶ 187.

⁶⁸ *Comment Public Notice* ¶ 151. Sprint supports increasing the size of the spectrum reserve. See Reply Comments of Sprint Corp. in Response to T-Mobile’s Petition for Reconsideration, WT Docket No. 12-269, GN Docket No. 12-268, at 3 (Oct. 6, 2014).

to low-band spectrum – and resulting impetus to competition and broadband deployment – the Commission seeks to promote.

A. New Information Sheds New Light on How the Commission Should Balance These Goals

The AWS-3 auction results have demonstrated that wireless operators have a robust demand for spectrum, eliminating any need for adopting additional revenue-focused procedures. In this sense, the historic revenues generated by the AWS-3 auction obviate even the *remotest* concern the Commission should have about the 600 MHz auction. Given the Commission’s general statutory duty *not* to develop its competitive bidding systems with respect to the “expectation of Federal revenues,” a legitimate case can be made that – consistent with the robust and forward looking dictates of Section 309(j)(3) – that Commission’s *only* revenue concern should be in ensuring that the forward auction generates sufficient money to meet the expense component of the reverse auction.⁶⁹

In that regard, however, Sprint has extensively documented the ways in which the Commission’s currently proposed competitive bidding procedures significantly undermine bidder confidence and could lead to cautious bidding and premature drop-outs. The

⁶⁹ Subordinating revenue-generation to competition, auction efficiency, and spectrum deployment goals not only reflects Congress’s explicit mandate but also good public policy. Myriad examples demonstrate that where spectrum policymakers adopted poor auction designs, focusing unduly on revenue generation and not competition and efficiency, auction outcomes resulted in extraordinary delays to deployment of next-generation networks and less downstream competition. *See, e.g.,* David J. Salant, *A Primer on Auction Design, Management, and Strategy*, at 123 (2014) (noting that, although the German 3G Auction seemingly was a success, raising considerable revenue, many of the winners (including the prospective new entrants) responded to the exorbitant auction prices by surrendering their licenses after a number of years and never deploying service); Kevin J. O’Brien, “3G cost billions: Will it ever live up to its hype?,” *New York Times*, (July 30, 2006), available at <http://www.nytimes.com/2006/07/30/technology/30iht-3G.html> (describing numerous instances in which European 3G auctions which raised considerable revenues nonetheless resulted in carriers “pruning their 3G ambitions,” slowing deployment and even surrendering their licenses)

Commission's focus thus should be on developing competitive bidding mechanisms that *predominantly* fulfill its statutory duties under Section 309(j)(3) with *sufficient* revenue generation as its sole ancillary concern.

Indeed, the signal lesson of the AWS-3 auction has been that the competitive imbalance between wireless operators remains formidable, and the Commission's pro-competitive goals *remain* unachieved. No *wireless operator* came close to matching AT&T and Verizon – in either licenses won or (as a measure of in-auction competitiveness) maximum financial exposure. In other words, the nation's two largest wireless operators have only entrenched their dominant competitive (and spectrum) positions, supplementing their commanding hold of scarce low-band spectrum with significant higher-frequency spectrum.

B. The Commission's Proposed Procedures Associated with the Reserve Frustrate the Commission's Competition Goals, Particularly in Light of Recent Developments

Relevant to this rebalancing in favor of its statutory mandate to promote competition, the Commission has acknowledged that reserve-eligible bidders will be especially “reliant on 600 MHz band spectrum to expand coverage and compete in the mobile wireless marketplace.”⁷⁰ For this reason, it is especially important that the Commission avoid adopting procedures which unnecessarily complicate bidding, undermine certainty and reduce participation by reserve-eligible bidders. Sprint has documented herein the myriad ways in which the Commission's proposed competitive bidding procedures for the Incentive Auction have the likelihood of undermining confidence among *all* bidders, with the inability to express and respond to preferences pertaining to license heterogeneity reducing auction efficiency across the board.

⁷⁰ *Comment Public Notice* ¶ 153.

Sprint has also demonstrated that this uncertainty has *especially* detrimental consequences for competitive bidders. With a greater need for deployment-ready, competition-enhancing low-band spectrum that is both relatively unimpaired and contiguous – and the financial inability to rectify higher-than-anticipated impairments post-auction without seriously compromising overall competitiveness – competitive operators are disproportionately susceptible to negative auction design elements that promote uncertainty.

i. Uncertainty Generated By the Reserve-Implementation Proposals

The Commission has structured the triggering of the reserve as contingent on the condition precedent of meeting a specific revenue target. Thus, the reserve will not come into existence until the Final Stage Rule has been satisfied, at which time only reserve-eligible bidders can bid on certain generic Category 1 blocks in each PEA.

Complicating this situation further, as a means of ensuring that the size of the reserve is no larger than the aggregate demand of reserve-eligible bidders in each PEA, the Commission proposed to shrink the reserve to the number of blocks demanded by reserve-eligible bidders in each PEA “at the time the auction reaches the trigger, *i.e.*, when the final stage rule is satisfied.”⁷¹ This is, the Commission argues, to ensure that the auction does not provision more spectrum reserve blocks than there exists demand by reserve-eligible bidders.⁷² As a consequence, bidders won’t know what the size of the reserve is in each PEA at the beginning of the auction. This approach not only sows uncertainty among reserve-eligible bidders in early rounds; it does so in a completely unnecessary way: as described in greater detail below, the Commission could just as effectively ensure that reserve-eligible supply does not exceed reserve-

⁷¹ *Comment Public Notice* ¶ 151.

⁷² *Id.* ¶ 151.

eligible demand by *retracting* designated reserve blocks from the spectrum reserve after a certain point at which the Commission does not think the revenue target has been met, instead of ‘*dropping in*’ reserve blocks subsequent to that point. The auction inefficiency engendered by the latter approach is described in greater detail below.

Further promoting reserve-eligible bidder uncertainty, owing to the Commission’s proposal to auction generic blocks, reserve-eligible bidders will not know where the reserve blocks on which they are bidding will be placed within the band plan. Moreover, reserve-eligible bidders will not know the extent of impairments within Category 1 reserve blocks compared to other Category 1 blocks (despite having a greater need for deployment-ready low-band spectrum and less financial ability to tolerate impaired spectrum), as the Commission has proposed to regroup all Category 1 blocks for purposes of bidding in the assignment phase.⁷³

Furthermore, Sprint’s analysis has identified instances in which blocks designated Category 1 using a F(50, 50) statistical measure are, on the basis of measures operators rely to construct and manage their networks such as F(50,10), more equivalent to Category 2 blocks – or even blocks so heavily impaired that under the Commission’s proposed thresholds they should not have been auctioned in the first place. Yet bidders could end up paying significantly above the competitive market value in high-demand market because of the clock’s inexorable rise to reflect *genuinely* unimpaired blocks within that bidding category. Overall, this structure results in very complicated and inhospitable auction for reserve-eligible bidders, undercutting the Commission’s goals of keeping the forward auction as simple as possible, increasing bidder certainty, and promoting broad access to low-band spectrum.

