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47 CFR Part 20
Broadcast Incentive Auction Scheduled To Begin on March 29, 2016; Procedures for Competitive Bidding in Auction 1000; Final Rule

FEDERAL COMMUNICATIONS COMMISSION

47 CFR Part 20

[GN Docket No. 12–268, MB Docket No. 15–146, WT Docket Nos. 14–252, 12–269; FCC 15–78]

Broadcast Incentive Auction Scheduled To Begin on March 29, 2016; Procedures for Competitive Bidding in Auction 1000

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: In this document, the Commission establishes final bidding procedures and qualifications for participation in Auction 1000, the Incentive Auction, including the forward and reverse auctions, 1001 and 1002 respectively. This document is intended to familiarize prospective applicants with the procedures and other requirements for participation in the Incentive Auction.

DATES: Effective October 14, 2015.

FOR FURTHER INFORMATION CONTACT: *Wireless Telecommunications Bureau, Auctions and Spectrum Access Division:* for general auction questions: Linda Sanderson at (717) 338–2868; for reverse auction legal questions: Erin Griffith at (202) 418–0660; for forward legal questions: Kathryn Hinton at (202) 418–0660. Lisa Stover at (717) 338–2868. *Media Bureau, Video Division:* for broadcaster questions: Dorann Bunkin at (202) 418–1636.

SUPPLEMENTARY INFORMATION: This is a summary of the Commission's document, *Auction 1000 BIA Bidding Procedures Public Notice,* GN Docket No. 12–268, WT Docket Nos. 14–252 and 12–269, MB Docket No. 15–146, FCC 15–78, adopted on August 6, 2015 and released on August 11, 2015. The complete text of this document is available for public inspection and copying from 8:00 a.m. to 4:30 p.m. Eastern Time (ET) Monday through Thursday or from 8:00 a.m. to 11:30 a.m. ET on Fridays in the FCC Reference Information Center, 445 12th Street SW., Room CY–A257, Washington, DC 20554. The complete text is available on the Commission's Web site at *http://wireless.fcc.gov,* or by using the search function on the ECFS Web page at *http://www.fcc.gov/cgb/ecfs/.* Alternative formats are available to persons with disabilities by sending an email to *FCC504@fcc.gov* or by calling the Consumer & Governmental Affairs Bureau at (202) 418–0530 (voice), (202) 418–0432 (TTY).

Regulatory Flexibility Analysis

As required by the Regulatory Flexibility Act of 1980, as amended (RFA), the Commission has prepared this Supplemental Final Regulatory Flexibility Analysis (SFRFA) of the possible significant economic impact on small entities by the procedures and policies contained in the *Auction 1000 Bidding Procedures Public Notice.*

Report to Small Business Administration

The Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, will send a copy of the *Auction 1000 Bidding Procedures Public Notice,* including this SFRFA, to the Chief Counsel for Advocacy of the SBA (SBA).

Paperwork Reduction Act

This document does not contain new or modified information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104–13.

Congressional Review Act

The Commission will send a copy of the *Auction 1000 Bidding Procedures Public Notice,* including the SFRFA, in a report to be sent to Congress and the Government Accountability Office pursuant to the Congressional Review Act. A copy of the *Auction 1000 Bidding Procedures Public Notice* and SFRFA (or summaries thereof) will also be published in the **Federal Register**.

I. Introduction and Executive Summary

1. The *Auction 1000 Bidding Procedures Public Notice* the Commission determined the procedures necessary to carry out the incentive auction, and resolves issues it raised in the *Auction 1000 Comment Public Notice* (*Auction 1000 Comment PN*), 80 FR 4816, January 29, 2015. In particular, the Commission establishes final procedures for setting the initial spectrum clearing target, qualifying to bid, and bidding in the reverse and forward auctions. The *Auction 1000 Bidding Procedures Public Notice* is organized from the perspective of potential bidders, with separate sections for the reverse and forward auctions, each ordered consistent with the overall sequence of procedures in the incentive auction. Bidding in the auction will begin on March 29, 2016, which will be the deadline for reverse auction applicants to commit to an initial bid option.

2. The incentive auction is composed of a reverse auction (Auction 1001) in which broadcasters will offer to voluntarily relinquish some or all of their spectrum usage rights and a forward auction (Auction 1002) of new, flexible-use licenses suitable for providing mobile broadband services. Forward auction proceeds will be used to pay broadcasters that relinquish rights in the reverse auction. As part of the auction process, the broadcast television bands will be reorganized or ''repacked'' so that the television stations that remain on the air after the incentive auction occupy a smaller portion of the ultra-high frequency (UHF) band, thereby clearing contiguous spectrum that will be repurposed as the 600 MHz Band. The Commission's decisions implement its central objective for the incentive auction: to allow market forces to determine the highest and best use of spectrum. In response to the robust public record in this proceeding, its key decisions include the following: (a) *Initial Clearing Target Determination Procedure.* The procedure the Commission adopts for selecting the initial clearing target will allow market forces to determine the highest and best use of spectrum on a near-nationwide basis, while permitting a limited amount of impairments in the repurposed 600 MHz Band to avoid the ''least common denominator problem'': limiting the amount of spectrum available in most markets to the quantity that is available in the most constrained markets. To limit impairments, the Commission modifies its proposal in the *Auction 1000 Comment PN* by adopting a scaled standard with a cap that will allow significantly less than the proposed 20 percent at higher clearing targets, consistent with the consensus that impairments must be minimized, particularly at higher clearing targets. The Commission's decisions to allow the optimization software to assign television stations within the 600 MHz Band so as to minimize impaired weighted-pops, and not to ''discount'' impairments located in the uplink portion of the Band, also will help the auction to repurpose as much near-nationwide spectrum as possible while minimizing impairments; (b) *Opening Prices.* The Commission adopts its proposal for calculating opening price offers for each eligible broadcaster based on a television station's interference and population characteristics. This methodology, which will yield opening price offers in the reverse auction of up to $900 million, should attract robust participation in all areas without undermining other goals of the auction. Opening prices in the reverse auction will be announced at least 60 days in

advance of the deadline to file an application to participate in the reverse auction; (c) For the forward auction, the Commission adopts its proposal to assign a specific number of bidding units to each spectrum block that will be available in a Partial Economic Area (PEA) based on the number of weighted-pops in the PEA, and to use the bidding units to calculate minimum opening bids, upfront payments, and bidder eligibility, as well as to measure bidding activity. To facilitate bidding across license categories, each block available in a PEA will have the same number of bidding units. The minimum opening bid for each spectrum block will be equal to the number of bidding units assigned to the block times $5,000, and upfront payments will be one-half that amount. Upfront payments will be due after the initial clearing target has been selected; (d) *Reverse Auction Bidding.* Having considered the comments the Commission received on its proposal for a Dynamic Reserve Price (DRP) mechanism, it has decided not to adopt DRP. This decision will encourage voluntary participation in the reverse auction by removing uncertainty among broadcasters, and maximize forward auction spectrum value by eliminating the possibility of additional impairments in the 600 MHz Band due to the operation of the DRP mechanism. In order to make bidding as simple as possible for reverse auction bidders, bidders will not be able to submit ''intra-round'' bids. The Commission adopts its proposal to establish a simple proxy bid mechanism to make it easier for bidders to participate in the auction; (e) The Commission also adopts several measures to improve transparency for reverse auction bidders. First, the auction system will inform them, for each station on which they are bidding, of their bidding status and the new price offers for available bid options. Second, bidders also will be provided with ''vacancy'' information regarding the availability of channels in bands relevant to each of their stations given its bid options. Vacancy information may help reverse auction bidders assess the likelihood that the price offers for a bid option will continue to decrease, as well as how likely any bid option to move to another band is to be available through the current round. Once reverse auction bidding stops in any stage, the total dollar amount of provisionally winning reverse auction bids will be announced publicly; (f) *Forward Auction Bidding.* The Commission adopts its proposal to offer two categories of generic spectrum blocks for bidding in the clock phase of the forward auction: ''Category 1'' blocks with potential impairments that affect zero to 15 percent of the weighted population of a PEA; and ''Category 2'' blocks with potential impairments that affect between greater than 15 percent and up to 50 percent. Prices for frequency-specific licenses will be adjusted downward at the end of the assignment phase of the forward auction by one percent of the final clock phase price for each one percent of impairment to the license; (g) The Commission adopts several measures to improve transparency for forward auction bidders. First, the auction system will provide them in advance of bidding with specific information regarding impairments, including the actual source and location of the impairment. Second, during the clock phase, aggregate price information that reflects the progress of the forward auction towards satisfying the final stage rule, as well as price and aggregate demand information for blocks in each PEA that reflects progress towards completion of bidding in the clock phase, will be publicly available; (h) To implement the Commission's decision in the *Mobile Spectrum Holdings Report and Order* (*Mobile Spectrum Holdings R&O*), 79 FR 39977, July 11, 2014, to incorporate a market-based spectrum reserve in the forward auction, the Commission adopts its proposals to base the maximum number of reserved spectrum blocks in a given PEA on the total number of Category 1 and 2 blocks offered in that PEA; to limit the actual number to demand for Category 1 blocks by reserve-eligible bidders when the auction reaches the spectrum reserve trigger; to reserve only Category 1 blocks; and to limit the number of reserved blocks in a PEA to two if, when the trigger is reached, only one reserve-eligible bidder demands such blocks. The Commission also affirms its decision that the spectrum reserve will be triggered by satisfaction of the final stage rule; (i) To implement the final stage rule established in the *Incentive Auction Report and Order* (*Incentive Auction R&O*), 79 FR 48441, August 15, 2014, the Commission adopts the proposed average price and spectrum benchmarks of $1.25 and 70 megahertz of licensed spectrum, respectively. The benchmarks will help to ensure that winning bids for the licenses in the forward auction reflect competitive prices and return a portion of the value of the spectrum to taxpayers without reducing the amount of spectrum repurposed for new, flexible-use licenses. The Commission also adopts its proposals for triggering an ''extended round'' to give bidders the opportunity to meet the final stage rule without moving to another stage, except that an extended round will not be triggered if the shortfall is greater than 20 percent; (j) *Assignment Round.* The Commission adopts the assignment round bidding procedures proposed in the *Auction 1000 Comment PN,* with a modification: in addition to limiting PEA grouping to PEAs with the same mix of clock-phase winners and winnings, as proposed, the Commission will limit PEA grouping to unimpaired PEAs. Winning clock-phase bidders will have the opportunity to bid for their preferred combinations of licenses, consistent with their clock-phase winnings, in a series of single sealed-bid rounds conducted by PEA or, in some cases, PEA group; (k) The auction system will incorporate certain intra-market contiguity objectives in determining the frequency-specific license assignments available in the assignment round. To assist forward auction bidders in determining whether, and how much, to bid in each PEA during the assignment phase, all clock-phase winning bidders across all PEAs will be informed of the extent to which contiguous blocks feasibly may be assigned to winning bidders from the clock phase within each PEA. In addition, the auction system will provide each bidder with bidding options that satisfy the feasible contiguity objectives for each PEA in which the bidder may bid; (l) *Final TV Channel Assignments.* The Commission will use optimization techniques to determine a final TV channel assignment plan that satisfies the constraints adopted in the *Incentive Auction R&O* and strives for the additional policy goals of maximizing the number of stations that stay on their pre-auction channels, minimizing aggregate new interference to individual stations, and avoiding channel reassignments for stations with high anticipated costs. These goals, in turn, will help to ensure that the total reimbursement costs associated with the repacking process remain below the $1.75 billion in the TV Broadcaster Relocation Fund that Congress made available, speed the post-auction transition process and minimize disruption for stations and viewers alike.

3. Consistent with its decision in the *Incentive Auction R&O* affirming the Wireless Telecommunications Bureau's (WTB's) delegated authority regarding auction procedure matters that it typically handles, at least 60 days before the deadline to file auction applications WTB will release a separate public

notice which will address the pre-auction application process, including detailed instructions and deadlines, as well as post-auction procedures (*Auction 1000 Application Procedures Public Notice* or *Application Procedures PN*). The *Application Procedures PN* will announce the filing window for applications to participate in the reverse and forward auctions, as well as upfront payments and minimum opening bids for the forward auction. In addition, the *Application Procedures PN* will include technical formulas implementing final decisions regarding the initial clearing target determination procedure, the final television channel assignment plan, and the assignment of frequency-specific licenses to forward auction clock-phase winning bidders, as well as algorithms for bid processing. The *Auction 1000 BIA Procedures Public Notice,* together with the *Application Procedures PN,* will provide prospective bidders with a complete guide to participating in the incentive auction.

II. Background of Proceeding

4. The Commission will conduct Auction 1000 (including Auctions 1001 and 1002) pursuant to Title VI of the Middle Class Tax Relief and Job Creation Act of 2012 (Spectrum Act), which authorized incentive auctions to help meet the Nation's accelerating spectrum needs and required the Commission to conduct a broadcast television spectrum incentive auction. Since enactment of the Spectrum Act, the Commission has released a number of decisions in which it has adopted rules and policies that provide the necessary framework for implementing the incentive auction. Prospective applicants must be familiar with additional specific details from these decisions as well as with the Commission's general competitive bidding rules in Part 1, Subpart Q of the Code of Federal Regulations and with the procedures, terms, and conditions contained in the *Auction 1000 BIA Bidding Procedures Public Notice,* and all other public notices related to Auction 1000, including Auctions 1001 and 1002.

5. In the *Incentive Auction R&O,* the Commission adopted a ''600 MHz Band Plan'' consisting of an uplink band that will begin at channel 51 (698 MHz), followed by a duplex gap, and then a downlink band. Consistent with the *Incentive Auction R&O,* the Commission refers throughout the *Auctions 1000 BIA Bidding Procedures Public Notice* to the UHF band spectrum that is repurposed through the incentive auction as ''the 600 MHz Band,'' and to the band plan scenarios adopted in the *Incentive Auction R&O* as ''the 600 MHz Band Plan.'' Because the Commission will not know the exact number of licenses or their frequencies when the incentive auction begins, the 600 MHz Band Plan includes different band plan scenarios associated with different spectrum clearing targets.

6. Additionally, in the *Incentive Auction R&O,* the Commission recognized the importance of finalizing *TVStudy,* the computer software that will be used in the repacking process, well in advance of the auction. On June 30, 2015, the Office of Engineering and Technology (OET) finalized *TVStudy* and released a detailed summary of baseline coverage area and population served by each station to be protected in the repacking process, based on then-current information in its databases regarding the stations' facilities. The Commission directs OET to release final baseline coverage area and population served data no later than 60 days before the deadline for auction applications.

III. Initial Clearing Target Determination Procedure

7. The Commission adopts the procedure for selecting an initial spectrum clearing target for the incentive auction. Examination of the record reflects consensus on several basic principles: that the goal should be to allow market forces to determine how much spectrum is repurposed; that flexibility to allow some degree of impairment is critical to achieving that goal; and that forward auction licenses should be as free from impairments as possible. Consistent with these principles, the procedure the Commission adopts is modified in important respects from that proposed in the *Auction 1000 Comment PN.* In particular, the Commission adopts a one-block-equivalent standard with a cap for limiting impairments that will allow significantly less than the proposed 20 percent nationwide impairment level at higher clearing targets.

8. The following provides a high-level overview of the procedure and then addresses in detail the elements of the procedure related to handling impairments. In Appendix A to the *Auction 1000 Bidding Procedures Public Notice,* the Commission provides a description of how its computer software will apply the procedure the Commission adopts on a step-by-step basis. An updated version of Appendix C to the *Auction 1000 Comment PN* setting forth the technical details and formulas associated with the procedure that the Commission adopts will be included with the appendices to the *Application Procedures PN.*

A. Overview

9. Based on the array of stations that apply to participate in the reverse auction and the bidding options to which they initially commit, the procedure the Commission adopts will use mathematical optimization techniques to determine a provisional television channel assignment plan for every possible spectrum clearing target. For each clearing target, the plan must include a feasible channel assignment in its pre-auction band for every eligible station that does not participate in the reverse auction and in the VHF band for every applicant designated to move to a VHF relinquishment option. Consistent with the constraints adopted in the *Incentive Auction R&O* to make all reasonable efforts to preserve each eligible station's coverage area and population served, ''[a] feasible assignment is one in which: (1) All stations are given a channel assignment, either to a channel or to go off the air; (2) a station can only be assigned to one of its allowable channels as defined in the domain.csv file; (3) stations' channel assignments must not violate adjacent and co-channel pairwise interference restrictions as defined in the interference_paired.csv file; (4) all non-participating stations and stations that have dropped out of bidding in the reverse auction are assigned a channel in their pre-auction band; and (5) all participating stations in the reverse auction must be assigned to a valid relinquishment option, that is, an option consistent with the relinquishment options the bidder selected during the application process and with the bidding rules of the reverse auction.'' Stations currently assigned to channels 50 or 51 will be provisionally assigned to different UHF channels. Each applicant station must be designated to a relinquishment option consistent with its initial bid commitment. If a station initially commits to move to a High- or Low-VHF channel as its preferred relinquishment option, and the auction system is unable to accommodate that option, the system must either designate that station to a fallback relinquishment option selected by the applicant or, if the system is unable do so, to a feasible channel in the station's pre-auction band. The optimization procedure can always accommodate an initial bid commitment to go off-air, including a commitment to go off-air in order to channel share. Due to the limited availability of channels in the VHF band and the technical constraints on repacking established in the *Incentive*

Auction R&O, the procedure may not be able to accommodate every station that commits to move to the Low- or High-VHF band. The procedure will try to accommodate initial bid commitments according to the priorities proposed in the *Auction 1000 Comment PN.* If a station's initial commitment(s) is not accommodated by the auction system, the applicant will be informed prior to the start of the clock phase of the reverse auction that the station will be assigned to a feasible channel in its pre-auction band. In the event that the procedure determines that relinquishment of a station's spectrum usage rights will be unnecessary to achieve a clearing target under any circumstances, the station will be assigned a feasible channel in its pre-auction band, and the applicant will be informed prior to the start of the clock rounds of the reverse auction.

10. Depending on broadcaster participation levels, there may not be a feasible channel available in the remaining UHF portion of the TV band for all non-participating UHF stations and all UHF applicant stations that are not assigned to their initial commitment or fallback option(s). In such circumstances, as a last resort, the procedure will assign stations to channels in the 600 MHz Band according to the primary objective of minimizing the sum of ''weighted-pops''—population weighted by an index of area-specific prices based on prior Commission spectrum auctions—impaired for all licenses by the assignments, and according to the additional objectives. The location of impairing stations in the 600 MHz Band will not be limited for purposes of applying the clearing target objectives; impairing stations may be assigned to the uplink, downlink, and duplex gap portions of the Band in order to minimize impairments. In addition to the primary objective of minimizing impairments, the procedure will apply the secondary objective of maximizing the weighted number of ''Category 1'' licenses (those licenses with zero to 15 percent impairment) nationwide. In order to avoid any increase in impairment levels, the secondary objective will be constrained by the primary objective. Thus, the secondary objective seeks an assignment plan that satisfies the primary objective, and contains the highest weighted number of Category 1 licenses nationwide.

11. Having determined the provisional TV channel assignment plan for all clearing targets that best satisfies the objectives, the clearing target determination procedure, using the 2x2 cell calculations, will apply the near-nationwide standard for limiting impairments in order to select the highest possible clearing target that meets the standard. Under that standard, the amount of impaired weighted-pops on a percentage basis will be less than the equivalent of the weighted-pops of one paired 5+5 megahertz spectrum block. For example, if the provisional TV channel assignment plan is for a 126 megahertz spectrum clearing target, then the forward auction licenses in the associated 600 MHz Band Plan (120 megahertz, or 10 paired license blocks) could only be subject to overall impairments on a near-nationwide basis of up to but not including 10 percent, or less than one out of 10 blocks. The procedure then will select the highest possible clearing target that satisfies the standard and the provisional TV channel assignment plan for that clearing target will be selected for the initial stage of the auction, along with the associated 600 MHz Band Plan. Application of this procedure will be subject to the international agreements the Commission reaches with Canada and Mexico. Although the Commission acknowledges it could miss the opportunity to clear more spectrum by skipping a clearing target, it may be necessary to skip the 144, 138, and/or 108 MHz clearing targets to better harmonize its band plan with Canada or Mexico. The Commission expects that this issue will be addressed in its negotiations with those countries. The Commission expects to reach timely arrangements with Canada and Mexico that will enable it to carry out the repacking process in a manner fully consistent with the requirements of the statute and its goals for the auction.

B. Objectives in Determining a Provisional TV Channel Assignment Plan

1. Primary Objective: Minimizing Impaired Weighted-Pops

12. The primary objective of minimizing impaired weighted-pops nationwide is consistent with the consensus among both broadcasters and wireless providers for limiting the impact of impairments overall. In addition, by using weighted-pops, the optimization tool will disfavor assigning impairing TV stations in major markets where they would have the greatest impact on forward auction spectrum prices, consistent with commenters' concerns. Weighting will discourage assignment of impairing TV stations to 600 MHz Band frequencies in or near major markets by increasing the cost of such assignments in the optimization. Its decisions to allow the optimization software to assign television stations within the 600 MHz Band so as to minimize impaired weighted-pops in applying the primary objective, and not to ''discount'' impairments located in the uplink portion of the Band, also will promote its goal of allowing market forces to determine the highest and best use of spectrum.

a. Calculation of Weighted-Pops

13. ''Weighted-pops'' will be calculated using the same price index measure the Commission adopts to calculate forward auction bidding units. Specifically, to calculate weighted-pops, the index of area-specific prices from prior auctions is used to weight the population in each license area based on the relative price of each Economic Area (EA) and Cellular Market Area (CMA) license (for paired spectrum) in Auctions 66 (AWS–1), 73 (700 MHz), and 97 (AWS–3). The price per MHz-pop of each license is divided into the average price per MHz-pop of the corresponding spectrum block to produce an index value of the license relative to the spectrum block. For example, if the price per MHz-pop of the winning bid for an EA license equaled the average price per MHz-pop for that spectrum block, then the index value for that license would be 1; if the price per MHz-pop was half the average, then the index value would be 0.5; if the price per MHz-pop was twice the average, then the index value would be 2; etc. Because the past prices are for EA and CMA licenses, the index value for each EA and CMA license area is broken down to the county level and averaged; the resulting county-level index values are aggregated to PEAs. The index values are aggregated to the PEA level by multiplying the county's index value by the percentage of the PEA's population within the county, and then summing those results for all of the counties in a PEA. In the *Auction 1000 Comment PN,* the Commission stated its intention to update the price index the Commission provided in Appendix F to the *Auction 1000 Comment PN* following Auction 97 to account for current values. Those results are now being incorporated into the price index to calculate weighted-pops for the incentive auction. An appendix providing the final index consistent with these decisions will be released with the *Application Procedures PN.* The explanation the Commission provides here together with the *Application Procedures PN* appendix responds to interested parties' requests for additional information on how weighted-pops is calculated and how it

will be used during the incentive auction in relation to impairments and to bidding.

14. Some commenters express concerns with the use of weighted-pops. The Commission disagrees with AT&T that its approach using weighted-pops is imprecise and will tend to understate impairment levels because it ignores major highways, railways and airports where population levels may be low but spectrum values are high. Indeed, by incorporating spectrum values from past auctions into the determination of where to locate impairments, the optimization tool will be able to account for those areas where spectrum values are high for reasons not directly related to population, including transportation hubs, and will avoid locating impairments in those areas, consistent with its goal of maximizing spectrum value. AT&T's criticism appears to concern how the ISIX methodology calculates impairments more than the use of weighted-pops. The former issue should have been raised in the ISIX proceeding. Moreover, the detailed information the auction system will provide to forward auction bidders on the locations where it places impairments will enable bidders to evaluate precisely their potential impact. The Commission also disagrees with NAB, which argues that the weighted-pops concept is confusing and overly complex. Although this is the first time the Commission will apply this measure for purposes of impairments, it has used weighted-pops in prior auctions to calculate bidding units. The Commission disagrees that use of weighted-pops adds undue complexity; rather, it agrees with those commenters that suggest that using weighted-pops will simplify the auction and avoid locating impairments where they will unduly harm spectrum values. By evaluating impairments based on weighted-pops rather than population alone, the procedure the Commission adopts can better account for the costs associated with impairing specific areas in order to identify a provisional TV channel assignment plan that minimizes impairments.

b. Measuring Potential Impairments

15. The Commission adopts its proposed procedure for determining the extent of potential impairments, with several modifications. The technical formulas for implementing the modified procedure the Commission adopts will be set forth in the *Application Procedures PN*. Under the measurement procedure the Commission adopts, the impairment level—the population subject to impairment—of each license that will be available in the forward auction under each spectrum clearing target will be pre-calculated for each station on each channel for each clearing target. More specifically, the ISIX methodology first will be used to predict potential inter-service interference between TV and wireless services. The ISIX methodology, which the Commission adopted for purposes of the incentive auction, predicts potential inter-service interference based on deployment of a hypothetical wireless network. The raw data the ISIX methodology produces at a two-by-two kilometer cell level will be aggregated into county-level data sets for the uplink and downlink portions of the 600 MHz Band and mapped to specific forward auction licenses. The ISIX methodology defines each two-by-two kilometer cell as ''impaired'' or ''unimpaired'' depending on whether it is subject to any inter-service interference. The percentage of the population of each county subject to inter-service interference then will be calculated for each potential channel assignment of a TV station to a location in the 600 MHz Band. The procedure will avoid double-counting the population of a county that is subject to potential inter-service interference from more than one TV station through the use of overlap tables. For any such assignment in which this percentage is more than 10 percent in either the uplink or downlink portion, the entire population of the county will be considered impaired for the license if the station is assigned to the channel. For a given TV channel assignment plan, the impairment percentage of a license is determined by dividing the sum of the populations of impaired counties by the population of the PEA.

16. The Commission adopts a 10 percent limit on the amount of impairment allowed in a county before the entire population of the county is considered impaired for the purposes of the measurement procedure. The Commission sought comment on setting this threshold between 10 and 20 percent. In order to avoid under-predicting potential interference, the Commission chooses a more conservative threshold at the low end of the proposed range. The Commission emphasized that the optimization procedure will use the county measurement only to determine the provisional TV channel assignment plans; the selection of a specific clearing target will use the more granular 2x2 cell data to determine the near-nationwide impairments. The Commission notes that because the initial clearing target is ultimately chosen based on the 2x2 grid cell data, using a 10 percent county threshold to aggregate the ISIX data up to the county level has very little impact on the overall result.

17. Rather than ''discounting'' the population for impairments located in the uplink portion of the 600 MHz Band, as proposed, the procedure the Commission adopts will consider uplink and downlink impairments to have equal weight. The Commission proposed to consider a county that is impaired in the downlink portion of the 600 MHz Band to also be impaired in the uplink portion, but not the reverse. Thus, only 50 percent of the population of a county with uplink impairments above the threshold would be considered impaired (*i.e.,* the portion of the population representing the uplink block); 100 percent of the population of a county with downlink impairments above the threshold would be considered impaired (*i.e.,* the population representing both the downlink and uplink blocks). Commenters generally oppose the proposal, arguing that it would tend to understate impairment levels. The Commission agrees and concludes that adopting it would be inconsistent with the strong record support for minimizing impairments. Therefore, the percentage of population attributed to uplink impairments will not be discounted: if the percentage of population with predicted impairment in the uplink exceeds 10, the optimization will consider the county wholly impaired, just as it will for impairments in the downlink portion of the block. The effect of this approach is that the optimization will not favor impairing the uplink over impairing the downlink but will focus instead on minimizing impaired weighted-pops in the 600 MHz Band overall. Further, the result of this approach is that any population that is not considered impaired will be usable for two-way communication (*i.e.,* both its uplink and downlink blocks will be unimpaired).

18. The measurement procedure will be used in applying the additional objectives as well as the primary objective. In creating the provisional TV channel assignment plan for each clearing target, data must be aggregated to the county level, and a percentage threshold must be applied to determine whether a county is impaired, in order to reduce the volume of data inputs to a quantity that reasonably can be utilized. Given all of the possible TV station and channel combinations under every clearing target, the ISIX methodology produces a quantity of data that exceeds the current

capabilities of optimization techniques. When aggregated to a county level, the ISIX methodology produces approximately 3.7 billion separate records of data for the roughly 3,000 counties in the United States. Use of data at the next possible level of granularity—the Census tract—would result in a 20-fold increase in the number of data records, and use of data at the cell level would result in a 650-fold increase. As it stands at the county level, the measurement procedure the Commission adopts must consider more than 100,000 decision variables and over two million constraints. At a more granular level than the county, the number of decision variables and constraints that must be considered would increase to an unsolvable number. For purposes of applying the near-nationwide standard to determine whether a plan satisfies the impairment limit, however, more granular, cell-level data will be used.

19. Likewise, forward auction licenses will be categorized as Category 1 (zero to 15 percent impaired) or Category 2 (greater than 15 percent and up to 50 percent impaired) based on cell-level impairment data, and forward auction bidders will be provided with cell-level data to inform their bidding strategies. Specifically, ISIX data will be used to identify the impaired population in both the uplink and downlink portion in the license. This data will show in which cells a potential licensee either will be restricted from operating due to harmful interference to an impairing TV station or may have its operations infringed upon by harmful interference from a TV station. The population of impaired cells across the license—whether the impairment results in the uplink or downlink—will be added together and divided by the total population of the PEA to calculate the impairment percentage. If the total population of the impaired cells within a block is less than or equal to 15 percent of the total population of the block, the block will be offered as a Category 1 block. If the total population of the impaired cells is more that 15 percent but less than or equal to 50 percent, the block will be offered as a Category 2 block. The location of an impairment in the 600 MHz Band will not be determinative for the purposes of calculating the impairment percentage; the population of a cell will be considered impaired even if the impairment only affects the uplink or downlink portion of the paired 5+5 megahertz spectrum block. This conservative approach avoids both the weighting proposed in the *Auction 1000 Comment PN* and double counting. For example, assume a PEA with a population of 100,000 has impairments that affect 10,000 people in the downlink portion of the A block and 5,000 of the same people in the uplink portion of the A block. The A block would be considered 10 percent impaired (10,000 impaired pops divided by 100,000 total pops in the PEA). Though the impairment affects a population of 5,000 in both the uplink and the downlink portion of the A block, 5,000 is not added to the total impaired pops because that would result in double counting—the population of 5,000 was already included when tallying the downlink impairments. The effect of this approach is that any population that is not considered impaired will be fully usable for two-way communication (*i.e.,* both its uplink and downlink blocks will be unimpaired), consistent with its prioritization of paired spectrum.

c. Assigning TV Stations to the 600 MHz Band To Accommodate Market Variation

20. The Commission adopts its proposal to allow the optimization tool to assign television stations within the 600 MHz Band where necessary to accommodate market variation in a manner that best fulfills the clearing target objectives, and not to restrict it to assignments in specific portions of the 600 MHz Band—downlink, uplink, or duplex gap. Restricting the optimization tool to certain portions of the 600 MHz Band would undermine its efficacy in carrying out the primary objective, likely resulting in more impairment of forward auction licenses and the selection of a lower spectrum clearing target. Such an outcome is not justified by the competing policies that some commenters advocate in support of restrictions.

21. Commenters express conflicting views on where to assign impairing television stations, arguing for various reasons that impairments should be restricted to the uplink, downlink, and/or the duplex gap portion of the 600 MHz Band and identifying problems with every possible location within the 600 MHz Band. For example, CCA, C Spire, and T-Mobile assert that stations should be assigned to the uplink because consumer demand is driving the need for more unimpaired downlink spectrum than uplink spectrum. T-Mobile and Verizon also suggest that assigning stations to the uplink is preferable because carriers can employ mitigation methods, such as base station filters, to guard against inter-service interference. On the other hand, Sprint supports assigning TV stations on contiguous channels starting at the bottom end of the downlink band to facilitate filter design in devices, reduce the number of filters needed for base stations, and maximize two-way spectrum. Sennheiser supports assigning stations to channels in the downlink portion of the band in order to provide greater certainty for unlicensed users in the duplex gap. In contrast, AT&T and Verizon oppose assigning TV stations to the downlink band because of complications to mobile device filter design. Several commenters caution against assigning stations to channels in the duplex gap. Conversely, AT&T, CCA, Sprint and T-Mobile support assigning stations to the duplex gap. AT&T states that it would likely be less harmful as a technical matter, and therefore preferable to assignment elsewhere in the 600 MHz Band, and T-Mobile argues that it ''will allow for more extensive, higher performance 600 MHz broadband transmissions in the affected geographic area license(s) than would be possible if the broadcast impairment were co-channel with broadband operations.'' Sprint states ''in the event of less robust broadcaster participation, in which fewer blocks of competitively critical low-band spectrum can be repurposed, repacking television stations in the duplex gap may be the only way to conduct an auction with a modestly successful amount of auctioned spectrum.'' CCA cautions that protecting the duplex gap will ''reduce the amount of spectrum available in the forward auction.'' Henry A. Waxman advocates for an alternative approach in which the assignment of TV stations to the duplex gap is dependent upon whether the clearing target exceeds 84 megahertz. Some commenters oppose repacking TV stations anywhere in the 600 MHz Band.

22. As an initial matter, the Commission emphasized that the optimization tool will assign television stations anywhere in the 600 MHz Band ''only where absolutely necessary.'' As the Commission determined in the *Incentive Auction R&O,* however, and as many commenters acknowledge, flexibility to accommodate some level of market variation—thus requiring some level of impairment to 600 MHz Band licenses—is critical to avoiding the least common denominator problem. The procedure the Commission adopts always will favor assigning television stations to channels in the remaining TV bands if possible, and, will select a clearing target selection that reflects an appropriate trade-off between the amount of spectrum cleared and the overall impairment level. Further, the

Commission disagrees with AT&T that assigning TV stations to the 600 MHz Band will create problems similar to those in the 700 MHz Lower A Block caused by TV stations in channel 51. The Commission developed the ISIX methodology to address this issue specifically by creating a methodology to predict where inter-service interference is likely to occur and proposing to restrict licensees' service in these areas where ''impairments'' are created. Moreover, wireless licensees will be aware of these impairments in advance: The Commission will provide bidders with detailed information about impairments in the blocks offered prior to the start of the forward auction, including the facility causing the impairment, and the resulting areas where they will be restricted from operating or not be required to operate due to inter-service interference. As a result, bidders can use the facility information about the impairing station to determine how their wireless networks could be deployed around the impairment, or whether they should not bid on impaired licenses (that is, a license to operate in a geographic area that is subject to inter-service interference) in that area.

23. The Commission declines to restrict the optimization procedure from assigning TV stations to the uplink, downlink and/or duplex gap portions of the 600 MHz Band in order to carry out the clearing target objectives. The Commission is not persuaded that any of the technical issues identified by commenters justify restricting the optimization procedure to create more license impairments and/or a lower initial clearing target. Despite the lack of consensus on where to locate impairments, most commenters agree with the principles that impairments should be minimized to the greatest extent possible, and that the goal of the auction should be to repurpose as much spectrum as market forces allow. The procedure the Commission adopts is consistent with this view because it provides the fullest possible scope for implementing the primary objective of minimizing the impact of impairments on 600 MHz licenses.

24. In particular, the Commission disagrees with AT&T and Verizon that technical issues justify restricting the optimization procedure from assigning stations to the downlink portion of the 600 MHz Band. AT&T argues that the Commission underestimates the ''real world'' impact of placing a TV station in the downlink portion of the 600 MHz Band because the ISIX methodology only measures potential interference within 5 MHz of a channel's edge and thus does not adequately predict the effect of placing a TV station in the downlink; and because wireless user equipment (*i.e.,* mobile and portable devices) cannot prevent interference into any frequency within the same filter or ''duplexer.'' Duplexers are pairs of filters, one transmit and one receive, that function together to reduce the potential for interference between a transmitter and a receiver in the same piece of equipment. AT&T's criticism of the ISIX methodology is unfounded. The ISIX methodology is consistent with its rules, which do not offer interference protection beyond the first adjacent channel. Moreover, AT&T ignores the fact that wireless user equipment is capable of attenuating interfering signals at frequencies separated beyond the first adjacent channel, as required by 3GPP standards. AT&T's criticism of the ISIX methodology also is untimely. AT&T failed to seek reconsideration of the final order adopting the ISIX methodology, or to raise its criticisms of the ISIX methodology before the Commission adopted that order.

25. AT&T's filter concerns also lack merit. With regard to blocks co-channel with or first adjacent channel to an impairing TV station, its approach recognizes that filters may be ineffective in impaired areas by not requiring wireless user equipment to operate in such areas. In addition, wireless user equipment is prohibited from operating where such equipment could interfere with digital television receivers. Beyond the first adjacent channel, the signal attenuation required by 3GPP standards will limit interference regardless of duplexer performance. The likely use of two or more duplexers also makes it less likely that a TV station assigned to a portion of the downlink will render the entire downlink unusable by wireless user equipment. To the extent that an impairing TV station is located in the non-overlapping part of one duplexer, the non-affected duplexer will be able to filter out the interfering signals, a fact that even AT&T appears to concede. For example, for an 84 megahertz clearing target (encompassing blocks A–G), if a TV station is co-channel with the A block, using two duplexers (one covering blocks A–D; the other covering blocks D–G), the duplexer covering blocks D–G at the opposite end of the downlink band will be able to filter out the interfering TV signal. Consequently, wireless user equipment operating in those blocks should not experience harmful interference from the impairing TV station. Because the optimization tool will prefer TV station assignments that overlap with the guard bands where possible in order to minimize the impaired weighted-pops pursuant to the primary objective the Commission adopts herein, TV stations are more likely to be assigned to the non-overlapping part of one duplexer than to the central part of the downlink where the duplexers overlap. Furthermore, technical solutions and enhanced filter technologies can mitigate the potential for interference once the 600 MHz Band Plan is finalized following the auction. As Sprint suggests, enhanced filter technologies will make it possible to use separate filters for separate frequencies in the future, further limiting the impact of a TV station in the downlink portion of the band by the time this band is deployed. The technical details on the 600 MHz duplexers will not be contemplated by 3GPP until the band plan and potential market variations are finalized after the auction. Once they are finalized, technical solutions, such as Sprint's, can mitigate the potential for interference given the actual frequencies affected.

26. Further, the Commission cannot conclude that protecting the duplex gap from any impairment is warranted at the risk of repurposing less spectrum. Its analysis indicates the duplex gap will not be subject to any impairment in most markets even if the optimization procedure tool is not restricted in assigning impairing stations. In scenarios 1, 2, and 3, the maximum number of TV stations assigned to channels that impair the duplex gap are 6, 7, and 2, respectively. Thus the duplex gap will remain free from impairment across most of the country except for in a relatively small number of markets. Conversely, protecting the duplex gap in every market is likely to lead to the selection of a lower clearing target as a result of increased nationwide impairment levels. In simulation scenarios 1 and 2 (40–50 percent and 50–60 percent broadcaster participation in the reverse auction, respectively), protecting the duplex gap from the assignment of TV stations raises the nationwide impairment percentage beyond the standard for limiting impairment, thereby requiring the optimization procedure to drop down to a lower clearing target. Protecting the duplex gap also reduced the number of relatively unimpaired Category 1 licenses in each scenario. By reducing the amount of spectrum available to generate forward auction proceeds, protecting the duplex gap could threaten the overall success of the auction, as well as its competition goals for licensed providers in the 600 MHz

Band. The Commission notes that the Spectrum Act prioritizes license 600 MHz Band services over services operating in the guard bands. By contrast, the Commission's decision to authorize guard band use by wireless microphones and unlicensed devices was wholly within its discretion. Its policy regarding impairments will also affect broadcasters and 600 MHz licenses, wireless microphones, and unlicensed devices in this limited number of markets. In addition, in the limited number of areas where the duplex gap is subject to impairment, it may also not be available to protect against interference between licensed services. In such areas, the methodology proposed in the *ISIX Further Notice,* 79 FR 76282, December 22, 2014, will be used to prevent inter-service interference, rather than the guard band. While commenters have identified a range of issues associated with assigning stations to the duplex gap, the goals of repurposing spectrum for mobile broadband use, minimizing impairments, and ensuring a successful auction militate in favor of flexibility and outweigh the potential benefits of protecting the duplex gap from any impairment.