⁷³ *Comment Public Notice* ¶ 205.

Put simply, the Commission's complicated proposals for identifying the amount of and auctioning reserve spectrum severely and disproportionately inhibits bidding flexibility for reserve-eligible bidders – and particularly for smaller bidders not necessarily seeking to acquire 600 MHz licenses nationwide. Under the current proposal, the contingent emergence of the spectrum reserve will inhibit reserve-eligible bidders' ability to move between markets to respond to price differences in early rounds. As analysis of past auctions *routinely* shows, early bidding activity of all bidders consistently focuses on larger markets for purposes of maximizing bidder eligibility (and thus retaining critical bidding units). Over time, bidding activity naturally spreads to mid- and small markets, with bidding more accurately reflecting the demand of bidders for licenses in specific markets. The inevitable consequence of the Commission's proposed implementation of the spectrum reserve – both contingent and punitive if reserve-eligible bidders have not shifted their demand to all their desired markets in time – is to make reserve-eligible bidders considerably less able to bid aggressively and actively as dominant rival bidders. Ever-fearful that the spectrum reserve could shrink in any given round because the trigger has been met, reserve-eligible bidders will have to park their eligibility in all their desired mid- and small markets. As a consequence, reserve-eligible bidders will have less bidding flexibility from the very outset of the auction. Dominant bidders will, by contrast, be able to respond to successfully switch their demand across PEAs (and bidding categories within PEAs) in response to changes in price and demand.

C. Resolving the Threat to Reserve-Eligible Bidding In A Way that Promotes Bidding Certainty and Flexibility

For all of the above reasons, reserve-eligible demand should not be determined on the basis of a single round. The hallmark of auction efficiency is the normal fluctuation of bidding

activity across different lots as rival bidders reveal their preferences and values; as the Commission noted elsewhere in the *Comment Public Notice*, “making it harder for bidders to switch their demands across categories” runs afoul of good auction design.⁷⁴

i. Implementing the Reserve Without Undermining Bidding Certainty and Flexibility

Sprint respectfully submits that the most effective way to implement the reserve while balancing the Commission’s numerous auction design goals is to begin the forward auction with reserve block designations in place. This will allow reserve-eligible bidders to clearly express their demand for reserve blocks while also permitting them, as in normal auctions, to focus on high-demand markets in early bidding rounds, shifting their demand to mid- and small markets as bidding progresses.

After some lapse of time – specifically, once the bidding has normalized such that demand in larger markets reflects true demand (and not eligibility-preserving bidding) – the Commission should evaluate whether the supply of reserve blocks exceeds reserve-eligible demand. If, for instance, after a specified round the reserve-eligible demand is low (perhaps as measured by bidding eligibility) and the Commission determines bidding is not likely to reach the Final Stage Rule, the Commission could issue an advance notification, indicating that it will, in a future round (perhaps five rounds later), the supply of reserve-spectrum in markets where there is insufficient reserve demand. After 20 rounds, the Commission will have information about how much demand is in the auction. (In Auction 97, the value of all bids had already reached \$50B by round 15, while the auction closed after round 441, generating high bids totaling over \$44.8B). In this manner, reserve-eligible bidders can observe demand after having

⁷⁴ Id. ¶ 154.

some opportunity to assess prospects before having to commit budgets to specific PEAs. If those conditions are not satisfied during the bidding rounds after the advance notification is issued, the Commission could convert spectrum reserve blocks into non-reserve blocks.⁷⁵

Thus, on PEA-by-PEA basis the Commission would not only identify block-by-block information (impairments), but also designate which specific blocks are eligible for the reserve. Precisely because reserve-eligible bidders are so reliant on 600 MHz spectrum – and in most cases lack broadband-capable low-band channels, the Commission also should ensure that any blocks designated for the reserve are contiguous and comprise the least impaired licenses.⁷⁶

Taken together, these proposals would considerably reinforce bidder confidence and certainty from the outset of the forward auction. With a better understand of the blocks on which bidders are bidding, bidders would be induced to bid their true values and more aggressively. Far from depressing revenue, the likely effect would be to promote vigorous bidding activity, ensuring that bidders win licenses at their competitive market value. This corresponding benefit of such auction-efficient outcomes would also be to promote the rapid and intensive deployment of new wireless services, as bidders acquire licenses at prices reflecting their utility value.

⁷⁵ Should the Commission decline to adopt this proposal it would be all the more imperative to address the threats to reserve-eligible bidding flexibility by, for instance, averaging reserve-eligible demand across a set number of rounds to determine the size of the reserve.

⁷⁶ Even if the Commission chooses to not adopt the revised bidding procedures proposed herein, it any case should include only Category 1 licenses in the reserve when the number of Category 1 licenses is greater than or equal the number of license in the reserve (as the Commission has proposed; *Comment Public Notice* ¶ 151). Further, in spectrum-constrained markets which either result in a larger number of Category 2 licenses, or which constrain the number of all licenses, competitive carriers will be particularly dependent on acquiring 600 MHz spectrum. In those cases, Sprint suggests that the Commission supplement the reserve in these markets with Category 2 licenses – ideally those with the lowest level of impairment (which are most likely to be contiguous to Category 1 licenses in the reserve, promoting the potential for contiguity).

V. **ADDITIONAL CHANGES WOULD IMPROVE THE PROPOSED FORWARD AUCTION PROCEDURES**

Sprint suggests that the Commission adjust several other proposed forward auction procedures to remove complexity, promote bidder certainty, and enable stronger competition through the auction.