27. The Commission also rejects arguments that impairing stations should be restricted to the same portion of the 600 MHz Band. For example, Sprint proposes that impairing TV stations should, to the extent possible, be assigned to channels side-by-side in any market in which multiple stations remain and on common frequencies. CCA proposes an alternative ''channel stacking plan,'' which would create a pattern for impairing station assignments specific to the 600 MHz Band Plan associated with the selected clearing target. CTIA also urges consistency in assignment of TV stations to the 600 MHz Band. The potential costs of such restrictions—reducing the optimization procedure's efficacy in minimizing impairments and risking the selection of a lower clearing target—outweigh the potential benefits that these commenters identify. The unrestricted approach the Commission adopts is consistent with the consensus for minimizing impairments and maximizing potential spectrum recovery.

28. Further, the Commission rejects Sinclair's request to impose constraints to ensure that no licensee of multiple television stations is disproportionately affected by channel assignments in the 600 MHz Band. The Commission disagrees with Sinclair's premise that stations assigned to the 600 MHz Band will be disadvantaged in comparison to stations located in the remaining TV bands. Such stations will be entitled to the same robust protections in the repacking process as all other eligible TV stations, including preservation of coverage area and population served pursuant to the constraints established in the *Incentive Auction R&O,* reimbursement for reasonable relocation costs, and protection from inter-service interference. In addition, by requiring the optimization tool to potentially forego channel assignments that minimize impaired weighted-pops in light of station ownership concerns, Sinclair's proposal would risk greater impairments to 600 MHz Band licenses and recovery of less spectrum through the incentive auction. Accordingly, the Commission concludes that the potential benefits of Sinclair's proposal are outweighed by the costs.

29. In determining a provisional TV channel assignment plan, the optimization tool will not assign impairing stations to channels 50 or 51. Many commenters caution against the assignment of stations to channel 51 due to potential interference with Lower 700 MHz A Block operations. Recognizing the existing interference concerns between television stations on channel 51 and the Lower 700 MHz A Block, the Commission took action in the *Incentive Auction R&O* to encourage early, voluntary relocation of channel 51 stations to further mitigate any potential interference. Further, its decision to create a 600 MHz Band Plan in which channels 50 and 51 would be repurposed for the 600 MHz wireless uplink band under every spectrum recovery scenario was intended to improve the interference environment for 700 MHz licensees. Unlike the 700 MHz service, which is already in operation, 600 MHz Band licensees will be able to account for potential loss in the value of their licenses as a result of impairments through the mechanism of the forward auction, and will have full prior knowledge of the areas of operation that may be affected by inter-service interference. Moreover, the proposed ISIX methodology would apply only to licenses in the 600 MHz Band and, therefore, no mechanism is available to prevent interference between impairing TV stations and the 700 MHz service. The decision to exclude both channels 50 and 51 (each totaling six megahertz) will ensure interference protection consistent with its use of technically reasonable guard bands of at least seven megahertz.

2. Additional Objectives

30. The Commission also adopts its proposal to include a secondary objective: Maximizing the weighted number of Category 1 blocks available in the forward auction. To calculate the weighted number of Category 1 blocks, the auction system sums the Category 1 blocks in each PEA, multiplies the result by the value weighted price index for the PEA, and adds those results for all PEAs. Commenters raise concerns that the impact of impairment on the value of spectrum licenses to forward auction bidders cannot be measured strictly in terms of nationwide percentages. The Commission agrees that it should strive to offer as many unimpaired licenses as possible.

31. In order to avoid any increase in impairment levels, the secondary objective will be constrained by the primary objective. Specifically, the secondary objective will be constrained by the nationwide impairment percentage determined by the primary objective, rounded up to the nearest integer. For example, if after applying the primary objective, the nationwide impairment percentage is 4.4, the procedure will maximize the weighted number of Category 1 licenses up to an impairment percentage of five. Thus, the secondary objective will function primarily as a tie-breaker in choosing a provisional TV channel assignment plan: When more than one potential plan exists with the same minimum level of impairment identified through application of the primary objective, the secondary objective will cause the optimization tool to choose the one that maximizes the weighted number of Category 1 licenses. Constraining the secondary objective in this manner is consistent with the consensus in favor of minimizing impairments and maximizing potential spectrum recovery.

32. The provisional TV channel assignment plan determined based on application of the first two objectives may include licenses that cannot be offered in the forward auction because greater than 50 percent of the population is subject to impairment. The optimization procedure will apply a tertiary objective in order to maximize their potential value in a subsequent spectrum auction. More specifically, the tertiary objective will seek to minimize impaired weighted-pops over all licenses, including licenses with greater than 50 percent of the population subject to impairment. The primary and secondary objectives will not take account of any license with greater than 50 percent impaired weighted-pops. The tertiary objective will be constrained by the first two objectives: It will be applied only to the extent that it neither increases the nationwide impairment

percentage resulting from application of the primary objective nor reduces the weighted number of Category 1 licenses resulting from application of the secondary objective. Further, it will not decrease the weighted number of Category 2 licenses existing after the application of the primary and secondary objectives. Solely for clearing targets where the lower guard band is 11 MHz, the Commission adopts a quaternary objective of minimizing the number of stations placed on the lower channel in the lower guard band to the extent it does not increase the total number of stations assigned to the 600 MHz Band or to any channel in that Band. This objective will not affect the results of the other objectives.

C. Standard To Limit Market Variation

33. The Commission adopts a scaled standard that will limit impairments to a level significantly less than the proposed 20 percent nationwide level at clearing targets above 72 megahertz, while ensuring an appropriate tradeoff between spectrum recovery and impairment level. Instead of a percentage-based standard, the standard the Commission adopts is equivalent to the weighted-pops of one paired 5+5 megahertz spectrum block nationwide, which translates into the percentages at each potential clearing target in the 600 MHz Band Plan. At clearing targets below 72 megahertz, the standard is capped at 20 percent.

34. This ''one-block-equivalent'' standard responds to concerns expressed by commenters that the proposed 20 percent standard would allow excessive impairment, particularly at higher clearing targets. It also responds to concerns that repurposing more spectrum may not be justified at the cost of allowing more impairment. Instead, T-Mobile argues, proportionally *less* impairment should be allowed at higher clearing targets, and more at lower clearing targets. Under the standard the Commission adopts, the percentage of impairment that is allowed is scaled to the amount of licensed spectrum that would be repurposed at each clearing target, increasing target by target from approximately eight percent at the highest clearing target to 20 percent at targets of 72 megahertz and lower. Because the impairment percentage is scaled to the amount of licensed spectrum that would be repurposed at each clearing target, the standard the Commission adopts also responds to criticisms that the proposed 20 percent standard was arbitrary and overly complex. The Commission notes that the one-block-equivalent standard is the same number of weighted-pops across all clearing targets and is based on the total nationwide 2010 census population multiplied by the index of area-specific prices from prior auctions based on the relative price of each EA and CMA license (for paired spectrum) in Auctions 66 (AWS–1), 73 (700 MHz), and 97 (AWS–3). The standard is capped at 20 percent at clearing targets below 72 megahertz because otherwise the one-block-equivalent approach would allow more impairment than the proposed 20 percent. Commenters raise concerns that these impairment levels are still too high overall. Even if that proves true in a given stage, however, the auction design includes a self-correcting mechanism: If the blocks offered in a stage are insufficiently valuable to produce the forward auction revenues necessary to meet the final stage rule, the auction would transition to a new stage with a lower clearing target and a lower level of aggregate impairment. Thus, the auction system relies on market forces to determine whether blocks offered in the forward auction are too impaired, even within the limits the Commission adopts. This market-based approach avoids unduly constraining the flexibility to set reasonable clearing targets that reflect the level of broadcaster participation.

35. The standard the Commission adopts also accounts for the tradeoff between the benefits of repurposing spectrum and the costs of allowing impairments at different clearing targets. For example, a 126 megahertz clearing target would repurpose 100 megahertz of licensed spectrum, or 10 paired blocks, so the impairment limit at that clearing target is the nationwide equivalent of one of the ten blocks. If aggregate impairments equal or exceed the equivalent of the population of one spectrum block nationwide at that target, the optimization procedure will move to the next lower clearing target. An 84 megahertz clearing target would repurpose 70 megahertz of licensed spectrum, or seven paired blocks, so the standard will tolerate a higher proportion of impairment—up to the equivalent of one out of seven blocks nationwide, or approximately 14 percent—but the optimization procedure likewise will move to the next lower clearing target if aggregate impairments equal or exceed that amount. Thus, the standard has the effect of moving to a lower clearing target with one less spectrum block to offer if impairments equal or exceed the equivalent of one block nationwide. The standard tolerates a higher proportion of impairment at lower clearing targets because the tradeoff is different: The record reflects that more flexibility to accommodate market variation is appropriate at lower clearing targets in order to ensure the auction's overall success. While commenters agree that minimizing impairments should be a high priority, many commenters also urge the Commission to balance this goal against the goal of ensuring that sufficient spectrum is made available in the forward auction. The Commission agrees with T-Mobile that at higher clearing targets the balance favors achieving greater uniformity across the band plan (by tolerating a lower percentage of impairment) and at lower clearing targets the balance favors repurposing spectrum by tolerating a greater percentage of impairment.

36. The Commission emphasized that the population in most PEAs will not be subject to any impairment under the standard it adopts, which will be applied on a nationwide, aggregate basis. In fact, the Commission expects that the vast majority of PEAs will have no impaired blocks, although there may be some PEAs with more than one impaired block. For example, in the *Clearing Target Simulations Public Notice* (*CTS PN*)*, 80 FR 30021, May 26, 2015,* the simulation resulting in the 84 megahertz initial clearing target shows that in 406 PEAs, all but 62 have only Category 1 licenses. The same is true for all but 53 in the 114 megahertz scenario and all but 47 in the 126 megahertz scenario. In its analysis, AT&T similarly found that in an 84 megahertz initial clearing target all but 64 PEAs will have only Category 1 licenses. AT&T acknowledges that its results ''align closely with the published FCC results for the top 20 markets'' and that differences may be attributed to the power and geography differences of stations assigned to the 600 MHz Band. Staff simulations project that at a range of clearing targets, the overwhelming majority of spectrum blocks would be unimpaired or nearly unimpaired. In each of the simulations in the *CTS PN,* at least 93.4 percent of licenses are Category 1 licenses, and Category 2 licenses comprise at most 1.3 percent of total possible licenses.

37. To promote transparency and provide information about the potential results of the clearing target determination procedure, Commission staff released a public notice in May 2015 showing the results of simulations of the procedure based on certain assumptions regarding broadcaster participation levels and impairments along the borders. These simulations project that the procedure, including the ''one-block-equivalent'' standard, would

result in the selection of a high initial clearing target with the vast majority of licenses available in Category 1. The Commission notes that for purposes of the *CTS PN* impairment analysis, the total number of licenses analyzed at each clearing target level included only those licenses that could be offered in the continental United States (*i.e.,* in 406 out of the 416 PEAs). When calculating impairments for the incentive auction, the procedure will include all 416 PEAs. In particular, these simulations result in an initial clearing target of 84 megahertz assuming 40 to 50 percent of broadcasters participate in the reverse auction (Scenario 1); an initial clearing target of 114 megahertz assuming 50 to 60 percent participate (Scenario 2); and an initial clearing target of 126 megahertz assuming 60 to 70 percent participate (Scenario 3). In Scenario 1, of the 2842 possible licenses, only 46 are Category 2 licenses. In Scenario 2, of the 3654 possible licenses, only 50 are Category 2 licenses. And in Scenario 3, of the 4060 possible licenses, only 48 are Category 2 licenses. In all three scenarios, 88 to 93 percent of the licenses in the high-demand markets (*i.e.,* PEAs 1–40) are Category 1 licenses and 84 to 88 percent of PEAs contain *only* Category 1 licenses. Under Scenario 1, of the 2654 Category 1 licenses, 2535 are entirely free of impairments (*i.e.,* zero percent of the weighted-pops in the PEA are impaired). In Scenario 2, of the 3469 Category 1 licenses, 3334 are entirely free of impairments; and in Scenario 3, of the 3886 Category 1 licenses, 3753 are entirely free of impairments.

38. While commenters generally support the release of the simulations to provide greater transparency, some question the staff's assumptions, request release of all of the underlying data or request additional simulations based on different assumptions. The Commission concluded that additional simulations are not necessary. On July 10, 2015 the Incentive Auction Task Force provided additional data for each of the six scenarios released in the CTS PN, including the assumptions regarding broadcaster participation, the specific DMAs with impairing TV stations and with stations in the duplex gap, and the channel to which each impairing station was assigned. The *CTS PN* provided information regarding a range of illustrative participation scenarios and clearing targets that afforded the public ample opportunity to understand and comment on the clearing target determination procedure that the Commission adopts, which procedure is identical to the one used in the *CTS PN.* The Commission also declines to release all of the data underlying the simulations: The *CTS PN* identified the critical information necessary to evaluate its clearing target determination procedure, and it is persuaded that the release of more data is warranted. With regard to broadcaster participation, rather than attempt to predict whether thousands of individual stations will choose to participate based on subjective factors, for purposes of the simulations certain categories of stations were assumed not to participate based on objective factors (*e.g.,* major network affiliates, the major PBS station in an area, etc.). Because the simulations require some assumptions regarding participation, it was reasonable to base those assumptions on such objective factors rather than merely a randomized array of stations. In any event, the purpose of the scenarios described in the *CTS PN* was to test the results of the clearing target determination procedure against a range of potential broadcast stations in the reverse auction.

39. With regard to impairments along the borders, some commenters question why the simulations did not include assumptions based on information about interference from Mexican television stations that AT&T has placed in the record of this proceeding. Reliable information about potential interference from Mexican TV stations is not publicly available at present, and AT&T's filing does not reflect Mexico's plans to change its television service in the near future. Instead, Commission staff chose to use the information reflecting current treaty agreements with Mexico—that is, to protect all Mexican allotments—but not to consider interference from Mexican stations into the U.S. Thus, the only potential impairments excluded from the simulations are areas in which 600 MHz licensees could operate but might experience interference from Mexican TV stations that may or may not exist. While that approach may under-predict such interference to a limited extent, the Commission cannot conclude that it was unreasonable. The Commission assures forward auction bidders that this information will be made available before the forward auction to allow bidders to evaluate all types of potential impairments caused by international TV stations, in addition to domestic ones. The Commission also does not want to over-predict Mexican interference into the U.S. given Mexico's suggestions that it will try to keep all radio and television broadcast below channel 37. The Commission notes that the Instituto Federal de Telecomunicaciones (IFT) and the FCC are working on a joint repurposing of the 600 MHz Band that places Mexican TV stations below channel 37 while providing additional channels for U.S. stations to use in the reorganized TV band.

40. The Commission rejects arguments by AT&T, Verizon, and others for a standard that allows no impairment except in border areas. In its May 1, 2015 *Ex Parte Letter,* AT&T acknowledges that ''an approach that permits the Commission absolutely no flexibility'' except in border areas ''is probably too stringent'' and instead suggests allowing up to three percent impairment outside border areas plus eight to nine percent in border areas. The resulting 11–12 percent standard is similar to the standard the Commission adopts at a number of clearing targets and indeed, more stringent than what it adopts for higher clearing targets. Subsequently, in its July 1, 2015 *Ex Parte Letter,* AT&T proposed that the Commission allow impairments at the border, without a set maximum percentage, and a three percent on non-border-related impairments. Such an approach would not provide the flexibility that is necessary to account for the unique challenges the incentive auction presents. Market variation may be caused by a variety of factors, including varying levels of spectrum congestion and broadcaster participation in different areas, as well as border-related constraints. Although AT&T argues that 84 megahertz or more of spectrum could be repurposed under an approach allowing for impairments only in border markets, its analysis relies on optimistic assumptions about reverse auction participation by broadcasters. The Commission fully expects high levels of participation by broadcasters; indeed, achieving such participation is a chief goal of its decision. At the same time, the purpose of the nationwide aggregate approach the Commission adopts is to provide flexibility in the event of non-participation by broadcasters in certain areas or other factors that it cannot fully predict in advance.

41. The Commission also rejects EOBC's proposal to base the selection of an initial clearing target on the degree of impairment in Los Angeles or New York in the interest of simplicity. Like AT&T's proposal, EOBC's simply does not provide sufficient flexibility to accommodate market variation. Indeed, depending on levels of broadcaster participation, EOBC's approach could defeat the purpose of its decision to accommodate market variation in the first place by constraining the choice of

an initial clearing target to the two markets with the most highly congested broadcast spectrum in the nation. Further, EOBC's simulations showing that the Commission can reallocate at least 126 MHz in New York and Los Angeles are simply not possible. Even under the most optimistic assumptions regarding broadcaster participation, the simulations analyzed in the Clearing Target Simulations PN, did not result in 10 unimpaired pairs in both New York and Los Angeles. EOBC's approach also would sacrifice the precision of the optimization-based approach the Commission adopts, focusing exclusively on two important markets, but which are not necessarily proxies for the rest of the nation. Accordingly, the Commission concludes that EOBC's approach would risk its goal of allowing market forces to determine the highest and best use of spectrum. For example, in Scenario 1 of the simulations run for the *CTS PN,* the initial clearing target would have to be lowered from 84 megahertz to 78 megahertz because there are only six unimpaired blocks available in the New York PEA. For the same reason, the Commission also rejects AT&T's proposal to allow for only three percent of the population nationwide to be affected by non-border related impairments. Given that the top two PEAs each comprise well over three percent of the U.S. population and the next two PEAs each comprise approximately three percent, to adopts EOBC's or AT&T's approach would also undermine the purpose of adopting market variation in the first place: To prevent the lack of spectrum in one or two markets from lowering the clearing target. EOBC's and AT&T's approaches also fail to reflect that different tradeoffs are appropriate between spectrum recovery and impairment level at different clearing target levels in order to ensure the auction's overall success.

42. Finally, the Commission declines to establish a separate standard to limit impairment levels in major markets. The procedure the Commission adopts protects major markets from impairment by weighting the population in such markets more heavily. The Commission rejects arguments that the procedure it adopts might disproportionately impair top markets. These commenters express concern that the optimization procedure will impair top markets to allow for fewer impaired markets nationwide. On the contrary, the procedure will seek to avoid impairing high-demand markets due to the added cost of such impairments in the mathematical optimization. The one-block-equivalent standard strictly limits impairment levels on a nationwide, aggregate basis. Accordingly, and based on staff simulations reflecting the number of Category 1 licenses that the Commission projects would be available in major markets under the procedure it adopts, the Commission is not persuaded that a separate standard to limit impairment levels in major markets is necessary, particularly at the cost of added complexity and less flexibility in accommodating market variation.

IV. Qualifying To Bid

A. Qualifying To Bid in the Reverse Auction

43. In order to qualify to bid in the clock phase of Auction 1001, the reverse auction, an eligible broadcast television licensee interested in voluntarily relinquishing spectrum usage rights in exchange for an incentive payment must submit an application in which it identifies, for each station that it wishes to enter in the clock phase of the reverse auction, every relinquishment option for which it would consider bidding for that station. If the broadcaster's application is timely filed and deemed complete, it must then commit to at least one relinquishment option per station at the opening price for that option for that station. Administrative details regarding the application and initial bid commitment procedures, including the application deadline, will be addressed in the *Application Procedures PN.* The Commission adopts its proposal with respect to an additional certification by applicants in the reverse auction regarding their exercise of due diligence. In the *Auction 1000 Comment PN,* the Commission sought comment on requiring all applicants in the reverse auction to certify to the truth of the following statement: ''The applicant acknowledges and agrees that any information provided by the Commission's outside contractors who are advising and assisting it with education and outreach in connection with the reverse auction is for informational purposes only and that neither the Commission nor any of its outside contractors makes any representations or warranties with respect to any such information and shall have no liability to the applicant in connection therewith.'' The Commission noted that this certification will help assure that each applicant accepts responsibility for its bids and will not attempt to place responsibility for its bids on either the Commission or the information provided by third parties as part of its outreach. The Commission received no comments in response. The additional certification serves the intended purpose and the Commission therefore will require all applicants in the reverse auction to make the certification. The Commission describes the available bid options, adopts procedures for setting the opening prices, and adopts the process by which applicants that are willing to accept the opening price for one or more relinquishment options will commit to that option and a fallback option(s), if they so choose, in order to become qualified to bid in the clock phase of the reverse auction.

1. Options for Relinquishing Spectrum Usage Rights

44. Reverse auction applicants will be able to select from three possible bid options to relinquish their spectrum usage rights on their auction applications. An applicant's ability to select options on its application will be limited by its pre-auction band and the hierarchy of relinquishment options. These options correspond to the bid options that will be available to bidders in the clock phase of the reverse auction. The three bid options are a bid to go off-air (available to all stations), a bid to move to a Low-VHF channel (available to UHF or High-VHF stations), and a bid to move to a High-VHF channel (available only to UHF stations). A participant that intends to share a channel with another station post-auction will bid to go off-air. The auction system will treat the intention to relinquish spectrum usage rights in order to channel share the same as a bid to go off-air because ''from the perspective of the auction system, a channel sharing bid is identical to a license relinquishment bid.'' No parties filed comments directly addressing the proposed bid types. The Commission concludes that offering these three bid options is appropriate to implement the relinquishment options that the Commission adopted in the *Incentive Auction R&O* and is consistent with its goal of making reverse auction participation straightforward for broadcasters.

45. *Option Hierarchy.* The auction system will treat the three possible bid options as a one-way hierarchy during the clock phase of reverse auction bidding. The hierarchy reflects the relative value of the relinquishment options to the auction system's ability to recover spectrum and simplifies the bidding process. Of greatest value in the hierarchy is a bid to go off-air, which is a bid to relinquish all spectrum usage rights to a particular channel. This option is followed in order of value by a bid to move to the Low-VHF band, then a bid to move to the High-VHF

band. For each station, the final option in the hierarchy is always to exit the auction in order to remain on the air in its pre-auction band. The option to which a bidder is designated pursuant to its initial commitment will represent the most spectrum rights it will be able to bid to relinquish in the auction. If the bidder subsequently decides to switch its bid option in accordance with the reverse auction bidding procedures, the only bid option(s) available to the bidder will be options that relinquish less spectrum usage rights. The one-directional nature of the bid options is important for bidders to consider when filling out their auction applications and committing to an initial relinquishment option.

46. Some broadcasters support the one-way option hierarchy because it will ''facilitate the orderly conduct of the reverse auction,'' while others advocate for flexibility to switch between bid options without restriction. Contrary to concerns that its design will discourage participation or complicate decision-making, the Commission concludes that limiting the direction in which bidders may switch bid options—from greater to lesser relinquishments—will make bidding easier because it will establish a simple framework for evaluating options and will improve price predictability. A bidder that wishes to preserve flexibility to bid for all the options may do so by selecting all of its options on its auction application and committing to go-off-air as its preferred initial relinquishment option. Furthermore, allowing bidders to ''move freely between any relinquishment options'' as Joint Broadcasters suggest would create a significant risk of harmful strategic bidding. Allowing bidders to switch bids unrestricted by the hierarchy would create opportunities for them to manipulate prices in the auction by moving back and forth between off-air and VHF options. Creating such strategic opportunities would actually make bidding more complicated for broadcasters because they would have to consider a broader range of strategies prior to and during the bidding.

47. Joint Broadcasters posit that the one-way hierarchy will create inefficiencies since a bidder might be willing to bid to go off-air once the price to move to VHF falls too low, but such a bidder would be precluded from doing so by the one-way-hierarchy. The Commission disagrees. The one-way hierarchy, together with the reverse auction bid processing system the Commission adopts, will provide for a more efficient repacking than if broadcasters were able to shift among the options without restriction. Based on the available vacancy in the VHF band, the reverse auction bid processing system will reduce the price differential between the off-air and VHF prices, in order to encourage bidders that can be accommodated in the VHF band to bid to move to VHF rather than to go off-air. Substantial movement back and forth between options could reduce the overall efficiency of repacking in the VHF bands. Additionally, bidders that move to VHF are unlikely to want to switch to off-air bids, as Joint Broadcasters posit, because generally the price to go off-air will decline more rapidly than the price to move to High- or Low-VHF. Accordingly, the Commission is unconvinced that the one-way hierarchy design will unduly restrict bidders. The benefits of the one-way hierarchy in terms of added simplicity, preventing harmful strategic bidding, and repacking efficiency outweigh any costs in terms of lost bidder flexibility.

2. Opening Price Offers

48. The Commission adopts its proposal for calculating opening price offers for each station using two factors: (i) A base clock price of $900, which represents the full per-unit of volume value to the auction of clearing a channel in the UHF band; and (ii) a station-specific ''volume'' factor that equally weights a station's interference-free population and the number of constraints that it imposes on the auction system's ability to repack other stations. The Commission will calculate opening price offers for UHF stations to go off-air by multiplying the base clock price of $900 by their station-specific volumes. Opening price offers for bid options other than a UHF station bidding for off-air relinquishment will be calculated by multiplying fractional portions of the nationwide uniform $900 base clock price by a station's volume. The Commission will publicly announce opening price offers for each bid option available to each station eligible to participate in the reverse auction at least 60 days in advance of the deadline to file an application to participate in the reverse auction.

a. Base Clock Price and VHF Clock Prices

49. The Commission adopts a slightly modified version of its proposal to set a nationwide uniform base clock price, representing the full per-volume value to the auction of clearing a channel in the UHF band, from which it will calculate the opening clock prices for each bid option for stations in each band. The Commission will set the base clock price at $900 per unit of volume so that the maximum opening price offer to any particular station is $900 million. The Commission will calculate a volume for each eligible station based on its interference and population characteristics. The Commission will then re-scale this volume calculation so that the highest volume for a UHF station is one million, in order to yield the maximum opening price for a UHF station to go off-air of $900 million. If any VHF stations have a higher calculated volume than the highest volume UHF station, such stations may have their volume re-scaled to greater than one million. However, because the opening clock prices for VHF stations are calculated as fractional portions of the base clock price, the Commission expects that the opening price offers for VHF stations will always be lower than $900 million. By scaling based upon the highest volume UHF station, the Commission can ensure that one station will be offered an opening price of exactly $900 million. Although the Commission proposed to scale the volume of other stations based on the highest volume station, regardless of its pre-auction band, the Commission concludes that using the highest volume UHF station is more appropriate because that station's off-air price will reflect the greatest value to the auction.

50. The Commission concludes that a $900 base clock price strikes the correct balance between attracting robust broadcaster participation across multiple markets and conducting an efficient—and ultimately, successful—auction. The Commission disagrees with broadcasters who argue that the base clock price should be increased to reflect the results of Auction 97 (AWS–3). Raising the base clock price would, according to these commenters, motivate greater broadcaster participation because stations would be offered higher opening prices, and this increased participation would ultimately result in more cleared spectrum. There is no basis to believe, beyond broadcasters' assertions, that opening prices of up to $900 million will be insufficient to encourage reverse auction participation. On the other hand, increasing the base clock price as suggested would raise the cost of repurposing spectrum and likely reduce the amount of repurposed spectrum. Increasing the base clock price would raise clearing costs for a given clearing target, increasing the likelihood of not meeting the final stage rule, necessitating additional stages at lower spectrum clearing targets. These risks would be compounded by the absence

of a dynamic reserve pricing (DRP) mechanism, because the auction system will not have a mechanism to mitigate the risk that a station will receive its opening price. Thus, increasing the opening prices in actuality would likely result in fewer stations having the opportunity to become winners in the auction. In addition, increasing the base clock price would risk increasing the length of the auction, making participation more difficult and costly for both forward and reverse auction bidders. Accordingly, the Commission adopts the $900 base clock price to ensure robust broadcaster participation without undermining its other auction goals.

51. While opening price offers for a UHF station to go off-air will always equal the base clock price multiplied by the station's volume, opening price offers for other bid options—for a UHF station to move to VHF or for VHF stations to move to a lower band or to go off-air—will equal the station's volume multiplied by a portion of the base clock price. Because the value to the auction of a cleared channel in the UHF band is the same whether a UHF station relinquishes its spectrum by going off-air or the channel is cleared through a series of intermediate moves involving VHF bids, the Commission will calculate the per-volume opening prices for intermediate moves to add up to the per-volume opening price for a UHF station to go off-air. Thus, the per-volume opening prices for a UHF station to move to High-VHF, a High-VHF station to move to Low-VHF, and a Low-VHF station to go off-air will add up to equal the base clock price, since these three moves are equivalent to a UHF station going off-air in terms of value to the auction. Likewise, the per-volume opening prices for other intermediate moves will add to the opening price for an equivalent direct move. Thus, in per-volume terms, the opening price offer for a direct move from High-VHF to off-air will equal the sum of the opening price for a move from High-VHF to Low-VHF and the opening price for a move from Low-VHF to off-air. During the clock rounds, however, the portion of the base clock price attributable to each intermediate move will vary from round-to-round, since price offers to stations during the clock rounds will also depend upon the availability of channels in the VHF bands in the station's area. For example, while the per-volume opening price for a High-VHF station to go off-air will be 40 percent of the opening base clock price, this percentage will vary in subsequent clock rounds depending upon congestion in the VHF bands.

52. More specifically, the Commission will apportion the base clock price for a station to move from the UHF band to off-air among the equivalent series of intermediate moves using the midpoint of the ranges the Commission proposed in the *Auction 1000 Comment PN.* The per-volume opening price for a UHF station to move to Low-VHF will be 75 percent of the base clock price (or $675), and the per-volume opening price to move from UHF to High-VHF will be 40 percent of the base clock price (or $360). The ranges that the Commission proposed represent the relative value of each band and its related relinquishment options to the auction, and reflect the scarcity of channels and different technical characteristics of each VHF band. In response to commenters that urge the Commission to increase the opening prices for VHF options, it is persuaded that it should not choose opening prices at the bottom of the proposed ranges in order to avoid discouraging broadcasters from choosing these options. At the same time, choosing opening prices at the top of the ranges proposed would run the risk of under-incentivizing the option to go off-air or to consider channel sharing. The Commission concludes that the values it choose strike the right balance between conducting an efficient auction and encouraging bidders to consider all bid options, include the VHF options.

53. Because the opening price for a UHF station to move to Low-VHF will be 75 percent of the base clock price, the opening price for a move from Low-VHF to off-air must be 25 percent of the base clock price for these two intermediate moves to add up to the base clock price (*i.e.,* 100 percent). Similarly, because the opening price for a UHF station to move to High-VHF will be 40 percent of the base clock price, the opening price for a move from High-VHF to off-air must be 60 percent of the base clock price. Lastly, since the opening price for a UHF station to move to High-VHF is 40 percent and for a Low-VHF station to go off-air is 25 percent, the opening price for a move from High-VHF to Low-VHF must be 35 percent of the base clock for these intermediate moves to sum and equal the base clock price. Given a per-volume opening base clock price of $900, the per-volume opening price for a Low-VHF station to go off-air will therefore be $225 (25 percent of $900), for a High-VHF station to go off-air will be $540 (60 percent of $900), and for a High-VHF station to move to Low-VHF will be $315 (35 percent of $900).

54. Several broadcasters oppose offering opening prices for the bid options to move to VHF that are lower than the bid option to go off-air. As an initial matter, the Commission rejects NAB's unsupported claim that it lack the statutory authority under the Spectrum Act to offer different prices for VHF options. Although the statute does not expressly authorize different price offers for VHF options, it does not follow that the Commission lacks authority to offer different prices: Such authority is inherent in its mandate to conduct a reverse auction—which requires establishing opening price offers—and nothing in the Spectrum Act's statutory language, context, or legislative history suggests that in doing so the Commission cannot distinguish between relinquishment options. The Commission also rejects PBS's argument that discounting UHF to VHF bid options ''is inconsistent with the basic purpose of the auction'' to discover prices through market-based means. Setting opening price offers for bid options that are proportional to the value of the relinquishment to the auction will send the appropriate price signals to bidders regarding the relative value of the options to the auction system and encourage bidders to initially commit to go off-air, recognizing that as price offers are reduced, they may request to switch to one of the VHF options. Moreover, price offers for VHF options and VHF stations in subsequent rounds will be determined by the actual demand for VHF options and the availability of channels in the VHF bands. As a result, the relative values for the various bid options will not remain fixed at the opening bid offer amounts, and the ultimate prices paid to winning bidders will reflect market demand for the options in the auction.

55. The Commission disagrees with NAB and the Joint Broadcasters that the auction system should be indifferent between the relinquishment options available to UHF stations because each option will result in clearing a channel in the UHF band. In order to clear a UHF channel by paying a UHF station to move to the VHF band, the auction system may first have to pay one or more stations to relinquish spectrum usage rights in the VHF band. A bid to go off-air also is of greater value than a bid to change bands because it provides the auction system with more repacking flexibility: Accepting an off-air bid by a UHF station clears a UHF channel without first requiring the system to find a feasible channel in another band. Conversely, a UHF station that agrees to

move to one of the VHF bands is less valuable because it must be assigned a feasible channel in that band, limiting the auction's ability to assign another station to VHF, and significantly increasing the complexity of the repacking process. A station that agrees to move to Low-VHF is of greater value to the auction than one that agrees to move to High-VHF due to the greater availability of channels in the Low-VHF band and the greater number of stations for which that bid option will be available, both of which make repacking easier. Consequently, of least value to the auction is a station that agrees to move to High-VHF, since in many markets few channels are available, and only UHF stations may bid on this option.

56. The Commission also disagrees with NAB that offering the same price for all three bid options would better serve the public interest by encouraging stations to move to the VHF band and continue to provide broadcast television service. NAB's premise is flawed, because a UHF station moving to VHF may necessitate a VHF station going off-air first. In any event, in keeping with its goal of allowing market forces to determine the use of spectrum, the public interest will be best served by pricing bid options according to their value to the auction and the repacking process, rather than based on separate broadcast-related policy goals. The Commission also rejects PBS's suggestion that if the Commission discounts price offers for VHF options, it should provide a bidding credit for noncommercial educational (NCE) stations that successfully bid to move to VHF in order to help pay for their relocation expenses. Unlike in the traditional auction context, where bidding credits are intended to help small or disadvantaged businesses that may lack the financial resources to effectively compete for licenses with larger ones, winning bidders in the reverse auction will receive—and not make—payments, and can factor their relocation expenses into their consideration of whether to accept a price offer.

57. The Commission disagrees with the Joint Broadcasters that its opening price offers for VHF bid options will fail to account for the ''substantial technical inferiority of VHF channels'' and to ''provide the proper incentives for broadcasters to accept these limitations.'' Contrary to Joint Broadcasters' argument, its approach does provide an incentive to accept the less favorable propagation characteristics and other technical properties of VHF channels—this is precisely the point of offering higher opening prices to UHF stations to move to Low-VHF than to move to High-VHF. Nor are the Commission persuaded that requiring stations moving to VHF to pay relocation expenses will ''greatly reduc[e] the desirability of a UHF-to-VHF move.'' Bidders can—and, the Commission expects, will—factor their relocation expenses into their consideration of whether to accept a price offer. The value inherent in a station retaining the exclusive right to use a full six megahertz channel will encourage stations to seriously consider bidding for VHF options.

58. The Commission also disagrees with the Joint Broadcasters' argument that offering lower opening prices for VHF options will hinder the efficient use of spectrum by encouraging channel sharing over moving to VHF, thereby reducing its flexibility to repurpose additional UHF spectrum in the future. First, the Spectrum Act authorizes only one broadcast television spectrum incentive auction. Its goal, therefore, is to ensure the success of this auction. Second, contrary to the Joint Broadcasters' assumption, the two options are not mutually exclusive: Two UHF stations may agree to share a channel in VHF (with one agreeing to go off-air, and the other bidding to move to a VHF channel which both stations would share) in order to receive greater compensation than if only one station participated in the auction.

b. Station-Specific Volume

59. The auction system will calculate each participating station's volume using the following formula: Station Volume = (Interference)0.5 * (Population)0.5. The Commission will set the interference component to equal the number of co- and adjacent channel constraints a station would impose on repacking on a pairwise basis, and the population component to equal the number of people residing within the station's interference-free service area. The Commission's approach to setting the interference component along the borders will be subject to the agreements it reaches with Canada and Mexico. For instance, it may be necessary to adjust the interference component for the purpose of determining station-specific volume. Considering population will ''enable[e] the Commission to clear more spectrum in markets where the forward auction value of relinquished spectrum usage rights is apt to be higher,'' and it concludes that a volume formula that equally balances interference and population components will best achieve the goals of the incentive auction. Once the auction system has calculated a station's volume, its volume metric will be fixed throughout the auction. While AT&T encourages the Commission to consider a dynamic volume adjustment based upon the provisional assignment of stations to channels, the Commission finds that the approach it adopts for calculating price reductions will capture similar efficiencies with less complexity.

60. The Commission rejects arguments by EOBC and other broadcasters against considering population when calculating each station's volume metric. As an initial matter, EOBC's argument that considering population is inconsistent with the policies the Commission adopted in the *Incentive Auction R&O* is without merit. The Commission expressly stated in the *Incentive Auction R&O* that the factors to be used in setting prices could ''include the number of stations that a station would interfere with and block from being assigned channels, the population the station covers, or a combination of such factors.'' EOBC points out that the *Incentive Auction R&O* ''explained that a station's price would account for objective factors 'that affect the availability of channels in the repacking process and, therefore, the value of a station's bid to voluntarily relinquish spectrum usage rights.' '' The Commission's volume formula is wholly consistent with this explanation. Likewise, its formula is consistent with its statement that ''a station with a high potential for interference will be offered a price that is higher than a station with less potential for interference to other stations'': Between two otherwise identical stations, the one with more interference constraints will have a greater volume, and thus higher opening price offers. The Commission did not state that stations with more interference constraints would receive higher offers than those with fewer interference constraints regardless of other factors. Contrary to EOBC's argument that population has nothing to do with a station's impact on the repacking process, ''population served [is] one of the major constraints on the availability of channels in the repacking process'' in light of the Spectrum Act's mandate that during the repacking process the Commission make all reasonable efforts to preserve the population served of eligible stations that will remain on the air.

61. Moreover, considering population alongside interference will allow the auction system to clear more spectrum in markets where the value to the forward auction is likely to be highest.

The purely interference-based approach advocated by EOBC and other broadcasters would result in larger payments to stations that serve small populations and smaller payments to stations that serve particularly large populations—an outcome at odds with both the typical metric by which spectrum is valued in spectrum auctions (*i.e.,* MHz-pops) and with stations' *own assessments:* As WRNN points out, ''[p]opulation is one of the most, if not the most, important elements by which the Commission and other broadcasters value its properties, and distinguish its stations from others. This is critical for the repacking process because participation of many stations with high population counts, especially in the major cities, is essential to meet larger clearing targets.'' The Commission notes that high participation levels by stations that serve small populations in markets adjacent to high-demand markets will not make up for low participation levels by stations in high-demand markets that serve large populations. Participation by both types of stations is required in order to allow the auction to repurpose a significant amount of spectrum. While the Commission affirms its determination in the *Incentive Auction R&O* not to set bid prices based upon a station's enterprise value, population is nevertheless an important metric for assessing *spectrum* value. Ignoring this metric would send the wrong price signals and discourage participation by large stations in major markets, thereby harming its ability to clear spectrum in such markets. For example, in certain border markets, a small Class A station may serve only a small population but there may also be few channels available for repacking stations. In such markets, the value of clearing and selling this spectrum in the forward auction may likewise be low. Ignoring or reducing the weight of population, as proposed by EOBC, could potentially result in the Class A station being offered an opening price significantly higher than a full power station in a major market that serves many more people, regardless of the price at which each station values itself. Furthermore, the value of clearing and selling the spectrum in the forward auction in the larger market is likely to be much higher. Using the balanced volume formula that the Commission adopts will help to avoid these results and will result in higher price offers to stations in markets where the spectrum is particularly valuable. The Commission need not resolve EOBC's argument that it is not required to consider the statutory goals of recovering a portion of the spectrum value for the public and avoiding unjust enrichment in the context of the reverse auction because these statutory provisions apply only to auctions of licenses. Even if EOBC were correct, nothing in the statute precludes the Commission from considering these goals in designing the reverse auction, and the Commission concludes that doing so will serve the public interest. The Commission also rejects Local Media TV's proposal to calculate volume based entirely upon the pairwise interference constraint files.