A. Timing Between Reverse and Forward Auctions

The Commission has proposed to start forward auction bidding in the initial stage on the second business day after the close of bidding in the stage's reverse auction.⁷⁷ Sprint respectfully disagrees. First, Sprint believes that the Commission should take sufficient time after the completion of any reverse auction stage to consider refinements to the repacking plan so as to maximize the amount of unimpaired spectrum that will be offered in the forward auction. During the reverse auction, the Commission has determined that it will perform only limited analysis of the feasibility to repack DTV stations that would remain on the air. However, after a reverse auction stage has been completed the Commission should take the opportunity to optimize the provisional channel repacking plan similar to what it has proposed to do after the final stage rule is satisfied.⁷⁸ In particular, the Commission should consider adjustments to the provisional repacking plan that would reduce the amount and level of impairments predicted to occur in the 600 MHz blocks that are about to be auctioned. In taking such an action, the Commission would be able to auction more useful and valuable spectrum blocks, and would also be able to reduce the uncertainty that forward auction bidders might have about whether the level

⁷⁷ *Comment Public Notice* ¶66.

⁷⁸ *See Comment Public Notice* ¶129 and Appendix E.

of impairment in a particular block could be significantly improved after the forward auction is over.

The Commission should provide two weeks, after it optimizes its provisional repacking plan and provides block impairment information, for forward auction bidders to adequately assess the number of spectrum blocks that will be available for auction in each PEA, and the level and location of impairment that will exist in each of those blocks. As discussed above, the amount of impairment is likely to vary greatly between spectrum blocks, and also vary greatly between different locations within a spectrum block. Forward auction bidders, in order to properly evaluate the usability and value of a spectrum block, need adequate time to analyze that information. This is particularly critical to support bidding on individual spectrum blocks rather than generic blocks and achieve the benefits of that approach. Otherwise, forward auction bidders are likely to discount their bids because of the great uncertainty and unknown variability that can occur. While the Commission is correct in setting a goal for conducting a speedy auction, the Commission's central goal of "allowing market forces to determine the highest and best use of spectrum" should be the guiding goal. Indeed, Sprint believes that it is far more important to have a successful 600 MHz auction than to have a less successful but speedier auction.

B. Activity Rules

The Commission proposes that forward auction bidders be required to maintain a fixed, high level of activity – between 92 and 97 percent of the bidder's eligibility – in all regular clock rounds.⁷⁹ Sprint proposes that the Commission instead start the auction with more typical

⁷⁹ *Comment Public Notice* ¶186.

activity requirements, such as 80 percent of the bidder's eligibility, as was used in the recent AWS-3 auction, and only move to higher activity requirements during the later stages of the auction. While such an approach might ensure that "the auction moves as quickly as possible," Sprint believes that it also inhibits bidders that are looking to deploy their assets in the most cost-effective manner based on the constantly-changing market opportunities. Typically in the early stages of a spectrum auction, bidders will move their bids between markets, and between licenses within a market, until they are satisfied that they have obtained the best possible spectrum available within their budget. This approach helps ensure that the spectrum is auctioned for the highest and best use.

The Commission's proposed fixed, high level activity rule would significantly limit the ability for a bidder to make such moves, and could easily foreclose the opportunity for a bidder to obtain the greatest amount of spectrum it can in the markets it is targeting. Suppose, for example, a bidder wants to buy licenses in New York, San Francisco, and Los Angeles. While the bidder can afford one license in all three markets, it can only afford to have a second license in either New York City alone or Los Angeles and San Francisco combined. Ideally, the bidder should be able to shift its interest between those two market options until either the bidder is able to secure the second license or the bidder is priced out of one of the markets. An 80 percent activity rule would permit such bidding and would also help ensure that the highest and best use of the spectrum in all three markets is obtained; however, the Commission's higher activity rule proposal could foreclose the bidder from obtaining second licenses in Los Angeles and San

Francisco, even if those licenses proved to be less expensive than a second license in New York City.⁸⁰

The Commission's proposed high level activity rule is likely to impact small competitive operators on an even greater scale, potentially limiting a regional operator's ability to obtain enough licenses in key markets within the target region. Thus, Sprint recommends that the Commission initially use an 80 percent activity rule and permit bidders to determine the most efficient use of their bidding budgets. As in a typical auction, the Commission could in subsequent rounds increase the activity rule (or decrease the length of bidding rounds) if the Commission determines it needs to accelerate the pace of the auction.

C. Activity Waivers

The Commission has proposed to not provide activity rule waivers to preserve a bidder's eligibility.⁸¹ Sprint understands that the proposed auction structure (an ascending clock auction) is not as conducive to activity waivers as a Simultaneous Multi-round Auction (SMRA), because the Commission must be able to determine, in real-time, at what point demand is equal to supply. Nonetheless, Sprint believes that, especially with an auction this complex, some flexibility is needed in order for bidders to make intelligent decisions.

⁸⁰ The number of bidding units required to bid in New York City (27,000) is 88% of the bidding units required to bid in Los Angeles and San Francisco (30,700). Under an 80% activity rule, a bidder could move between New York City and Los Angeles/San Francisco without sacrificing bidding eligibility. Under a 92% activity rule, however, the bidder would lose its ability to bid in Los Angeles and San Francisco if it placed its second license bid in New York City even for just one bidding round, regardless of whether the bidder retained sufficient budget to meet the clock prices in Los Angeles and San Francisco.

⁸¹ *Comment Public Notice ¶188.*

Regulators have provided limited activity relief in similar auctions. For example, the Canadian regulator provided bidders in its AWS-1 auction two activity waivers.⁸² In recent Combinational Clock Auctions in the United Kingdom (for 800 MHz and 2600 MHz licenses) and in the Netherlands (for 4G licenses), the regulators allowed each bidder to take up to two 30-minute round extensions. Sprints suggests that the Commission provide similar opportunities for bidders in the 600 MHz forward auction, at least after the eligibility ratio falls below 1.5.⁸³ As bidding progresses towards completion of the auction, the Commission should increase the activity waivers or recess allowance, ensuring that additional time is granted only to serious bidders. Such relief would provide bidders the opportunity to ensure that they have adequate time to evaluate the most critical bidding opportunities in this auction and, as such, ensure that the repurposed 600 MHz spectrum is put to its highest and best use. By limiting the amount of waivers and/or extensions, the Commission can ensure that, at the same time, the auction moves to completion within a reasonable time frame.

D. Bidding Units

The Commission proposes to set the bidding units of each PEA by weighting population by an index of relative prices, which incorporates AWS-3 auction information.⁸⁴ While market-based information across numerous transactions can be a useful way to estimate substitution between different licenses in any given auction, SMRA outcomes can have some distortions in

⁸² While this auction was technically an SMRA auction, bidders were permitted to agree only to a fixed bid increment, and bidders could not choose any price other than the posted price. As such, this auction was essentially a clock auction with provisionally winning bids.