62. The Commission also disagrees with arguments that, if it retains a population component, it should reduce its weight in its volume formula. In particular, EOBC proposes a formula that would reduce the weight of the population component from 0.5 to 0.25, raising opening prices for almost all stations and de-emphasizing the impact of population in price offers. The Commission is not persuaded by the supposed benefits of this unbalanced weighting. The Commission rejects broadcasters' assertions that it more closely reflects the pricing policy the Commission adopted in the *Incentive Auction R&O,* for much the same reason it rejected EOBC's consistency argument. The Commission has no reason to think, and broadcasters have not established, that its opening price methodology results in prices that are too low to attract robust participation. However, raising opening prices would raise the costs of repurposing spectrum, increase the likelihood of repurposing less spectrum, and could even jeopardize the success of the auction. Absent Dynamic Reserve Prices (DRP), the Commission no longer has any mechanism to reduce prices in markets that are particularly constrained (due to the impact of Canadian or Mexican stations, or non-participants), further increasing opening prices would decrease the likelihood of a successful auction. Reducing the weighting of population would also likely increase clearing costs significantly for the same amount of cleared spectrum, which could drive the auction to lower clearing targets because forward auction revenue is insufficient to close the auction in a given stage. On the other hand, using a balanced weighting where the sum of the exponents equals one will result in appropriate price signals for all stations: If a broadcast station has twice the number of constraints and twice the population of another, under its approach its opening prices will be twice as much. Furthermore, a square-root weighted volume score (*i.e.,* using an exponent of 0.5) can improve the efficiency of algorithms similar to its pricing and bid processing algorithm.

63. EOBC additionally argues that reducing the weight of population would be in the public interest because it would result in less loss in broadcast service, since smaller stations would more often become winning bidders. In keeping with its goal of allowing market forces to determine the highest and best use of spectrum, the public interest will be best served by setting prices according to each station's value to the auction and the repacking process. While encouraging stations that serve smaller populations to go off-air might result in loss of service for fewer over-the-air viewers, it would do so at the risk of discouraging large stations in high-demand markets from participating in the auction. In order to fulfill the goals of the Spectrum Act, it is appropriate to set price signals that encourage broadcasters to relinquish their spectrum usage rights in the reverse auction, not to discourage certain stations from participating so that they will remain on the air. The Commission concludes, therefore, that considering population and interference, in an equal, balanced weighting, will best achieve the goals of the incentive auction.

3. Committing to an Initial Relinquishment Option

64. As the second condition for qualifying to bid in the clock phase of the reverse auction, an applicant that has submitted a timely and complete application must commit to a preferred relinquishment option for each station that it intends to bid for in the reverse auction, and under the circumstances, it may commit to additional ''fallback'' options. An applicant will be able to commit only to relinquishment option(s) that it identified for a particular station when initially submitting its auction application. If an applicant did not identify a particular relinquishment option on its auction application, that option will not be available to the applicant when it logs in to the FCC software to commit to an initial relinquishment option for that station. The commitment(s) will constitute an irrevocable offer by the applicant to relinquish the relevant spectrum usage rights in exchange for the opening price offer for that bid option. A commitment to a fallback relinquishment option is treated as a binding commitment in the alternative to the preferred option. An applicant need only commit to a fallback option in the event that its preferred option is to move either to the Low- or High-VHF band. Therefore, the auction will

commence with the submission of initial bid commitments. An applicant that fails to commit to an initial relinquishment option for a given station by the applicable deadline will not be qualified to bid in the clock phase of the auction for that station.

65. As part of determining an initial clearing target, the auction system will assign or designate each station to a relinquishment option consistent with its initial bid commitment in order of the priority rules proposed in the *Auction 1000 Comment PN* (proposing the following priority order: (1) Minimize the number of participating UHF stations that must be repacked in their pre-auction band; (2) minimize the number of participating VHF stations that must be repacked in their pre-auction band; (3) maximize the number of participating stations that will commence bidding on their preferred option; (4) maximize the number of participating stations that will commence bidding on their alternative bid option to go off-air; and (5) minimize the sum of impaired weighted-pops across all licenses), modified by the additional priority rules the Commission adopts to take account of the secondary and tertiary objectives in the initial clearing target determination procedure. The technical details of the modification to take account of the additional clearing target objectives will be released in an appendix to the *Application Procedures PN.* That relinquishment option will be the starting point for each station to bid in the clock phase of the reverse auction. Due to the limited availability of VHF channels and the technical constraints on repacking, the auction system may not be able to accommodate every station that commits to move to the Low- or High-VHF band. The auction system can always accommodate going off-air as a preferred option because going off-air does not require finding a feasible channel assignment. In order to increase the likelihood that stations will be able to participate in the auction, the Commission established procedures to allow applicants that commit to move to VHF as their preferred option to also commit to a fallback option(s) if they so choose. Applicants that commit to a preferred option may decline to commit to fallback options. In order to qualify to bid in the clock phase of the reverse auction, an applicant that identified only one relinquishment option on its auction application must still affirmatively commit to that option as its preferred option—it will not have any fallback options available to it. The auction system will attempt to designate a station to the preferred option for that station. If the auction system is unable to accommodate a station in its preferred option, the system will attempt to designate the station to its fallback option(s), if the applicant committed to any. If an applicant declines to commit to a fallback for a station and its preferred option for the station cannot be accommodated—or, if neither its preferred nor fallback options can be accommodated— the station will be designated to be repacked in its pre-auction band and will not participate in the reverse auction bidding.

66. As applicants consider which option to commit to as the preferred option for a station, they should be mindful that once the bidding system designates a station to an initial relinquishment option, future bid options for that station will be limited by the one-way hierarchy of relinquishment options. For example, if a UHF bidder identified all three options on its auction application and then committed to go off-air, it may, in a subsequent bidding round, request to switch to Low-VHF or High-VHF. However, if that same bidder instead committed to move to Low-VHF as its preferred option and the auction system were able to accommodate that option, that bidder would begin the auction bidding to move to Low-VHF and would be precluded from ever bidding to go off-air.

4. Final Auction Application Status

67. Once the auction system processes the initial bid commitments and designates each station that can be accommodated to an initial relinquishment option, the Commission will send confidential letters to each reverse auction applicant to inform them of their status with respect to the clock phase of the reverse auction. The letters will notify applicants for each of their stations either that (1) the station is qualified to participate in the clock phase of the reverse auction; (2) the station is not qualified because no initial commitment was made, and therefore, that station will be designated to be repacked in its pre-auction band; (3) the commitment(s) made by the applicant for the station could not be accommodated, and therefore, that station is not qualified and will be designated to be repacked in its pre-auction band, or (4) the auction system determined that the station is not needed, and therefore, the station is not qualified and will be designated to be repacked in its pre-auction band. As part of the process of determining the initial clearing target, the auction system may determine that certain stations will always have a feasible assignment in their pre-auction band at the initial and all subsequent clearing targets. Such stations' spectrum usage rights will never need to be purchased to meet the clearing target and their participation in the clock phase of the reverse auction is not needed. Qualified bidders will begin the first round of the clock phase bidding for each station's designated initial relinquishment option. Each applicant that submits an initial commitment is obligated to relinquish at the relevant opening price the spectrum usage rights associated with its initial relinquishment option if the auction system selects its station to relinquish its rights at the opening bid price.

68. Prior to the deadline to apply to participate in the reverse auction, the Commission intends to provide, in various formats, detailed educational information to would-be participants, including among other things an auction tutorial that will be available on the Auction 1000 Web page for prospective bidders to walk through the auction process and the application and bidding screens. Once applicants have qualified to participate in the clock phase of Auction 1001, registration materials will be distributed. Additionally, all bidders qualified to bid in the clock phase will be able to participate in a mock reverse auction prior to bidding in the clock phase of Auction 1001, which will enable bidders to obtain hands-on experience with the auction system. Further details about the mock auction and the auction tutorial, including relevant dates and how to access these tools, will be announced in the *Application Procedures PN.*

B. Qualifying To Bid in the Forward Auction

69. In order to qualify to bid in Auction 1002, an applicant must timely submit an auction application that is deemed complete and timely make a sufficient upfront payment. The amount of the upfront payment will determine a bidder's initial bidding eligibility in terms of bidding units, *i.e.,* the maximum number of blocks, as measured by their associated bidding units, a bidder may demand in the clock phase of the forward auction. The *Application Procedures PN* will address the process of applying to participate in Auction 1002, including descriptions of the information required to be disclosed, instructions for completing the form, and specific deadlines for submission. The Commission adopts procedures for assigning bidding units to each spectrum block that will be

available in the forward auction. The Commission also adopts a method for calculating the upfront payment each applicant must make to obtain bidding eligibility for forward auction spectrum blocks.

1. Bidding Units

70. The Commission will assign to each spectrum block that will be available in the forward auction a specific number of bidding units and will use the bidding units to calculate minimum opening bids, upfront payments, and bidder eligibility, and for measuring bidding activity. In particular, as the Commission proposed, it will assign bidding units to spectrum blocks in each PEA by using a weighted population method similar to the method it will use for measuring the extent of impairment in a PEA. The only difference is that, in measuring the extent of impairment in a PEA, the Commission will use the index value specific to the PEA—it will not group the price index by deciles and apply the lowest index value in a decile to all of the PEAs in that decile, as it does for calculating bidding units.

71. The *Application Procedures PN* will set forth the updated indices and number of bidding units that will be assigned to spectrum blocks in each PEA under its adopted approach. The Commission notes that some of the bidding unit values that will be announced will differ from those in Appendix F of the *Auction 1000* Comment *PN* because they will incorporate the results of Auction 97. The Commission will derive these values by incorporating auction results from Auction 66, Advanced Wireless Services (AWS–1); Auction 73, 700 MHz Band; and Auction 97, Advanced Wireless Services (AWS–3) into an index of area-specific relative prices from prior auctions. This relative price index is the same index used for measuring the impaired weighted-pops for a license. Consistent with the approach used for Auction 96 (H Block) and Auction 97, the Commission will multiply the population of each PEA by the index value for the PEA. The Commission will incorporate the results from past auctions for spectrum licensed in Economic Areas (EAs) and Cellular Market Areas (CMAs) by breaking the data down to the county level and then aggregating the county-level data up to the PEA level. For the purpose of assigning bidding units to spectrum blocks in each PEA, the Commission will group the relative price index by deciles and apply the lowest index value in each decile to all PEAs in that decile. Next, the Commission will divide the result of the calculation by 1,000 and round it using the Commission's standard rounding procedures for auctions. Specifically, the Commission will round numbers greater than 10,000 to the nearest thousand; numbers less than 10,000 and greater than 1,000 to the nearest hundred; numbers less than 1,000 and more than 10 to the nearest ten; and numbers less than 10 to the nearest one. All PEAs will have at least one bidding unit. As a result, the Commission will calculate bidding units for the spectrum blocks in most PEAs as (pops * index)/1000, rounded. Because not all of the licenses covering U.S. territories and protectorates had winning bids in past auctions, for spectrum blocks in the PEAs for Puerto Rico, Guam-Northern Mariana Islands, U.S. Virgin Islands, and American Samoa, the Commission will divide the results of the weighted population calculation by 2,000 and round the results. Further, the Commission will assign one bidding unit to spectrum blocks in the Gulf of Mexico PEA.

72. Each block available in a PEA will have the same number of bidding units regardless of category. This approach will facilitate bidding across categories by enabling bidders to switch their demand for Category 1 blocks to Category 2 blocks and vice versa without affecting their bidding eligibility. The number of bidding units for the blocks in a given PEA will be fixed and will not change during the auction, regardless of price changes.

73. The Commission disagrees with arguments that it should determine bidding units (and, therefore, upfront payments and minimum opening bids) based solely on population or without regard for the final results from Auction 97. By incorporating past prices, its approach reflects the relative value bidders have assigned to the different markets in the past better than would a calculation based solely on population, and hence, is more likely to reflect the relative prices for markets in this auction. Its approach also helps ensure that bidders' upfront payments are reasonably proportional to the market prices of the spectrum blocks they demand. Further, using a price index rather than a population index ensures that the Commission does not exclude significant past price differences between similarly-sized markets in its calculations. At the same time, using the results of several previous auctions and the decile approach helps to reduce the impact of any unusual price variation from a single auction. Thus, this approach addresses concerns about incorporating auction-specific anomalies from prior auctions.

74. The Commission is not persuaded by CCA's argument that including pricing data from Auction 97 will prejudice smaller bidders. Prices from Auction 97 are useful in that they provide the most recent data on the relative prices bidders were willing to pay for spectrum licenses in various markets. While prices in Auction 97 generally were higher than in previous auctions, the Auction 97 information being incorporated consists of additional data on relative prices across markets and does not reflect overall price levels. The updates will have a varying effect on different markets, but it will not result in a substantial change in the total number of bidding units, upfront payments, and minimum opening bids.

2. Upfront Payment Due After Initial 600 MHz Band Plan Determined

75. The Commission adopts an upfront payment amount of $2,500 per bidding unit—half of the amount of the minimum opening bid for each spectrum block. The upfront payment amounts for generic blocks in every PEA for Auction 1002 will be announced in the *Application Procedures PN.* The Commission will base the upfront payment for each generic block on the number of bidding units associated with the blocks in a specific PEA established. The Commission notes that in the *Auction 1000 Comment PN* it proposed to multiply the number of bidding units of a spectrum block by $2,500 and then round the result of that calculation. The upfront payments the Commission adopts here will use the same calculation, but the result will not be rounded so as to maintain a two to one relationship between minimum opening bids and upfront payments. This approach is consistent with its usual practice and supported by the record. Thus, to become a qualified bidder, a forward auction applicant must make an upfront payment sufficient to obtain bidding eligibility for the quantity of generic blocks in each PEA on which it may wish to bid in any round.

76. Its experience in past spectrum license auctions indicates that requiring upfront payments protects against frivolous or insincere bidding and provides the Commission with a source of funds from which to collect payments owed at the close of the auction. For these reasons, the Commission declines to reduce the upfront payment to $1,000 per bidding unit as suggested by CCA. Contrary to CCA's assertions, the Commission finds that insincere bidding is a real risk in any spectrum

license auction. Moreover, the Commission is not persuaded that setting an upfront payment amount at half of the minimum opening bid price will threaten small carrier participation. Even after applying discounts for license impairments and bidding credits, the final winning bid amount for a license will exceed the ''cost'' (*i.e.,* upfront payment) to obtain enough eligibility to bid for the generic block. Thus, it is reasonable to require that forward auction applicants be willing and able to make upfront payments in the amount of $2,500 per bidding unit.

77. The Commission finds it unnecessary to discount upfront payments for Category 2 licenses. The upfront payment is a refundable deposit meant to help ensure sincere bidding and to establish initial eligibility levels for use with the activity rules. Basing an upfront payment on a spectrum block's potential degree of impairment would not further the purpose of an upfront payment, especially since the number of spectrum blocks in each category and their respective degrees of impairment may change from stage to stage of the auction.

78. Upfront payments will be due after the initial clearing target and associated band plan scenario has been determined. This timing will enable an applicant to take into account the number of spectrum blocks in the band plan scenario associated with the initial clearing target when determining the amount of its upfront payment. In keeping with the Commission's usual practice in spectrum license auctions, all upfront payments must be made by wire transfer in U.S. dollars. Specific instructions for submitting upfront payments, including wiring instructions, will be set forth in the *Application Procedures PN.*

79. An applicant's total upfront payment must be enough to establish eligibility to bid on at least one block in one of the PEAs selected on its auction application for Auction 1002, or else the applicant will not be qualified to bid in the auction. An applicant must select on its auction application one or more PEAs in which it may place bids during the forward auction. An applicant will not be required to identify on its auction application the number of blocks within a PEA it demands because the Commission will not know the maximum number of spectrum blocks that will be offered in the forward auction until the initial spectrum clearing target is determined. Because bidding unit amounts pertain to a single paired 5+5 megahertz block for each PEA, a bidder that wishes to bid on multiple generic blocks within a PEA simultaneously will need to ensure that its upfront payment provides enough eligibility to cover more than one paired 5+5 megahertz generic block in the PEA.

80. An applicant does not have to make an upfront payment to cover blocks in all of the PEAs the applicant selected on its auction application, but it should make an upfront payment that covers the maximum number of bidding units that are associated with the quantity of blocks in the PEAs on which it wishes to place bids in any given round. The total upfront payment does not affect the total dollar amount the bidder may bid for quantities of generic blocks, nor will it be attributed to specific blocks or PEAs. Rather, the bidder may place bids for quantities of blocks in any combination of the PEAs it selects on its auction application, provided that the total number of bidding units associated with those blocks will not exceed its eligibility when it places the bid(s). Bidders will not be able to increase their eligibility during the auction; bidders only will be able to maintain or decrease their eligibility. Thus, in calculating its upfront payment and hence its initial bidding eligibility, an applicant must determine the maximum number of bidding units on which it may wish to bid in any single round and submit an upfront payment covering that total number of bidding units.

81. For example, under the approach the Commission adopts, assume there are 27,000 bidding units associated with each block in the New York, New York PEA, and 21,000 bidding units associated with each block in the Los Angeles, California PEA. If a bidder wishes to bid on one block in both PEAs in a round, it must have selected both PEAs on its auction application and purchased at least 48,000 bidding units (27,000 + 21,000) of bidding eligibility. If a bidder only wishes to bid on a block in one of these PEAs, purchasing 27,000 bidding units would allow the bidder to bid on a block in either PEA, but not on a block in both PEAs at the same time. If the bidder purchased only 21,000 bidding units, it would have enough eligibility to bid on a block in Los Angeles, but not on a block in New York. If a bidder wishes to bid on more than one block in a PEA, it must have purchased sufficient eligibility for that number of blocks. Thus, continuing with its example, a bidder interested in bidding on three blocks in Los Angeles must purchase at least 63,000 bidding units (21,000 * 3) of bidding eligibility.

82. The Commission notes that its rules require that any auction applicant that certifies it is a former defaulter—*i.e.,* has been in default on any Commission license or has been delinquent on any non-tax debt owed to any Federal agency—must submit an upfront payment equal to 50 percent more than that set for each spectrum block. Recently in the *Updating Part 1 Competitive Bidding Rules* 80 FR 56764, September 18, 2015 proceeding, the Commission narrowed the scope of the defaults and delinquencies considered for purposes of this rule. Under its amended rules, applicants may exclude from consideration as a former default any cured default on a Commission license or delinquency on a non-tax debt owed to a Federal agency for which any of the following criteria are met: (1) The notice of the final payment deadline or delinquency was received more than seven years before the relevant auction application deadline; (2) the default or delinquency amounted to less than $100,000; (3) the default or delinquency was paid within two quarters (*i.e.,* six months) after receiving the notice of the final payment deadline or delinquency; or (4) the default or delinquency was the subject of a legal or arbitration proceeding that was cured upon resolution of the proceeding. Additional details concerning the application of the Commission's former defaulter rules to forward auction applicants, including any required certifications and the higher upfront payment requirement, will be set forth in the *Application Procedures PN.* After the auction, applicants that are not winning bidders or are winning bidders whose upfront payment exceeded the total net amount of their winning bids may be entitled to a refund of some or all of their upfront payment.

3. Final Auction Application Status

83. Consistent with its normal auction procedures, a public notice will announce all qualified bidders for the forward auction (*Qualified Bidders PN*). Qualified bidders are those applicants with submitted auction applications that are deemed timely-filed and complete, provided that such applicants have timely submitted an upfront payment that is sufficient to qualify them to bid. Since the rule prohibiting certain communications applies to both reverse and forward applicants and the prohibition commences on the auction application deadline, the Commission anticipates setting concurrent application filing deadlines for the reverse and forward applicants.