⁸³ An eligibility ratio of 1.5 indicates that there is, on average, only 1.5 bidders left for each block. This is often indicative that the auction is winding down and that only serious bidders remain bidding.

⁸⁴ See *Comment Public Notice* ¶ 162.

any given auction. One possible reason for this is that budget constraints or eligibility issues may limit the ability of bidders to express their true valuations and relative prices can end up distorted.⁸⁵

Avoiding market anomalies is crucial for providing incentives for bidders to make offers based on actual perceived 600 MHz values, and to achieve an efficient auction outcome.

Assigning Bidding Units in ways unrelated to current market value risks interfering with the efficiency of the SMR or clock auction by hindering arbitrage opportunities that would promote efficient allocations of licenses. Sprint suggests that the Commission adopt a much simpler bidding unit approach rule that is based more closely on the actual POPs within the PEA, with increased bidding units/POP in the largest PEAs and reduced bidding units/POP in rural PEAs.

E. Post-Auction Remedies

The Commission should make clear that 600 MHz licensees can reach post-auction agreements with any broadcaster that remains in the 600 MHz band to minimize impairments. Such agreements could include arrangements under which the broadcaster utilizes interference-mitigation techniques such as reduced power or directional antenna patterns, and could also permit an agreement to cease broadcast operations.

⁸⁵ We illustrate this point by examining some anomalies in the allocation of bidding units in the AWS-3 auction. In that auction, participants could bid in two different regional divisions: BEAs and CMAs. BEAs are a coarser partition of the US and each BEA was comprised of several CMAs. Surprisingly, there were a number of regions in which the FCC assigned more bidding units to the CMA than to the entire BEA to which the CMAs belonged. This was the case in the following locations:

	BEA	CMA
Buffalo, NU	59,000	213,000
Rochester, NY	297,000	328,000
Tucson	333,000	456,000
Sacramento	1,006,000	1,394,000

Source: FCC Auction 97, DA 14-1018, Attachment A

VI. CONCLUSION

For the foregoing reasons, Sprint respectfully submits that the Commission should seize the opportunity provided by the *Comment Public Notice* to correct and build upon the “basic framework” of the Incentive Auction, soliciting input from commenters who, with the benefit of greater perspective on its “moving parts,” can now identify unforeseen complications. The auction design the Commission adopts must balance a wide range of goals established by the Spectrum Act, the Communications Act, and the Commission’s precedent. As Sprint has described, these include not merely auction framework-specific goals, such as promoting simplicity, ensuring sufficient revenue generation, auction efficiency, and speed, but also broader public interest mandates such as promoting competition and ensuring that spectrum is effectively utilized. By focusing on these latter, overarching goals through more predictable and efficient auction processes, the Commission can best promote bidder certainty and overall auction success.

Respectfully submitted,

Dr. David J. Salant
Professor Associé
Toulouse School of Economics
Co-founder
Auction Technologies, Inc.

Dr. Gregory Attiyeh, Ph.D.
Managing Director
FTI Consulting

February 20, 2015

Lawrence R. Krevor
Vice President,
Legal and Government Affairs – Spectrum

Richard B. Engelman
Director, Legal and Government Affairs

Rafi Martina
Counsel, Legal and Government Affairs

SPRINT CORPORATION
900 7th Street NW, Suite 700
Washington, DC 20001
(703) 433-4140

Appendix 1

Figure 1:

The FCC proposes to offer discounts of the clock price in order to compensate for impairments. The following provides some examples first of how bidding might work without any discounts and second the impact of the discounts. We show that in certain cases bidding on generic blocks should, after the assignment round, result in efficient outcomes and competitive prices. We also show that in these cases the application of discounts does *not* have *any* effect on the outcome – even where the FCC measure of the appropriate discount can be a bit too high or low. Third, we provide examples about how the auction with or without the discounts fails to result in efficient outcomes, reduces the amount of revenues, and results in the wrong bidders winning the wrong licenses.

- The FCC proposes to offset the value of the impairment with a discount.⁸⁶ To see the effect of such a discount consider the case with two impaired blocks, one more impaired than the other, and three bidders, each seeking only one of two blocks (L1 or L2):
 - For references purposes, one can imagine that Block L1 represents a PEA 1 license with an impairment over the New Jersey and Pennsylvania counties (i.e. New York City and other parts of PEA 1 are unimpaired)
 - Block L2 represents the PEA 1 license with an impairment over the City of New York (i.e. all counties outside of New York City are unimpaired)

Table 1

Bidder/Block	Block L1	Block L2
Bidder B1	28	21
Bidder B2	23	21
Bidder B3	20	20

- The values in the Table 1 represent bidder valuations for each block. In this example, Table 1 indicates Bidder B3 is essentially unaffected by the impairment in that its value is 20 for either block. This could be for a number of reasons; for instance, as described elsewhere, B3 could represent a dominant operator with ample existing low-band holdings and less immediate need for 600 MHz spectrum. Or, as previously noted, B3 could represent a vertically-integrated MVPD-mobile operator,

⁸⁶ *Incentive Auction Order* ¶ 147 (“We further propose to incorporate a price adjustment into the auction system at the end of the assignment phase of the forward auction to account for varying degrees of predicted impairment to the licenses offered for sale, regardless of whether such licenses are in Category 1 or Category 2. Specifically, we propose to discount the final clock price by one percent for each one percent of predicted impairment. For example, under this proposal a 10 percent discount would be applied to a license that is 10 percent impaired following the clock phase of the forward auction impairment. We address procedures for applying the proposed discount in detail below. We propose such price adjustments in order to help accommodate a range of values among generic licenses within a proposed category, while minimizing the number of bidding categories in the interest of simplicity.”).

whose interactions with broadcast suggest that they can mitigate the impairments post-auction. Bidders B1 and B2 each have a preference for block L1: B1 is willing to pay 28 for L1 but only 21 for L2; and B2 is willing to pay 23 for L1 and only 21 for L2.