84. Similar to what will be provided for potential reverse auction participants, the Commission intends to provide, in various formats, detailed educational information regarding the forward auction, including among other

things an auction tutorial that will be available on the Auction 1000 Web page for prospective bidders to walk through the auction process and the application and bidding screens. Registration materials will be distributed to qualified bidders prior to the auction. All qualified bidders will be eligible to participate in a mock auction prior to bidding in Auction 1002, which will enable bidders to obtain hands-on experience with the auction system prior to the auction. Further details about the mock auction and the auction tutorial, including relevant dates and how to access these tools, will be announced in the *Application Procedures PN.*

V. Reverse Auction Bidding

85. The Commission will use a descending clock auction format in the reverse auction, in which participants will bid over a series of rounds by responding to new price offers for one or more relinquishment options. The Commission establishes reverse auction bidding procedures and explain how the auction system will both calculate new price offers during the clock rounds and process bids to determine which bidders will be selected by the auction, and at what price, to relinquish spectrum usage rights.

86. The Commission generally adopts the reverse auction bidding procedures proposed in the *Auction 1000 Comment PN,* except that the Commission will not use dynamic reserve prices (DRP), and the Commission adopts its alternative proposal to simplify the reverse auction bidding process by not providing an intra-round bidding option. Notwithstanding the potential benefits of using DRP, the Commission concludes that not using it will encourage voluntary participation in the reverse auction by removing uncertainty among broadcasters, and is consistent with the record consensus in favor of minimizing the potential for impairments. In addition to the information the Commission proposed to provide, the auction system will provide information to each active bidder regarding the available room for repacking stations at the end of each round of the auction.

A. Availability of Auction-Related Information

87. The Commission will make auction information public as soon as possible, consistent with its rules, policies, and procedures that help protect the competitiveness of the auction, as well as with applicable statutory requirements. As in past Commission auctions, the public will have access to certain auction information, while auction participants will have secure access to additional non-public information. Details of how to access auction information will be provided in the *Application Procedures PN.*

88. The Application Procedures PN also will detail the prohibition on communicating information relating to bids or bidding strategies, such as the non-public information that bidders may access in the auction system, to broadcast licensees eligible to participate in the reverse auction or to forward auction applicants, subject to specified exceptions. The Commission cautions eligible broadcast licensees that communicating non-public information that they receive to others, whether directly or indirectly through third-parties or public disclosure, could violate that prohibition.

89. In response to the numerous commenters that contend that the Commission should make as much information available regarding the reverse auction as possible, either to the public or to the auction participants, more information will be provided to both the public and reverse auction participants than was proposed in the *Auction 1000 Comment PN.* The Commission will make public, before the deadline for filing applications to participate in the reverse auction, the opening prices for all stations whose spectrum usage rights are eligible to be offered in the auction and for each bid option available to each station. The Commission set forth the formula for these prices in the *Auction 1000 Bidding Procedures Public Notice.* Prices for each station and for each bid option for each station may be calculated using this formula and publicly available information. Rather than require each licensee to make these calculations separately, the Commission will make them public. The Commission does so to encourage participation, to further the transparency of the auction, and in response to comments requesting that the Commission do so.

90. Reverse auction bidders will be informed of the initial bidding round schedule when they are informed that they are qualified to bid in the clock phase. The schedule will establish the length of time each round will last. Bidders may respond to price offers for available bid options in each round. Round results will be released to bidders after each bidding round.

91. The Commission will make public the initial spectrum clearing target as soon as possible after completion of the initial clearing target determination procedure. Many commenters support this approach. Some suggest that the Commission announce a clearing target before broadcasters make initial commitments, in order to assist broadcasters in doing so. The initial commitments, however, are an essential component for determining the initial clearing target. The Commission will announce the initial clearing target before any bidding takes place in the clock phase of the reverse auction.

92. Once the bidding in the clock phase of the reverse auction begins, the Commission will make publicly available information about the current stage of the auction and whether or not reverse (or forward) auction bidding is currently open. Information regarding amounts necessary to meet the final stage rule will be public, as well as whether or not the final stage rule has been met. Such information will include the aggregate amount of provisionally winning reverse auction bids to relinquish spectrum usage right, which is part of the second component of the final stage rule. In addition, the auction system will provide each reverse auction bidder with non-public information that it can use in determining how it will bid. More specifically, the auction system will provide to each bidder—but not to the public—each station's bidding status and price offers for all options relevant given the station's status.

93. The auction system also will provide each reverse auction bidder with vacancy index information, indicating the relative availability of channels in each relevant band, as part of each round's bidding results for active stations. Providing this information is consistent with the strong record support for providing reverse auction participants with as much information as possible to help with bidding. A broadcaster can use vacancy information to assess the likelihood of various developments, such as whether a price for a given option may continue to decline. Given that the auction system incorporates such information in price computations, and sophisticated bidders might be able to extract the information in a limited set of cases, the Commission concludes that providing such information to each bidder will promote transparency and information parity among all bidders, and that the auction system can provide such information without unduly complicating participation or compromising the confidentiality of participation in the reverse auction.

94. The auction system calculates vacancy information when setting prices. For a given station, the auction

system will determine the number of channels available in the station's ''neighborhood'' for the relevant band. A station's neighborhood consists of all active stations, *i.e.,* all participating stations that have not exited or become provisional winners including the station itself, that could interfere directly with the station in the relevant band and therefore potentially limit assigning the station to an available channel in that band. The auction system uses each station's volume to weight the number of channels available to it and then averages those weighted results for all stations in the station's neighborhood. The vacancy index information that the auction system will provide to bidders will indicate whether the average of weighted channels available to active stations in the neighborhood falls within one of three ranges, low, medium, or high. The range format should prevent the information from being used to identify the neighboring stations consistent with its obligation to protect the confidentiality of reverse auction participation.

95. More specifically, for each bidder with an active UHF station, the UHF vacancy index will indicate whether the average of weighted UHF channels available to the active stations in the neighborhood is: Less than three (low); greater than or equal to three, but less than or equal to six (medium); or more than six (high). Given the smaller number of channels in the VHF band, the ranges will be narrower. For each bidder with an active VHF station, the vacancy index in the station's pre-auction band will indicate whether the average of weighted channels available to the active stations in the neighborhood for the pre-auction band of the bidder's station is: Less than two (low); greater than or equal to two, but less than or equal to four (medium); or more than four (high). With respect to relevant bands other than a station's pre-auction band (*i.e.,* for UHF stations, High-VHF and Low-VHF, and for High-VHF stations, Low-VHF), the values used to define the three ranges will be determined based on the ratio of the level of vacancy in that band to the level of vacancy in the station's pre-auction band. This ratio is already used in setting prices for moving to the same bands. Consequently, bidders with prices for a station that may move to a new band could infer the information without the vacancy index. The vacancy index puts it to use in an explicit report to the bidder. The auction system will report the values that define the ranges when providing the vacancy index information. The technical formulas for setting the values will be provided in the *Application Procedures PN.*

96. In all cases, a value in the low range for the index will indicate a higher potential for the relevant band to fill soon; a value in the medium range will indicate less likelihood; and a value in the high range will indicate still less likelihood. The Commission emphasizes that this information will be based on the results of the prior round and will provide no certainty with respect to developments in future bidding rounds. Ultimately, the bidding of other reverse auction participants will determine when any available channels are filled. Nevertheless, the vacancy index information based on past round results will help bidders make rough estimates of whether a particular bid option will continue to be available, as well as provide bidders with a sense of the relative likelihood that a station's various bid options will continue to be available. Changes to the vacancy index from round to round also may provide helpful information regarding changes in the status of neighboring stations at current clock prices. The Commission notes, however, that a station's vacancy index may change if a second neighboring station becomes provisionally winning, even though that did not change the number of available channels. For example, if a non-neighboring third station's decision to exit the auction made it infeasible to repack the neighboring second station, the neighboring station would become a provisional winner and therefore would no longer be included in the calculation of the first station's vacancy index. In that circumstance, the first station's index may change even though no available channel in its neighborhood was filled.

97. The Commission declines to adopt EOBC's proposed alternative to the vacancy index, which likewise uses the average of the weighted number of channels available to all stations in a given station's neighborhood, but instead of providing station-specific information on a confidential basis would involve averaging that information across all stations in each Designated Market Area (DMA) and disclosing the information publicly. The vacancy index will confidentially provide each bidder with information targeted to its station(s), which should better predict how soon a price offered that station is likely to freeze. The station-specific information provided by the vacancy index the Commission adopts also will be more uniformly useful to all bidders than EOBC's alternative. EOBC argues that a publicly disclosed metric is fairer as it would provide more uniform information, in particular assuring that the information each bidder possesses is the same regardless of the number of stations it offers in the auction. The Commission disagrees. Some bidders might be able to infer information unavailable to others based on a combination of average DMA vacancy information and station-specific vacancy information, which is used by the auction system to calculate prices. The approach the Commission adopts will provide each bidder with station-specific information without providing an advantage to some bidders. Further, providing vacancy index information for each station will avoid putting participants with fewer stations in the auction at a disadvantage, as bidders will have the same information relative to each of their participating stations.

98. Because the vacancy index the Commission adopts will assist broadcasters seeking to forecast the outcome of the auction, it addresses requests by commenters for information regarding the reverse auction that would enable ''outcome discovery'' by broadcasters. The other information that will be provided satisfies many requests that commenters make for specific information regarding the reverse auction, such as the initial spectrum clearing target and opening prices for all stations. In combination, all of the information will facilitate efforts by broadcasters to forecast prices in the auction. The Commission conclude that providing additional information to reverse auction bidders could unduly complicate participation in the reverse auction or compromise the confidentiality of such participation.

99. In addition to the bidding information, the Commission will use the auction system to make auction announcements regarding any other necessary information to reverse auction participants, such as schedule changes. Providing auction announcements through the auction system has been an effective and efficient way to communicate necessary information to auction participants in past auctions, and the Commission expects that this will be the case for the reverse auction as well.

100. The Commission notes that while reverse auction bidders will have access to far more information than it originally proposed, in order to serve the interests of broadcasters, it is required to make less information public regarding the reverse auction than it does regarding the forward auction. To begin with, the Spectrum Act expressly requires that the Commission take reasonable steps to

keep confidential Commission-held data of licensees with respect to their participation in the reverse auction, including their identities. Commission rules further extend confidential treatment with respect to non-winning bids and bidders for two years after the close of the auction, so that broadcasters may participate in the reverse auction without being compelled to disclose their willingness to relinquish spectrum usage rights for that longer period.

101. Accordingly, the Commission will not disclose the name of the licensee, the channel number, call sign, or facility identification number of its participating station(s), or its network affiliates in connection with the participation of any licensee in the reverse auction. The Commission also will keep confidential any other information that may reasonably be withheld to protect the identity of the licensee as a reverse auction participant, such as information regarding the status of licensees as participants or provisional winners during the auction. To safeguard this confidential information, the Commission will not make public any information relating to applications to participate in the reverse auction until after the auction concludes. Whether similar information was made public in prior spectrum license auctions, or has been provided on a non-public basis by the Commission, does not change whether the rule applies. Unlike in conventional spectrum license auctions, the Commission will not issue public notices with respect to the status of the reverse auction applications that are filed. Instead, the Commission will communicate regarding these applications directly—and confidentially—with the respective applicants. Finally, because information regarding a participant's station is integral to determining the bids offered in the auction, information regarding specific bids during the course of the auction cannot be made public.

B. Determining New Price Offers in Clock Rounds

102. Under the descending clock auction format that the Commission adopted for the reverse auction, in every clock round, the auction system will decrement the per-volume nationwide base clock price. As with opening price offers, a UHF station will be offered a price to go off-air in each clock round that will equal the base clock price multiplied by its station-specific volume factor. The price offer for a UHF station to go off-air is the base clock price times the station's volume. Therefore, if the per-volume base clock price is decremented by five percent, the price offer will decrease by five percent. Unlike opening price offers, however, the new price offers in clock rounds for UHF stations to move to the VHF bands, or for VHF stations to move to a lower band or go off-air, will reflect the relative availability of channels for each station in the VHF bands. Opening prices for intermediate moves will in aggregate be equal to the full base clock price (or, in percentage terms, will sum to 100 percent) for a move from UHF to off-air since in terms of value to the auction intermediate moves, when taken together, are equivalent to a move from UHF to off-air, which is set by the base clock price. The opening prices for intermediate moves will form the starting point for prices for such moves in the clock bidding rounds, but as relative vacancy rates change, these prices will vary. These differences in relative price changes are intended to encourage moves that promote more efficient repacking of the VHF bands. For example, if the High-VHF band is particularly congested in an area, the price offer for a UHF station in that area to move to High-VHF will decrease more quickly than if the High-VHF band were less congested. As a result, a UHF station will have less incentive to request a move to High-VHF than if the High-VHF band were less congested and price offers decrease more slowly. By setting price offers in this way, the auction system will encourage moves that are particularly beneficial to the reverse auction's goal of clearing spectrum in the UHF band.

103. In each round of the reverse auction, the base clock price decrement will be the larger of: (i) Five percent of the current base clock value or (ii) one percent of the $900 opening base clock price. Consistent with the Commission's standard auction procedures and as proposed in the *Auction 1000 Comment PN* (to reduce the base clock price by between three percent and 10 percent per round) the size of the decrement may be adjusted in the reverse auction. Although the Commission does not anticipate that the decrement in the reverse auction will need to be adjusted, if circumstances warrant, the change and the new decrement will be announced at least 24 hours in advance to all bidders. Although several commenters urge the Commission to decrease prices by no more than one percent in each round, a decrement of five percent will better balance its interests in completing the reverse auction bidding within a reasonable amount of time while avoiding significant losses of efficiency or increases in costs. Because the forward and reverse auctions run sequentially within a stage and because there may be multiple stages, it is important to limit the number of reverse auction rounds. The combination of (i) and (ii) ensures that the reverse auction will require no more than 52 rounds in any stage. In subsequent stages, the reverse auction may require even fewer rounds, depending on the level to which the base clock price must be reset after a new stage transition, and how quickly newly-active stations either drop out or become provisionally winning. Using a decrement of one percent would require considerably more bidding rounds. For example, using just part (ii) of the Commission's price decrement rule—a price decrement of one percent of the base clock's opening value—would require 100 rounds, whereas using a price decrement of one percent of the current base clock value, without part (ii) or a similar mechanism, could cause the auction to continue for hundreds of more rounds as the decrement gets increasingly smaller. The Commission recognizes commenters' concerns that larger decrements could cause some stations to drop out quickly, but find that with a decrement of five percent any loss of efficiency or increased costs is likely to be *de minimis.* Moreover, a decrement of one percent risks increasing the cost of repurposing spectrum. In the absence of the proposed DRP mechanism, the prices offered to stations in some areas may ''freeze'' near opening price levels; in such cases, a one-percent decrement might require higher payments to individual stations. Higher payments are likely when stations are able to engage in coordinated behavior to manipulate the point at which their prices ''freeze.'' The Commission's rules and procedures are intended to prevent such manipulation, but do not prevent coordinated behavior by bidders that own multiple stations within an individual market. In addition, five percent price decrements would be small enough to allow the system to provide useful information to participants to guide their bidding.

C. Bidding Mechanics

104. Consistent with its proposed procedures, at the commencement of the clock phase of the reverse auction, each participating bidder will begin bidding for each of its stations at the opening price for that station's ''currently held option,'' which will be the initial relinquishment option determined by the initial commitment procedures. So long as the auction system can determine a feasible channel assignment

for that station in its pre-auction band—by conducting a ''feasibility check'' prior to the clock round—the system will continue making new, reduced price offers to that station. For each station the auction system must, prior to processing its bid, find a feasible channel assignment in the station's pre-auction band—that is, an assignment that does not violate any of the pairwise constraints and is therefore consistent with the Spectrum Act's preservation mandate. To do this, the system conducts a ''feasibility check'' using mathematical satisfiability-solver software to quickly determine whether such a channel assignment exists. The bid options for which the system will calculate price offers will be based on the station's pre-auction band, the options the bidder selected for that station on its application, the currently held option for that station, and the hierarchy of bid options. If, however, a feasible channel assignment does not exist for a station in its pre-auction band in the first round, the station will be ''frozen'' in its currently held option from the start of the auction at the opening price offer to which it initially committed. The system will then ask the bidder to place a bid for that station by indicating whether it is willing to accept the new price offer for its currently held option, wishes to switch to a different bid option (if applicable), or wishes to drop out of bidding. If the system is able to find a feasible channel assignment for the station in its pre-auction band during bid processing, it will adjust the station's currently held option according to its bid (honoring its request to switch options if feasible) and reduce its current price to the accepted price offer for that option. Otherwise, the system will ''freeze'' that station's currently held option without reducing its current price. Once a UHF station is frozen, it becomes a provisionally winning bidder and will not be asked to bid for the rest of the reverse auction in that stage. If a VHF station is frozen, however, it does not necessarily become provisionally winning if the station may be unfrozen later in the reverse auction in the same stage. This could occur, for example, if a UHF station that was bidding to move to VHF chooses to drop out of bidding, thus freeing up a channel in the VHF band. If this free channel enables the system to feasibly assign a frozen VHF station to a channel in its pre-auction band, the system will unfreeze the VHF station and ask it to bid at its new price offers. The system will freeze a station in its currently held option without reducing its current price regardless of whether the station submitted a bid to accept the new price offer for the option, requested to switch to a different option, or bid to drop out of the auction. This will provide strategic simplicity for bidders by ensuring that bidding to accept a new price offer will never result in a station receiving a lower price for its option than it could have received if it refused to accept the offer.

105. A bidder that has or is interested in only a single bid option will have a simple choice: Whether to accept the lower clock price offered for its station's currently held option or to rejects that offer and drop out of the bidding. If a bidder fails to place a bid, the auction system will treat this bidder as unwilling to accept a lower offer. A bidder that is considering more than one of the relinquishment options currently available to its station will additionally be able to request to switch bid options, consistent with the hierarchy of options. Since the auction system may not always be able to find a feasible channel assignment for a station to switch to one of the VHF bands, the system will prompt a bidder requesting to switch options to provide a fallback bid in case the system cannot accommodate its request. A fallback bid allows the bidder to choose either to accept the lower price offered for its station's currently held option or to drop out of bidding if the system cannot accommodate its request to switch bid options. The Commission reminds bidders that each bid placed is a binding commitment by the bidder to accept a payment that is no less than the price offered in return for relinquishing the spectrum usage rights associated with its bid option should the auction system select the bid as a winning bid.

106. Responding to numerous commenters that urge the Commission to make reverse auction bidding as simple as possible, the Commission determines that it can reduce complexity without sacrificing efficiency by foregoing the use of intra-round bidding. In the *Auction 1000 Comment PN,* the Commission sought comment on bidding procedures without intra-round bidding due to its concern that intra-round bidding could increase the complexity of auction participation for broadcasters. Absent intra-round bidding, bidders will face a simpler choice to accept or rejects a new lower price, or to switch bid options at the lower price, rather than having to indicate precise prices at which their choices change. In addition, because the number of computationally complex feasibility checks that the system must solve during bid processing will be greatly reduced, the auction system will be able to report round results more quickly. Furthermore, not providing for intra-round bidding will have minimal effect on the reverse auction's efficiency and cost given the relatively small price decrements that the Commission has chosen. For reasonably sized price decrements (within the three to 10 percent range that the Commission proposed), the loss in efficiency and cost is of ''second-order'' to the size of the decrement because the likely number of instances in which there is any loss at all for any particular bidder and the magnitude of the loss when it occurs are both proportional to the percentage bid decrement. Specifically, the likelihood of loss is proportional to the bid decrement because there is a loss only when two competing bidders attempt to make incompatible changes to their bids in exactly the same clock round. The magnitude of the loss is likewise proportional to the decrement because two competing bidders that try to change in the same round have the same value to the auction, within one decrement, in terms of cost and efficiency. The price decrements the Commission chooses are large enough to ensure a reasonably speedy reverse auction while at the same time small enough that removing intra-round bidding will not have a substantial impact on the outcome of the auction.