- The following describes bidding decisions during the clock phase for this example. It is assumed that the clock price starts below 20 (say 10) and then is gradually increased, say 11, 12, ..., 19, 20,
 - Given these clock prices and absent a discount, bidder B3 would elect to drop out of the bidding when the clock price passes 20. This would leave bidders B1 and B2 as the winners – at a price of 21 (assuming price increments of 1).
 - In the assignment phase, B1 would offer a premium of 7 for L1, and bidder B2 will offer only 2. This is because B1 values L1 as worth 7 more than L2, and whereas B2 would offer 2 more for L1 over L2. So:
 - B2 wins L2 at 21 and B1 wins L1 at a clock price of 21 plus an assignment round price of 2 (when B1 offers more for L1 in the assignment round than the 2 that B2 would offer.)⁸⁷ B1 would then pay 23 for L1 and B2 would pay 21 for L2.
- Now suppose the FCC discounts both blocks by 2 to reflect an impairment. Recall, it was assumed that both blocks had similar percentage impairment. As a consequence, this would have the effect of adding 2 to the value relative to the clock prices. The reason this is the case is that 2 would be subtracted from the final clock prices of L1 and L2. So, if a bidder won L2 at a final clock price of 21, it would have to pay a net price of 19.
 - This is illustrated as follows:

Table 2

Bidder/Block	Block L1	Block L2
Bidder B1	30	23
Bidder B2	25	23
Bidder B3	22	22

- Each bidder has merely increased their valuation by the expected discount

⁸⁷ The Commission proposed that the assignment phase use a Vickrey pricing rule. For example, the assignment round price for B1 is computed as follows: If B1 was not in the assignment phase, B2 would be allocated the block L1 for a price of 3. To this value, one has to deduct the winning bid of B2, which is 1. Hence the resulting price is 3-1=2.

to L2.

- Here the clock price, adding in the discount of 2, stops at 23, after B3 drops his bid.
 - The assignment round price is still 2; B1 wins L1 for a gross price of 25, net price of 23. And B2 wins L2 for a net price of 21. This assignment round price is driven by B2's indifference with either block given the anticipated impairment-discount. **Notice the outcome is the same as in the previous case.**
- *Thus, when bidders have similar views about the impact of impairment, the discount of impaired blocks has no effect on the outcome.*
 - Also, a similar calculation illustrates that had the FCC provided a slightly larger or smaller discount of 1 or 3, the final outcome would be the same. The examples did not specify the exact percentage of actual impairment.
 - The examples in Tables 1 and 2 show how the auction can efficiently allocate and price blocks, even when bidders have different views of the impact of the impairment. But more fundamentally, these examples also illustrate the fact that the discount does not seem to change the outcome.

The next example considers the situation in which two bidders are more affected by the impairment of Block L2 than a third bidder, which creates a strategic problem:

Table 3

Bidder/Block	Block L1	Block L2
Bidder B1	102	51
Bidder B2	100	50
Bidder B3	80	60

- In this example, as above, there are three bidders for two blocks. Each bidder only wants one block. B1 and B2 are the strongest, but are very much affected by the impairment of block L2. Bidder B3 has a lower value for L1 but is not so affected by impairment. (We can again envision B3's relative insensitivity to the impairment as a function of its existing low-band holdings or perhaps better position in mitigating any impairment post-auction). The optimal allocation is highlighted and would have B1 win L1 and B3 win L2.
- If the clock price is below 50, all three bidders will remain in the bidding. Once the price exceeds 50 (or 51), B1 and B2 must anticipate the assignment round price to decide whether to keep bidding or not.
- B3 is not going to drop out of the clock phase of the auction until the clock price

passes 60. At that price, both B1 and B2 would stay in if they know that they would face B3 in the assignment round.

- However, once the clock price passes 60 – say 61– B3 will drop. This leaves B1 and B2 to compete in the assignment phase.
 - At this point, B1 and B2 would enter the assignment round. They would each value the L1 block as worth at least 50 more than L2. So, B1 should bid 51 for the preferred block and B2 50. B1 will then win L1 for a total price of $61 + 50 = 111$, and B2 will be left with B2 at a price of 61. Both lose: B1 pays 9 more than L1 is worth, and B2 pays 11 more than L2 is worth.
 - If B1 and B2 anticipate this possibility, they will each seek to mitigate the potential losses by dropping demand before the clock price reaches 61 and B3 drops. However, if one of B1 and B2 drops its demand first, the other one will win L1 for a nominal assignment round premium. So, there is no deterministic equilibrium. (There is what is called a mixed strategy equilibrium).
 - The outcome is then inherently random, and some outcomes are necessarily inefficient and resulting in low revenues.
- **To conclude, the outcome of the auction is difficult to predict, and very sensitive to minor rules, such as tie breaking. In any case, inefficiency in the outcome remains probable.**
- **This problem persists even when the FCC discounts L2. The FCC would need to revert to auctioning only concrete blocks, as it is doing in the reverse auction, to eliminate this concern.**
- **The conclusion is that this uncertainty created by generic blocks confronts some bidders with unmanageable risks and can result in the wrong bidders winning (B3 should win block L2, but does not).**

Tables 4a and 4b provide a variant of the example in Table 3 and shows how *bidding can result in the wrong bidders winning each block when there is uncertainty about valuations.*

- In the case of Table 4a, B1 and B2 place a large premium on the L1 block. If B3 thinks this is likely to be the case, then it will drop out when the clock price reaches 61. In this case, B1 will win block L2 and B2 will win L1. The assignment round price for L1 will be 24 – the difference between B1’s value for L1 (85) and its value

of L2 (61).

- However in the case of Table 4b, B3 should win L1 and B2 should win L2. But, if B3 thinks there is sufficient likelihood that rivals values are as in Table 4a, it will drop out.
 - **In all these examples, these problems would disappear if there were separate clock prices for each block.**
 - If there are separate clock prices, then bidding will stop on each block at the point at which the marginal bidder is indifferent between buying and dropping its demand.
 - For example, in Table 4a, the clock price of L2 would end at a price of 61 and for L1 at a price of 85. For lower L1 prices, B1 will bid on L1 rather than L2. For lower L2 prices, B2 would still be bidding.
 - Similarly, in the example of Table 4b, the clock price of L1 would end at 62 and L2 at 64.