107. The Commission adopts a simple proxy bid mechanism to make it easier for bidders to monitor the auction. EOBC, the only commenter to address this proposal, urges the Commission to adopt it. Under the bidding procedures the Commission adopts, a bidder will be able to submit a proxy bid to continue bidding for its station's currently held option until the price offer drops below some specified price. A station that is frozen but not provisionally winning (*i.e.,* that has the status of either ''frozen—currently infeasible'' or ''frozen—pending catch up'') may also place a proxy bid notwithstanding the fact that it is not given a price offer in the round and it is not otherwise submitting a bid, because the station may become unfrozen in a later round. Additionally, the Commission will limit the range that a bidder can set its proxy bid, so that the specified price for a proxy bid may be no less than 75 percent of a station's price offer in the round. This limit may be adjusted up or down at any point in the auction. Such an adjustment will be announced at least one round before the new limit on proxy bids. Thus, a bidder who wishes to remain active in the auction may be required to submit a new proxy bid periodically. Bidders will be able to

revise or cancel any proxy bid before it is processed or in subsequent rounds while the proxy bid instructions are still in effect. Proxy bids will remain confidential from other bidders and from Commission staff other than those staff authorized during the auction to monitor bidding and the operation of the bidding system.

D. Processing Between Clock Rounds

108. The Commission establish procedures by which bids will be processed at the conclusion of each round to determine new provisional channel assignments and the new bidding status for stations. The Commission adopts the bid processing procedures detailed in Appendix D of the *Auction 1000 Comment PN,* except that the auction system will not use DRP. As bids are processed, for each station bidding in the current round, the auction system will either process its bid and reduce its current price to the accepted price offer or freeze the station, keeping its current price and currently held option unchanged, depending on the results of feasibility checking during bid processing. Once all bids have been processed, the auction system will update the bidding status of all stations and begin a new round or, if the stopping rule has been met, the reverse auction will conclude for the stage.

1. Bid Processing

109. After a clock round closes, the auction system will process bids using the bid processing algorithm the Commission proposed, except without intra-round bidding. Under these procedures, the auction system will first establish an order or ''processing queue'' for processing the bids of stations that are bidding in the current round. The system will order all such stations in descending order of the per-volume difference between the station's current price and its new price offer. Specifically, this metric is calculated by subtracting the station's new price offer from its current price and then dividing by its volume. Since the system cannot change the status of provisionally winning stations within a stage or of exited stations at any point in the auction, the system does not consider such stations during bid processing. The auction system will break any ties between stations following this calculation by using pseudo-random numbers. The system will then sequentially conduct feasibility checks for each station in the queue to find the first station in the queue that can feasibly be assigned a channel in its pre-auction band given the current provisional channel assignment. The system will consider the first feasible station and process its bid, removing it from the queue, before resuming its search for the next feasible station in the queue. The auction system will repeat this process of considering bidding stations until each station remaining in the queue is ''frozen'' in its currently held option at its current price.

110. Under the procedures that the Commission established, when the auction system considers a station that bids to accept the new price offer for the station's currently held option, the auction system will reduce the station's current price to the new price offer for that option. When the auction system considers a station that bids to switch relinquishment options, the system will first perform a feasibility check to determine whether the station's request can be accommodated: The system will only switch the station's currently held option if the station can feasibly be assigned to a channel in the requested VHF band. In that case, the auction system will update the station's currently held option and current price to the option and price offer for the requested bid option. If the station cannot be feasibly assigned to a channel in the new band, the system will instead process the station's fallback bid—either to accept the lower price offer for its currently held option or to drop out of bidding. If a station's fallback bid is to drop out of bidding, the system will mark the station as exited. Similarly, when the system considers a station whose only bid is to drop out of the auction, the system will mark the station as exited. An exited station will be assigned a provisional channel in its pre-auction band and will no longer be given price offers or asked to bid for the remainder of the auction. After bid processing, the auction system will again perform feasibility checks for all stations to determine if any stations processed earlier in the queue that had a feasible assignment are no longer feasible as a result of later processing. Any such stations will then be frozen in their currently held option at the already-reduced current price. Because the system will have already updated the currently held option and reduced the current price of stations that became infeasible due to later processing, these stations will be frozen at the lower price offer that they accepted or in the new bid option that they switched into at the start of the next round. For all stations that will be active in the next round, the auction system will then calculate prices for the next round using the price reduction procedures. The auction system will calculate prices for stations that are ''frozen—currently infeasible'' so that they may monitor price decreases in case they become unfrozen and must resume bidding in later rounds, but such stations will not be asked to submit a bid so long as they remain frozen.

111. Two parties disagree with aspects of the bid processing procedures and algorithm the Commission proposed, and filed comments proposing alternatives. AT&T proposes that, after each round, the auction system recompute the repacking constraint files based upon the provisional TV channel assignment plan in order to link price decrements to the difficulty of repacking a station in each round. Professors Sandholm and Nguyen propose to remove the hierarchical restriction on bid options and use mathematical optimization to calculate price offers and process bids. As an initial matter, neither of these commenters has demonstrated, either in theory or by means of simulations, that their proposals have significant advantages over the auction procedures the Commission establishes herein. The pricing procedures the Commission adopts take into account some measure of repacking difficulty for VHF options and VHF stations. However, in comparison to AT&T's proposed approach, the procedures that the Commission adopts provide the significant advantage of greater price certainty and predictability for UHF stations bidding to go off-air, which should speed the auction and encourage bidders to consider this relinquishment option. The Commission therefore is not persuaded that AT&T's proposal offers substantial benefits over the procedures it adopts.

112. The Commission also rejects the alternative approach proposed by Professors Sandholm and Nguyen. They argue that the sequencing of bids under the approach the Commission adopts provides an unfair advantage to stations that are processed first. However, bids must always be processed sequentially due to the relationship between the reverse auction and the repacking process, which must guarantee a feasible assignment: Stations face price competition in the reverse auction as a result of the number of stations that must be repacked into a limited number of channels. Thus, stations must always be repacked one at a time in order to guarantee a feasible assignment. In any event, some bid sequencing (and thus possible price variation) is required for *any* processing algorithm. Indeed, even the optimization-based approach proposed by Professors Sandholm and Nguyen relies upon the sequencing of

bids, they just disagree with how the Commission achieves this sequencing and instead propose an optimization-based approach that would optimize to reduce costs. While bids processed earlier may limit the options available to bidders later in the queue (*e.g.,* if two otherwise identical stations both request to switch to High-VHF, but there is only one channel available in the band), this sequencing provides the best value to the auction, because the stations that have the largest price decreases will be processed first. Furthermore, stations processed later in the queue are more likely to be frozen at a higher price offer. Any price variation due to sequencing will be no larger than one price decrement for identical bidders, in line with the price variation found in the Commission's simultaneous multiple round auctions. The Commission therefore does not regard this outcome to be problematic.

113. In addition, Professors Sandholm's and Nguyen's alternative procedures for eliciting information from bidders and for setting clock prices would add strategic complexity to the reverse auction and might deter participation. For eliciting bids, they propose that each bidder indicate a set of acceptable options, rather than a single preferred option in each round. For determining prices, they suggest optimization-based procedures to set clock prices in which a bidder's prices could continue to fall even after it can no longer be assigned a feasible channel in its pre-auction band. The Professors claim certain advantages of their proposed algorithm, but offer no comparison of their proposal to the algorithm described in the *Auction 1000 Comment PN.* Their proposed approach would create significant new opportunities for some bidders to affect final prices for their own bid options, adding strategic complexity to the auction. Such complexity would make bidding errors more likely, raise the costs of bidding, and potentially deter participation, making these procedures unsuitable for the reverse auction.

2. Dynamic Reserve Prices

114. The Commission elects not to adopt DRP procedures, which would enable the bidding system to reduce the prices offered to all UHF stations in the early rounds of the reverse auction, regardless of whether a station could be feasibly repacked into its pre-auction band. By providing a ''safety valve'' for stations whose opening prices otherwise would remain frozen because no feasible channel assignment is available for them in the remaining television bands (due to international border constraints or other factors), the Commission explained that DRP would allow it to set higher opening prices for all stations, reduce the overall cost of repurposing spectrum, and increase the likelihood of a successful auction. Based on examination of the record, however, the Commission concludes that the potential benefits of DRP are outweighed by its potential costs. Broadcasters unanimously oppose the use of DRP procedures, arguing that it will ''artificially reduc[e] prices,'' undermine trust in the fairness of its auction procedures, increase complexity and uncertainty, and discourage participation. A broad range of commenters also oppose use of DRP because it risks increasing the degree of impairment to repurposed spectrum. Commenters argue that using DRP will inevitably increase the amount of impairments to or close to the near-nationwide standard and detract from the value of repurposed spectrum.

115. The Commission agrees with commenters that it should adopt auction procedures that minimize impairments. By not using DRP procedures, the Commission eliminates the possibility of creating additional impairments after the determination of a clearing target. In addition, based on examination of the record, the Commission is concerned that using DRP as proposed would discourage voluntary broadcaster participation in the auction, contrary to its commitment to encouraging such participation. Accordingly, the Commission will not use DRP procedures. Instead, price offers will be reduced only in accordance with the procedures, and any stations with no feasible channel assignments at the beginning of the reverse auction bidding will be frozen at their opening prices. Combined with its decisions regarding the initial clearing target selection procedure and the information that will be available to bidders, not using DRP will promote its auction goals by encouraging reverse auction participation, minimizing impairments, and providing transparency for bidders.

116. The Commission also declines to adopts EOBC's alternative proposal for a ''round zero reserve'' pricing mechanism which would offer, before bidding begins, an undefined (but high) take-it-or-leave-it price to each station that would otherwise begin the reverse auction bidding process ''frozen'' at its opening price. EOBC and others support this proposal only as a substitute for DRP, and the Commission is not persuaded that EOBC's alternative would provide the benefits of its proposed DRP procedures.

3. Bidding Status

117. Based on the bid processing procedures the auction system will determine the bidding status of each station prior to each round of the reverse auction. The auction system will also determine the bidding status of each bidder prior to the first round of the reverse auction after bidders commit to an initial relinquishment option, as well as prior to the first round after transitioning to a new stage. The system will inform each bidder of the currently held option, the current price for this option, and the bidding status of each of its stations. The bidding status of each station will be one of the following: (1) Bidding in the current round, (2) frozen—provisionally winning, (3) frozen—currently infeasible, (4) frozen—pending catch up, (5) exited—voluntary, or (6) exited—not needed.

118. *Bidding in the Current Round.* If the auction system determines that a station can be feasibly assigned a channel in its pre-auction band, its bidding status will be ''bidding in the current round'' and the system will offer a new reduced price offer for each of the options currently available to it, consistent with the bid option hierarchy and price determination procedures. A station will be offered lower prices and asked to submit a bid in each round so long as its status remains ''bidding in the current round.'' However, if the system determines that a station can be feasibly assigned a channel in its pre-auction band but will be not needed for the remainder of the auction, its status will become ''exited—not needed.''

119. *Frozen—Provisionally Winning.* If the auction system determines that a station can never be assigned a feasible channel in its pre-auction band in the current stage, the station will be declared ''frozen—provisionally winning.'' For the remainder of the stage, the current price and currently held option of a station with this bidding status will remain unchanged. If the final stage rule is met during that stage, such stations will become winning stations. Otherwise, at the beginning of the next stage, the auction system will again evaluate the feasibility of assigning the station to a channel in its pre-auction band, and the station's status may change to ''frozen—pending catch up,'' ''frozen—currently infeasible,'' ''bidding in the current round,'' or ''exited—not needed.'' If at any point the system is unable to find a feasible assignment for a UHF station, its status will become ''frozen—provisionally winning.''

120. *Frozen—Currently Infeasible.* If the auction system is currently unable

to find a feasible channel assignment for a VHF station in its pre-auction band, but a feasible channel assignment could become available in a later round of the current stage, the station's bidding status will be ''frozen—currently infeasible'' and the system will freeze the station in its currently held option at its current price. A station with this status will not be asked to bid and will keep its currently held option and its current price in each round in which its status remains ''frozen—currently infeasible.'' However, a station with this status may become unfrozen and resume bidding in later rounds if the system is able to find a feasible channel assignment for the station in its pre-auction band. Such a station will be able to monitor the price offers for its different options as clock prices are decremented, and may submit proxy bid instructions that will apply if and when it becomes unfrozen. Likewise, stations with this status may later become ''frozen—provisionally winning'' if the system determines that, for all possible future behavior of bidders in the current stage, a feasible assignment will never be found. This bidding status is only possible for a VHF station because a feasible channel assignment in the VHF band may become available in a subsequent round if a UHF station currently designated to move to this VHF option drops out of the bidding or switches to a different VHF option.

121. *Frozen—Pending Catch Up.* If, at the start of a new stage, the auction system determines that a station that was ''frozen—provisionally winning'' at the end of the prior stage is no longer provisionally winning, but the base clock has not caught up to the station's ''catch up point,'' or the base clock price at the time that the station became provisionally winning in a previous stage, the station's bidding status will change to ''frozen—pending catch up'' and its currently held option and current price will remain unchanged. A station with this status will not be offered lower prices nor asked to bid in each round so long as the base clock remains above the station's catch-up point. However, a station with this status may become unfrozen and resume bidding in later rounds if the base clock reaches this price. As a result, such a station will be able to submit proxy bid instructions that will apply in case it becomes unfrozen and its status changes back to ''bidding in the current round.'' Likewise, stations with this status may later become ''frozen—provisionally winning'' if, prior to the base clock reaching the station's catch up point, the system determines that a feasible assignment will never be found for all possible future behavior of bidders in this stage.

122. *Exited—Voluntary.* If a bidder places a bid for its station to drop out (or the system placed this bid because the bidder failed to submit a bid for its station that had the status of ''bidding in the current round'') and the bid is processed, the station's status will become ''exited—voluntary,'' and that station will no longer bid in the auction. Stations with this status will no longer be offered prices nor allowed to place bids in the auction, and will be designated for repacking in their pre-auction bands.

123. *Exited—Not Needed.* If the auction system determines at any point that a feasible channel assignment will always be available for a station in its pre-auction band, its status will change to ''exited—not needed,'' and that station will no longer bid in the auction. Since the auction system will never freeze a station that has a feasible assignment, such a station will be dropped out of the bidding rather than forcing it to continue bidding until the price offer decreases to $0. As with stations that voluntarily drop out, stations with this status will be designated for repacking in their pre-auction bands, and will not participate in the remainder of the auction.

E. Stopping Rule

124. Under the procedures the Commission establishes, bidding rounds in a stage of the reverse auction will continue until no participating stations are ''active'' and all participating stations have the status ''frozen—provisionally winning,'' ''exited—voluntary,'' or ''exited—not needed.'' At that point, each participating station will either have its currently held option tentatively accepted or it will be provisionally assigned to a feasible channel in its pre-auction band. The procedures the Commission adopts answer EOBC's objection that bidding should stop when it ''does not need any additional volunteers.'' The Commission will ''not need any additional volunteers'' when no actively bidding stations remain in the auction and the reverse auction in that stage will end.

F. Final Winning Bids

125. If the current stage is the final stage of the incentive auction—that is, if the final stage rule is satisfied in the forward auction portion of the current stage—stations with ''frozen—provisionally winning'' status when the reverse auction stops in that stage will become winning stations, and the system will accept the currently held relinquishment option of each winning station. Bidders whose stations won will receive their current prices at the time the stations became ''frozen—provisionally winning.''

VI. Forward Auction Bidding

A. Bidding in the Clock Phase

126. The forward auction will utilize an ascending clock auction format under which each qualified bidder will indicate in successive clock bidding rounds its demands for categories of generic license blocks in specific geographic areas. After bidding stops in the clock phase of the forward auction, the forward auction assignment phase will be conducted to assign frequency-specific 600 MHz Band licenses consistent with the demands of specific bidders in specific geographic areas.

127. The initial stage of the forward auction will begin on the second business day after the close of bidding in the reverse auction, but no sooner than 15 business days after the release of the *Qualified Bidders PN.* The *Qualified Bidders PN* will announce the list of forward auction qualified bidders—those applicants with submitted auction applications that are deemed timely-filed and complete, provided that such applicants have timely submitted an upfront payment that is sufficient to qualify them to bid. Forward auction qualified bidders will have access to the detailed impairment information once they receive their registration materials, which will be sent after release of the *Qualified Bidders PN.* Detailed impairment information will be available only to forward auction qualified bidders. Forward auction qualified bidders must use the SecurID® tokens included with their registration materials to access the impairment information. All forward auction qualified bidders will have an opportunity to participate in a mock auction prior to bidding in the clock phase of the forward auction. The Commission anticipates that forward auction qualified bidders will have at least 10 business days after receiving their registration materials to analyze impairment data before the first round of bidding begins in the forward auction. In subsequent stages, if necessary, the forward auction will begin on the next business day after the close of bidding in that stage of the reverse auction. Forward auction bidders will be given detailed impairment information for a subsequent stage prior to the start of the reverse auction in that stage, which will give them adequate time to analyze such

information. Therefore, the Commission declines to provide any additional time between the conclusion of the reverse auction and start of the forward auction in any subsequent stage.

1. Availability of Auction-Related Information

a. Impairment Information for Bidders

128. In order to make the forward auction transparent for bidders, and in response to commenters' concerns regarding the challenges associated with bidding for impaired licenses, more information regarding impairments will be available than what the Commission proposed in the Comment PN. Forward auction qualified bidders will have access to detailed impairment information, including the actual source and location of any impairment, upon receipt of their registration materials. Information regarding the actual source and location of any impairment, *i.e.,* the facility information of the impairing stations, will be determined when the clearing target for a stage is set. More specifically, the auction system will give forward auction qualified bidders access to the following information about the licenses offered in all PEAs: (1) Aggregated impairments at the license level (for every block of every PEA), with impairment level percentages calculated using population (pops) including the associated license category (*i.e.,* Category 1 or Category 2), provided in two formats (CSV [Comma-separated values (CSV) files provide tabular data in a plain text format] and PEA maps); (2) uplink and downlink impairments at the license level (for every block of every PEA), with impairment level percentages calculated using pops, provided in two formats (CSV and PEA maps); (3) impairments measured in pops at the 2x2 kilometer cell level for each impairing station for ISIX Case 1, including the facility ID (*i.e.,* the specific television station, domestic or international, that will cause the impairment) of and the channel assigned to the source of potential interference to the wireless base station as well as the difference between the interference threshold and the interfering field strength, provided in CSV format only; (4) impairments measured in pops at the 2x2 kilometer cell level for each impairing station for ISIX Case 2, including the facility ID, domestic or international, of and the channel assigned to the source of potential interference to the user equipment as well as the difference between the interference threshold and the interfering field strength, provided in CSV format only; (5) for ISIX Case 3, impairments measured in pops of counties containing the hypothetical wireless base station which causes interference to a 2x2 kilometer cell within a television station's protected contour, regardless of whether this cell has population provided in CSV format only (because 600 MHz Band wireless base stations will not be deployed until after the incentive auction, for purposes of applying the ISIX methodology during the auction, the optimization software will assume the location of hypothetical wireless base stations by applying uniformly spaced sample locations, spaced every ten kilometers within the boundaries of every wireless license area that is within 500 kilometers of the television station); (6) impairments measured in pops at the 2x2 kilometer cell level for ISIX Case 4, provided in CSV format only; and (7) reference files giving the location of all 2x2 cells, the location of all hypothetical base stations, information on stations interfered with by hypothetical base stations, and information on the spectrum overlap, in megahertz, between the interfering transmitter channel and the interfered-with receiver channel. This information will be provided to forward auction qualified bidders for each stage, and will not become fixed unless and until the final stage rule is satisfied. The Commission rejects Sprint's suggestion that it re-optimize the provisional channel assignment plan at the close of the reverse auction in a stage in order to further reduce impairments, then release this information to forward auction bidders who would have two weeks before the forward auction begins. Because the reverse auction can only increase the number of stations that must be assigned channels in the UHF band between the start of a stage and the end of a stage, the potential efficiency gains of re-optimizing are extremely limited and do not warrant delaying the auction for two weeks. If the final stage rule is not satisfied at a particular clearing target, the clearing target will be lowered, and forward auction bidders will be provided with new impairment information for the new clearing target. The Commission also plans to release sample data in advance of the auction for bidders to examine, which—if desired—would allow bidders to build their own analysis tools.