Table 4a

Bidder/Block	Block L1	Block L2
Bidder B1	85	61
Bidder B2	92	62
Bidder B3	80	60

Table 4b

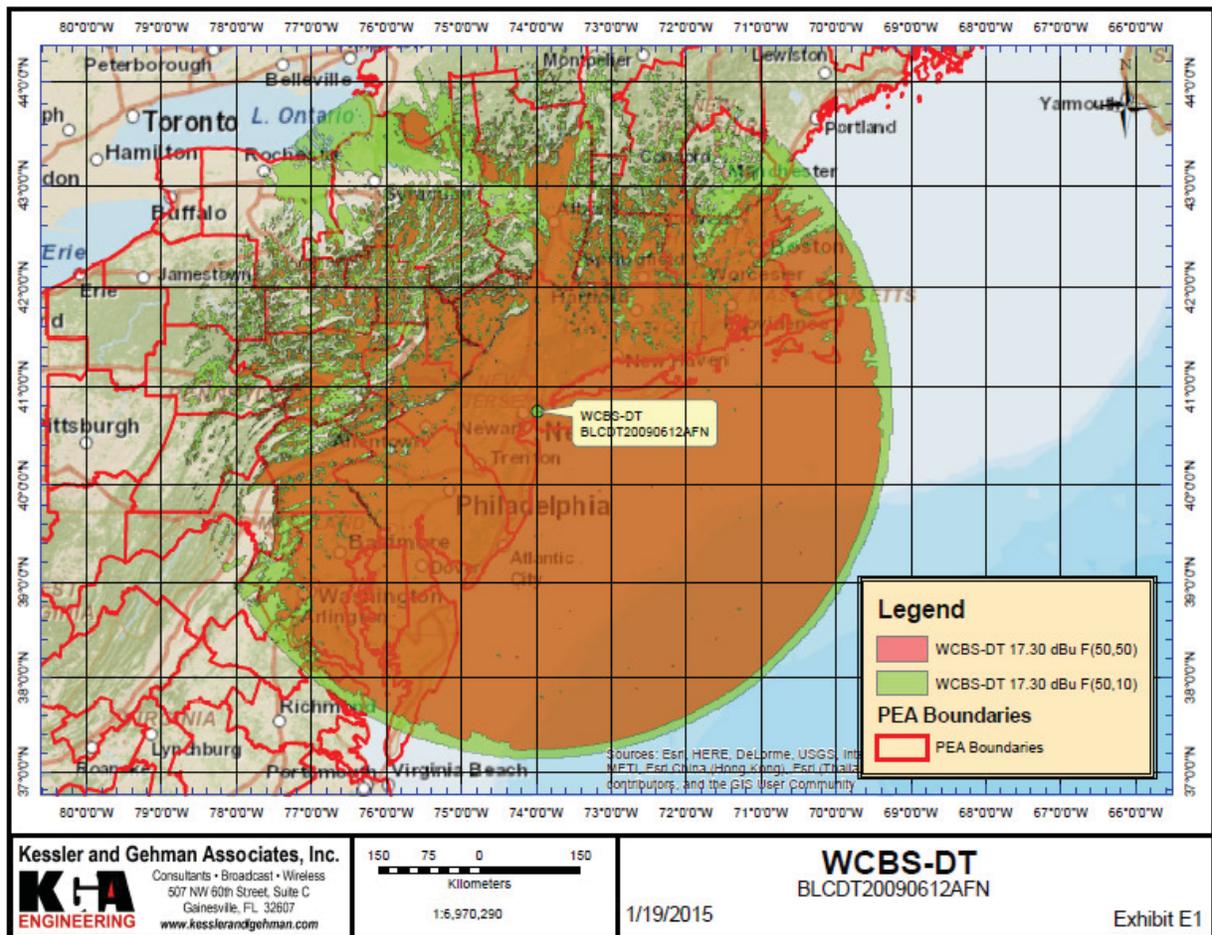
Bidder/Block	Block L1	Block L2
Bidder B1	62	61
Bidder B2	64	62
Bidder B3	80	60

Appendix 2

Two Examples of Existing DTV Stations Showing Difference in Impairments Predicted using F(50,50) vs F(50,10) Statistical Measure

Kessler and Gehman Associates performed these analyses using current DTV station parameters, including power levels and channels, and followed the FCC's proposed methodology to calculate uplink impairment to a grid of 600 MHz base stations located co-channel to the DTV station.⁸⁸

WCBS-DT (Channel 33), New York, NY

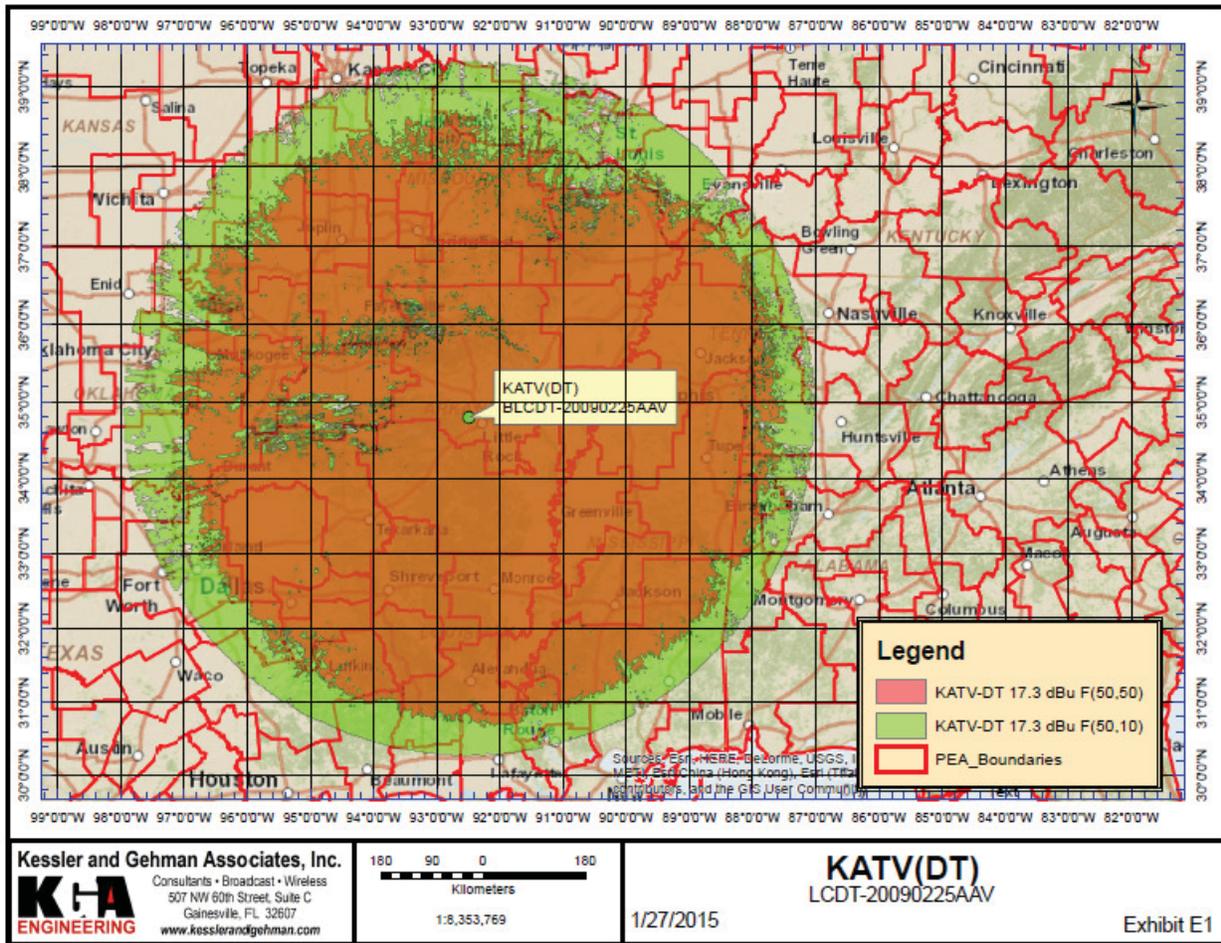


⁸⁸

While the current channels used by these two stations are unlikely to actually occur in the 600 MHz uplink band, the station parameters are similar to what any DTV station in New York, NY or Little Rock, AR might use in the 600 MHz uplink band under the Commission's market variation approach. Sprint recognizes that DTV propagation goes further on lower frequencies (both service and interfering contours), which could lead someone on first impression to believe that the analyses overstate the potential co-channel interference to 600 MHz base stations. Sprint and KGA submit, however, these analyses are reasonable considering that a DTV station that is repacked from a lower frequency to a 600 MHz uplink channel would be entitled to retain comparable interference-free coverage on the new channel (meaning that the interference or impairment contours would also likely be similar to those for their current frequency).

WCBS-DT, New York, NY			F(50,10)		F(50,50)		Difference	
PEA Number	PEA Name	PEA Population	Pop Within 17.3 dBuV/m	% Impaired	Pop Within 17.3 dBuV/m	% Impaired	Pop Within 17.3 dBuV/m	% Impaired
1	New York, NY	25,237,061	24,736,167	98.0%	24,358,291	96.5%	377,876	1.5%
5	Baltimore, MD- Washington, DC	7,842,134	7,819,907	99.7%	6,929,659	88.4%	890,248	11.4%
6	Philadelphia, PA	7,587,252	7,505,298	98.9%	7,406,199	97.6%	99,099	1.3%
7	Boston, MA	6,776,035	6,696,364	98.8%	5,974,790	88.2%	721,574	10.6%
41	Syracuse, NY	1,371,959	472,022	34.4%	43,018	3.1%	429,004	31.3%
44	Rochester, NY	1,316,146	331,139	25.2%	7,297	0.6%	323,842	24.6%
48	Harrisburg, PA	1,244,058	1,201,582	96.6%	1,080,835	86.9%	120,747	9.7%
49	Albany, NY	1,222,542	1,119,723	91.6%	913,027	74.7%	206,696	16.9%
57	Richmond, VA	1,080,661	30,133	2.8%	13,103	1.2%	17,030	1.6%
60	Manchester, NH	1,025,620	831,666	81.1%	135,983	13.3%	695,683	67.8%
69	Springfield, MA	861,286	772,866	89.7%	627,200	72.8%	145,666	16.9%
77	Portland, ME	784,594	60,201	7.7%	0	0.0%	60,201	7.7%
88	Frederick, MD	678,674	226,850	33.4%	131,069	19.3%	95,781	14.1%
103	Winchester, VA	556,408	88,726	15.9%	2,205	0.4%	86,521	15.5%
121	Altoona, PA	490,867	11,193	2.3%	1,324	0.3%	9,869	2.0%
136	Williamsport, PA	454,792	312,186	68.6%	121,381	26.7%	190,805	42.0%
138	Burlington, VT	452,191	29,625	6.6%	1,495	0.3%	28,130	6.2%
140	Fredericksburg, VA	438,705	136,426	31.1%	19,984	4.6%	116,442	26.5%
143	Keene, NH	427,275	124,759	29.2%	37,996	8.9%	86,763	20.3%
147	Salisbury, MD	419,355	411,386	98.1%	404,466	96.4%	6,920	1.7%
188	Jamestown, NY	325,075	7,602	2.3%	958	0.3%	6,644	2.0%
194	State College, PA	317,863	59,897	18.8%	1,087	0.3%	58,810	18.5%
210	Binghamton, NY	295,081	127,769	43.3%	35,904	12.2%	91,865	31.1%
227	Watertown, NY	255,260	12,697	5.0%	1,527	0.6%	11,170	4.4%
271	Elmira, NY	193,433	77,632	40.1%	19,589	10.1%	58,043	30.0%
283	Plattsburgh, NY	173,097	607	0.4%	175	0.1%	432	0.2%
296	Pottsville, PA	148,289	121,050	81.6%	67,022	45.2%	54,028	36.4%
324	Honesdale, PA	110,191	105,620	95.9%	97,062	88.1%	8,558	7.8%
Total Population:		62,085,904	53,431,093		48,432,646		4,998,447	
Total % Impaired:				86.1%		78.0%		8.1%

KATV (Channel 22), Little Rock, AR



KATV, Little Rock, AR			F(50,10)		F(50,50)		Difference	
PEA Number	PEA Name	PEA Population	Pop Within 17.3 dBuV/m	% Impaired	Pop Within 17.3 dBuV/m	% Impaired	Pop Within 17.3 dBuV/m	% Impaired
8	Dallas, TX	6,452,472	5,067,455	78.5%	647,438	10.0%	4,420,017	68.5%
24	Saint Louis, MO	2,396,938	1,680,734	70.1%	10,175	0.4%	1,670,559	69.7%
30	Kansas City, MO	1,810,075	478,400	26.4%	9	0.0%	478,391	26.4%
32	Nashville, TN	1,748,445	95,257	5.4%	1	0.0%	95,256	5.4%
36	New Orleans, LA	1,622,143	55,108	3.4%	0	0.0%	55,108	3.4%
39	Oklahoma City, OK	1,446,527	706,027	48.8%	53,411	3.7%	652,616	45.1%
40	Birmingham, AL	1,399,686	198,069	14.2%	102	0.0%	197,967	14.1%
46	Little Rock, AR	1,275,690	1,271,522	99.7%	1,262,035	98.9%	9,487	0.7%
55	Huntsville, AL	1,105,409	232,105	21.0%	123,985	11.2%	108,120	9.8%
59	Memphis, TN	1,039,627	1,039,627	100.0%	1,039,627	100.0%	0	0.0%
63	Tulsa, OK	969,078	966,172	99.7%	931,780	96.2%	34,392	3.5%
79	Hattiesburg, MS	780,833	736,859	94.4%	423,175	54.2%	313,684	40.2%
82	Baton Rouge, LA	756,008	288,620	38.2%	0	0.0%	288,620	38.2%
90	Jackson, MS	646,279	646,287	100.0%	646,287	100.0%	0	0.0%
93	Lafayette, LA	638,768	169,068	26.5%	13,345	2.1%	155,723	24.4%
99	Tupelo, MS	599,462	599,446	100.0%	598,692	99.9%	754	0.1%
101	Wichita, KS	564,245	305	0.1%	0	0.0%	305	0.1%
110	Jackson, TN	533,539	533,350	100.0%	530,583	99.4%	2,767	0.5%
111	Fayetteville, AR	527,374	526,119	99.8%	498,939	94.6%	27,180	5.2%
120	Shreveport, LA	492,213	492,216	100.0%	492,216	100.0%	0	0.0%
125	Alton, IL	476,174	186,967	39.3%	3,345	0.7%	183,622	38.6%
133	Nacogdoches, TX	464,704	254,629	54.8%	173,454	37.3%	81,175	17.5%
135	Beaumont, TX	460,666	59,560	12.9%	3,761	0.8%	55,799	12.1%
139	Hot Springs, AR	443,880	443,968	100.0%	443,831	100.0%	137	0.0%
144	Paris, TX	423,195	423,193	100.0%	422,465	99.8%	728	0.2%
145	Columbia, TN	422,947	22,672	5.4%	0	0.0%	22,672	5.4%
150	Rolla, MO	405,037	404,330	99.8%	369,507	91.2%	34,823	8.6%
152	Tyler, TX	397,075	397,053	100.0%	397,018	100.0%	35	0.0%
161	Carbondale, IL	368,043	293,112	79.6%	42,939	11.7%	250,173	68.0%
171	Fort Smith, AR	356,101	349,451	98.1%	326,067	91.6%	23,384	6.6%
174	Springfield, MO	352,596	352,596	100.0%	352,532	100.0%	64	0.0%
175	Southaven, MS	349,748	349,748	100.0%	349,748	100.0%	0	0.0%
178	Sedalia, MO	346,580	309,448	89.3%	86,889	25.1%	222,559	64.2%
181	Texarkana, TX	343,206	342,401	99.8%	337,618	98.4%	4,783	1.4%
183	Columbia, MO	340,194	332,889	97.9%	29,722	8.7%	303,167	89.1%
184	Ruston, LA	338,416	338,416	100.0%	338,416	100.0%	0	0.0%
189	Alexandria, LA	324,637	324,689	100.0%	281,379	86.7%	43,310	13.3%
193	Saint Joseph, MO	318,414	641	0.2%	0	0.0%	641	0.2%
196	Cape Girardeau, MO	315,713	311,496	98.7%	292,174	92.5%	19,322	6.1%
198	Jonesboro, AR	311,312	311,312	100.0%	311,312	100.0%	0	0.0%
204	Owensboro, KY	301,206	7,486	2.5%	0	0.0%	7,486	2.5%
211	Ardmore, OK	291,829	232,130	79.5%	131,861	45.2%	100,269	34.4%
216	Joplin, MO	280,505	280,505	100.0%	280,367	100.0%	138	0.0%
232	Topeka, KS	245,402	7,374	3.0%	0	0.0%	7,374	3.0%
242	Lake Charles, LA	231,201	21,673	9.4%	0	0.0%	21,673	9.4%
243	Paducah, KY	230,924	228,727	99.0%	157,304	68.1%	71,423	30.9%
244	Manhattan, KS	230,920	273	0.1%	0	0.0%	273	0.1%
245	West Plains, MO	229,798	229,816	100.0%	225,522	98.1%	4,294	1.9%
255	Greenville, MS	214,872	214,872	100.0%	214,872	100.0%	0	0.0%
258	Cullman, AL	210,229	67,470	32.1%	31,356	14.9%	36,114	17.2%
275	Corsicana, TX	184,725	178,244	96.5%	59,168	32.0%	119,076	64.5%
277	Hutchinson, KS	183,101	30,197	16.5%	77	0.0%	30,120	16.4%
278	Bartlesville, OK	179,889	179,889	100.0%	126,994	70.6%	52,895	29.4%
281	Muskogee, OK	177,148	176,980	99.9%	172,213	97.2%	4,767	2.7%
293	Lawrenceburg, TN	158,283	148,521	93.8%	30,516	19.3%	118,005	74.6%
295	Stillwater, OK	152,050	95,932	63.1%	12,429	8.2%	83,503	54.9%
302	Enid, OK	143,731	355	0.2%	0	0.0%	355	0.2%
310	Farmington, MO	133,395	113,557	85.1%	25,160	18.9%	88,397	66.3%
314	Jacksonville, TX	127,971	125,959	98.4%	115,409	90.2%	10,550	8.2%
335	Natchitoches, LA	99,546	99,543	100.0%	99,543	100.0%	0	0.0%
337	Mineral Wells, TX	95,311	40,062	42.0%	752	0.8%	39,310	41.2%
344	Clanton, AL	82,318	6,197	7.5%	0	0.0%	6,197	7.5%
347	New Roads, LA	79,775	77,720	97.4%	19,927	25.0%	57,793	72.4%
350	Forrest City, AR	78,309	78,309	100.0%	78,309	100.0%	0	0.0%
367	Moberly, MO	66,156	19,841	30.0%	0	0.0%	19,841	30.0%
377	Demopolis, AL	57,694	29,870	51.8%	1,129	2.0%	28,741	49.8%
393	Macon, MO	36,158	55	0.2%	0	0.0%	55	0.2%
397	Aliceville, AL	34,310	34,262	99.9%	27,953	81.5%	6,309	18.4%
Total Population:		38,900,205	24,317,136		13,644,838		914,958	
Total % Impaired:				62.5%		35.1%		2.4%