129. Providing this detailed information responds to concerns commenters raised about whether forward auction bidders would have sufficiently detailed information to make informed bids on impaired licenses. For example, NAB asserts that providing information about all potential impairments will aid transparency for bidders in the forward auction and prevent disputes as to whether or not winning bidders understood their future obligations with respect to inter-service interference. Sprint argues that bidders must know precisely how impairments may affect particular licenses. Similarly, CTIA states that detailed information regarding the location of impairments ''would greatly enhance the ability of bidders to develop strategies and make sound choices.'' Specifically, CTIA suggests that the FCC provide information regarding the impairing stations, including key operating parameters—such as station location, antenna height, and power level—to forward auction bidders on a confidential basis. Bidders will know for each impaired license the percentage of impairment (by population), whether the impairment is located in the uplink or downlink portion of the license, and the geographic location of the impairment. Bidders can use the facility information about the impairing station to determine how their wireless networks could be deployed around the impairment. Further, Verizon recommends Commission outreach in order to ''educate potential forward auction bidders about how to participate from a technical and administrative point of view.'' The Commission provides extensive information prior to the bidding in every auction, including publicly available seminars and/or tutorials and—for qualified bidders—mock auctions. The Commission intends that the education and outreach efforts in advance of Auction 1000 will be even more detailed and extensive than normal in light of the many new aspects of this auction and the procedures necessary to conduct it. Several commenters request that in addition to providing the ISIX data results based on the F(50,50) statistical measure incorporated into the Commission's ISIX methodology, the auction system provide data using the F(50,10) statistical measure. While the Commission declines to provide multiple sets of ISIX data results to bidders, the impairment information that will be provided will allow a forward auction bidder to analyze the potential interference employing any statistical measure it chooses. The Commission will address Sprint's pending Petition for Reconsideration of the use of the F(50,50) measure for the ISIX methodology in the ISIX proceeding.

130. The Commission finds that providing information to forward auction bidders about impairing stations is consistent with its statutory confidentiality obligation because providing this data will not reveal the identity of licensees that elect to participate in any stage of the reverse auction. Impairing stations in the 600 MHz Band could be stations that elected not to participate in the reverse auction at all, stations that applied but failed to make an initial commitment and therefore did not become qualified to bid in the clock phase of the reverse auction, stations that the system could not accommodate during the initial commitment process, or stations that dropped out in a prior stage. In any subsequent stage, an impairing station may also have been a bidder in a prior stage that has dropped out. Forward auction bidders will not be able to distinguish previously participating impairing stations from impairing stations that never participated. Moreover, forward auction bidders will not be able to infer which licensees elected to participate in the reverse auction from the impairment information they receive. The vast majority of non-participating stations will be assigned to channels in the remaining TV bands, and forward auction bidders will not receive any information about those stations. Therefore, forward auction bidders will not have enough information about the full complement of non-participating stations from which to surmise the identity of participating stations. This impairment information will be available only to forward auction qualified bidders. Forward auction participants need this information to make informed bids, but other parties do not need to know this information to participate effectively in the auction; in particular, the Commission declines to provide this information to all auction participants, because knowing this type of information could lead to undesirable strategic behavior by reverse auction bidders. Additionally, the Commission will not provide this information to the impairing stations. The impairing stations' assignments will remain provisional only until the final stage rule is satisfied and the final TV channel assignment plan is determined (the assignments will become permanent if the auction closes in the current stage, however, so forward auction bidders will know the actual impairing stations for any given stage). Thus, although the Commission recognizes that impairing stations may be interested in this information, it will not provide it to them. The Commission cautions forward auction participants that communicating the non-public information that they receive to others, whether directly or indirectly through third-parties or public disclosure, could violate the Commission's rule prohibiting communication of certain auction information.

b. Bidding Information

131. As in past Commission auctions, the public will have access to certain auction information, while auction participants will have secure access to additional non-public information. Details of how to access auction information will be provided in the *Application Procedures PN.*

132. The *Application Procedures PN* also will detail the prohibition on communicating information relating to bids or bidding strategies, such as the non-public information that bidders may access in the auction system, to other forward auction applicants or to broadcast licensees eligible to participate in the reverse auction, subject to specified exceptions. As in all recent Commission spectrum license auctions, it will limit the availability of forward auction information in order to prevent the identification of forward auction bidders placing particular bids until after the auction is over. Specifically, the Commission will not make publicly available until after the auction concludes: The PEAs that an applicant selects for bidding in its application, the amount of any upfront payment made by or on behalf of the applicant, any information on any applicant's bidding eligibility, including whether an applicant is eligible to bid on reserve spectrum, and any other bidding-related information that might reveal the identity of the bidders placing bids and taking other bidding-related actions. The Commission cautions forward auction participants that communicating the non-public information regarding bids or bidding strategies, such as PEAs selected in the auction application, could violate its rule prohibiting communication of certain auction information. These procedures have helped safeguard past auctions against potential anti-competitive behavior, such as retaliatory bidding, and should do so here as well. As in prior auctions, the Commission will make available to the public before the bidding begins the other contents of applications to participate in the forward auction. The Commission retains the discretion not to limit information regarding the identities of forward auction bidders pursuant to the procedures if circumstances indicate that these procedures would not be an effective tool for deterring anti-competitive behavior. This helps ensure the competitiveness of the bidding. The Commission reiterates that auction applicants could violate the prohibition on communicating certain forward auction information by communicating non-public information that they receive to others, whether directly or indirectly through third-parties or public disclosure.

133. The public notice announcing qualified bidders for the forward auction also will announce the forward auction's initial bidding round schedule. The schedule will establish the length of time each round will last. Bidders may respond to prices in each round. Each bidding round will be followed by the release of round results.

134. Before bidding begins in the forward auction clock phase, information on the target amount needed to satisfy each component of the final stage rule will be publicly available, based on the results of the reverse auction bidding for the current stage. Specifically, depending on whether or not the clearing target for the stage is above the spectrum clearing benchmark of 70 megahertz, the target gross proceeds or average price in relevant PEAs required to satisfy the first component of the final stage rule and the target estimated aggregate net proceeds required to satisfy the second component will be publicly announced.

135. After each round of forward auction clock phase bidding concludes, whether the final stage rule has been met and detailed information regarding the progress toward meeting it will be publicly available. Given the provision of this information regarding whether the final stage rule may be satisfied, the Commission need not address U.S. Cellular's argument that, if such information is not provided, the bidders should have an opportunity to change their bids when the rule is satisfied. Available detailed information will include the aggregate gross proceeds and average price in relevant PEAs with respect to the first component of the final stage rule, and the estimated aggregate net proceeds, rounded down to the nearest $10 million, with respect to the second. Rounding will help prevent any attempt to infer information about applicable bidding credits and the identity of bidders and rounding down will prevent any confusion that could result from a rounded amount appearing to meet the target before the actual estimate does so. In addition, for each category of license in each PEA in the just completed round, the supply, the aggregate demand, the price at the end

of the last completed round, and the price for the next round, will be publicly announced. This detailed price information will indicate the progress of the auction, both towards satisfying the final stage rule and, separately, towards completion of bidding. The Commission addresses the information that will be provided to forward auction bidders regarding the assignment phase of the forward auction below.

136. In addition to the bidding information described here, the Commission will use auction announcements to report any other necessary information to forward auction participants, such as schedule changes. Providing auction announcements through the auction system has been an effective and efficient way to communicate necessary information to auction participants in past auctions, and the Commission expects that this will be the case for the forward auction as well.

2. Available Generic Spectrum Blocks

137. In the clock phase of the forward auction, the Commission will offer generic blocks in two bidding categories based on the extent to which the blocks may be impaired by broadcast television stations repacked in the 600 MHz Band. The Commission adopts its proposed approach to categorizing blocks for bidding, including how it define generic blocks in two categories. The Commission also addressed implementation of the spectrum reserve established the *Mobile Spectrum Holdings R&O.*

a. Bidding Categories

138. The Commission will offer two categories of generic blocks for bidding in the clock phase of the forward auction. ''Category 1'' will include any block with potential impairments that affect zero to 15 percent of the population of a PEA. The impairment percentage will be calculated based on the population impaired in a PEA as measured at the two-by-two kilometer cell level. ''Category 2'' will include any block with potential impairments that affect greater than 15 percent but less than or equal to 50 percent of the population of a PEA. Any block with potential impairments that affect more than 50 percent of the population will not be offered in the forward auction. After the assignment phase, the auction system will provide a price adjustment to the final clock phase price equal to one percent for each one percent of impairment to account for varying degrees of impairment to the licenses.

139. *Category 1.* The Commission adopts its proposal to establish a 15 percent threshold for Category 1 blocks. Many commenters agree that some level of impairment is acceptable in generic blocks, supporting a range of percentages. Moreover, the record reflects that wireless operators have the ability to mitigate the impact of impairments within license areas: Operators normally expect some degree of signal degradation due to attenuation, scattering, interference, or other factors, and have various methods of mitigating interference from impairing TV stations. In choosing a specific threshold, the Commission must balance the need to ensure fungibility of blocks within Category 1 with its auction design goal of maximizing the number of such licenses available in the forward auction, which in turn will promote its competitive goals and the overall success of the auction. The Commission finds that a 15 percent threshold strikes the appropriate balance. Its analysis projects that the vast majority of Category 1 blocks will have no impairments. In Scenario 1 (84 megahertz repurposed), 2535 of the 2654 Category 1 licenses in the continental United States would have no impairments. In Scenario 2 (114 megahertz), 3334 of the 3469 Category 1 licenses would have no impairments. And in Scenario 3 (126 megahertz), 3753 of the 3886. The 15 percent threshold the Commission adopts provides the flexibility to include in this Category blocks with a limited range of impairments that should be manageable for wireless operators and are unlikely to affect major population centers within the PEA. Major population centers in Category 1 blocks are likely to be unimpaired because in most PEAs, such areas would likely comprise more than 15 percent of the population in the PEA. The fungibility of such blocks will be enhanced by the discount that will be available at the end of the assignment phase of the forward auction, and bidders will be provided with detailed information in order to prevent uncertainty regarding the inventory of Category 1 blocks available in each PEA. The Commission recognizes that bidders will judge impairments and their impact on the value of a block differently. The detailed information the auction system will provide on the levels, including locations and types, of impairments in a block will enable bidders to reflect their own assessment of the impairment's impact on the value of the license with their bids both in the clock and assignment phase. For these reasons, the Commission declines to adopt the proposed alternative to limit Category 1 to unimpaired blocks (and broaden Category 2 to blocks with impairments from one to 50 percent). The Commission also agrees with CCA, T-Mobile and U.S. Cellular that adopting this alternative would create excessively wide disparities in the level of impairment in Category 2 licenses, ultimately harming their fungibility.

140. The 15 percent threshold the Commission adopts also serves its competition goals. Only Category 1 blocks will be placed in the spectrum reserve. In addition, Category 1 blocks will be reserved after all bidders, including non-reserve-eligible bidders, have already established bidding interests in them. The amount of reserved spectrum will be based on demand by reserve-eligible bidders at the time the final stage rule is met, in part so that ''entities that acquire reserved spectrum would pay their fair share of the cost of the Incentive Auction.'' The 15 percent threshold maximizes the number of Category 1 blocks, which will help to ensure that a full complement of reserved blocks can be made available in each market, while also allowing an equitable distribution of Category 1 blocks among reserve-eligible and non-reserve-eligible bidders.

141. *Category 2.* The Commission also adopts its proposal to establish an impairment threshold for Category 2 blocks of greater than 15 percent but less than or equal to 50 percent. The record reflects that impaired spectrum blocks retain significant value and utility for wireless providers. In the *Incentive Auction R&O,* the Commission stated that it will offer paired spectrum blocks and declined to offer downlink-only blocks. The thresholds for Category 2 blocks are consistent with this policy, and therefore the Commission declines to adopt T-Mobile's proposal to revise the Category 2 thresholds. The Commission concludes that the 15-to-50 percent range that it establish strikes a reasonable balance between ensuring the fungibility of blocks within Category 2 and its other goals. So long as Category 2 blocks in a PEA are economic substitutes, which means that sufficiently raising the price of one license in a set of Category 2 blocks would cause demand to switch to a lower priced license in the set, the relative prices of the Category 2 licenses within a PEA can be determined by bidding in the assignment phase. The anticipated minimal range of impairments between Category 2 blocks within individual PEAs, means that the difference between the most impaired license, to which clock phase bidders bid, and the other Category 2 blocks will also be minimal and bidders, and

therefore likely economic substitutes. Blocks within Category 2 will be subject to significant impairment levels by definition, and the Commission projects that there will be very few of them available in the forward auction. In many cases, only one Category 2 block will be available in a PEA. Staff simulations demonstrate that from among the top 20 PEAs, only 2 PEAs had more than one Category 2 block in Scenarios 1 & 3 and only three PEAs had more than one Category 2 block in Scenario 2. Further, the variation in impairment levels among Category 2 blocks in a specific PEA likely will be minimal. Category 2 blocks within a single PEA will likely be affected by the same impairing station, resulting in similar levels of impairment and geographic footprints across the Category 2 blocks. Thus, although the range of impairments in Category 2 is between 15 and 50 percent, the actual range in any one PEA is likely to be much smaller. Accordingly, the Commission finds that a wider range of impairments is appropriate for Category 2 than for Category 1. Given the minimal number of PEAs in which the Commission expects multiple Category 2 blocks to be available, and the limited impairment range of Category 2 blocks within such PEAs, the Commission is not concerned that its decision puts too much emphasis on bidding in the assignment phase, as some commenters suggest. As with Category 1 blocks, the fungibility of Category 2 blocks will be enhanced by the discount that will be available at the end of the assignment phase, and bidders will be provided with detailed information to prevent uncertainty regarding the available inventory of Category 2 blocks. The fungibility of Category 2 licenses will be further enhanced by the Commission's decision not to weight impairments located in the downlink portion of the 600 MHz Band for purposes of measuring the extent of potential impairments, as the percentage of impairment permitted for Category 2 licenses will be lower for uplink impairments than the Commission proposed initially.

142. The comparatively wide impairment range for Category 2 also serves its auction design goals by enabling the Commission to limit the total number of generic blocks categories to two, thereby simplifying the auction and providing bidders with more flexibility. Limiting the number of categories to two will enable bidders to more easily switch their demands from one category to another or from one PEA to another than if the clock phase included more, but more narrowly defined, categories, as AT&T suggests. Given the need to assure that the final stage rule remains satisfied once it is met, the procedures the Commission adopts herein will limit bidders' ability to reduce demand for blocks in a category unless there is excess demand in the category. With fewer categories for bidding, the likelihood that there will be excess demand in any one category is greater, giving bidders' greater flexibility to modify their bidding strategies. In addition, limiting the number of categories to two will simplify the auction interface and make the bidding process more manageable for forward auction bidders.

143. *Clock Phase Price Adjustment for Impaired Blocks.* To enhance the fungibility and offset the variation in value of the generic blocks within the two categories the Commission adopts, it incorporates a price adjustment to account for impairment for both Category 1 and Category 2 blocks. Specifically, for a given frequency-specific license, the final clock phase price in the assignment round will be discounted by one percent for each one percent of impairment to the license. The auction system will calculate the categories of generic licenses based on the percentage of the population impaired in each block as measured at the two-by-two kilometer cell level. For example, if a Category 1 block is ten percent impaired, it will be subject to a ten percent discount off the final clock phase price. The price adjustment will be applied at the end of the assignment phase of the forward auction. While several commenters argue that the impact of impairments on forward auction license value will not necessarily be linear, most commenters either support or do not oppose a price adjustment, and no commenter identifies an alternative that would be more effective in enhancing fungibility. Consistent with the Commission's reasoning for adopting its proposed price adjustment, it declines to adopt T-Mobile's proposal to offer different price adjustments for foreign-origin impairments. The value that bidders ascribe to each license is likely to vary based on a variety of factors in addition to the level of impairment, including the location of the impairments and the wireless operators' existing coverage area. The price adjustment the Commission adopts is designed to accommodate a range in values and enhance fungibility, and is not intended to fully compensate for that range or resolve all differences in value, however. Indeed, the price adjustment remains consistent for all bidders, allowing them to assess each license, its level of impairment (if any), and its relative value, which they can then express through their bidding in the assignment round.

144. The Commission also agree with T-Mobile that when the price adjustment is ''accompanied by more granular information about the impairments,'' it will provide ''enough commonality among [blocks] to allow for generic . . . bidding. By providing bidders with detailed information about impairments, including the impairing station, the auction system will enable bidders to assess whether they should bid on, and how much they should bid for, impaired licenses in a particular PEA. For example, if a bidder considers impairments in a particular block to be more detrimental to the value of the license than is accommodated by the discount, it can bid less or shift its preference to another block in the assignment round. This includes any valuation a bidder may have on either expanding its service footprint to currently unserved areas or acquiring more spectrum in its service area. The Commission notes that U.S. Cellular's assertion that ''areas subject to inter-service interference could be concentrated in the portions of the PEA that encompass a carrier's current service area, and thus have the greatest value to the carrier,'' assumes that all carriers will value spectrum in their existing service areas more than spectrum in areas they currently do not serve.

145. *Alternative Proposals.* The Commission declines to offer in the forward auction any spectrum blocks that are more than 50 percent impaired. Specifically, the Commission declines to offer such blocks as ''overlay'' licenses in the assignment phase in conjunction with frequency-adjacent licenses in the same PEA. The Commission finds that doing so would unduly complicate the assignment phase of the forward auction, making bidder strategies more difficult and potentially interfering with the assignment phase's primary purpose: To optimally assign licenses to winning bidders consistent with their frequency preferences and the contiguity goals the Commission adopts. Specifically, this approach would complicate the assignment phase priority of assigning contiguous blocks. Consistent with prior Commission actions with regard to licenses that remained unsold after an initial auction for a new spectrum band, the Commission could offer heavily impaired 600 MHz licenses in a subsequent auction.

146. The Commission rejects commenters' proposals that it offer only one category of generic blocks in the forward auction or a single category of wholly-unimpaired licenses outside of border areas. Although these commenters assert that their proposals would improve fungibility of the generic licenses, the Commission finds that the potential benefits in terms of increased fungibility would be outweighed by the harms to its other auction goals. Limiting available blocks to a single category of unimpaired or lightly impaired blocks, whether nationwide or outside of border areas, would limit the amount of spectrum available in the forward auction, potentially reducing auction revenues, complicating bidding for forward auction bidders, and undercutting its competitive goals. With staff simulations demonstrating that only a small portion of available licenses will be Category 2, and in light of the demonstrated interest in these moderately-impaired licenses, the Commission finds good reason to offer both types of licenses. Further, the Commission projects that its approach will result in the vast majority of licenses available in the forward auction being unimpaired or only minimally impaired. The Commission is persuaded that the categories it adopts strike the appropriate balance between ensuring fungibility and its other goals. Conversely, the Commission rejects CCA's suggestion that it offer a single category of generic blocks with a wider range of impairments because such an approach would fail to ensure the fungibility of generic blocks within the one category.

147. The Commission also rejects Sprint's proposal for bidding on frequency-specific spectrum blocks in the clock phase rather than generic blocks as inconsistent with the basic auction design the Commission established in the *Incentive Auction R&O.* In the *Incentive Auction R&O,* the Commission adopted an ascending clock mechanism to collect bids on generic categories, to be followed by a separate assignment mechanism to assign frequency-specific licenses. Because auction speed correlates to costs for both forward and reverse auction participants, the Commission found that bidding on generic blocks enhances the speed and efficiency of the auction because bidders will not need to bid iteratively across rounds on several similar blocks. Finally, the Commission declines to treat impairments in border regions differently. Under the approach the Commission adopts, bidders will know whether an impairing station in a PEA is domestic or foreign, and can adjust and prioritize their preferences accordingly.

b. Market-Based Spectrum Reserve

148. The Commission starts by addressing issues related to the market-based spectrum reserve adopted in the *Mobile Spectrum Holdings R&O.* First, the Commission denies a petition for reconsideration of the *Mobile Spectrum Holdings R&O* insofar as it seeks to change its determination that the spectrum reserve will be triggered when both components of the final stage rule are satisfied. The Commission addresses this specific T-Mobile reconsideration request here, rather than in the Mobile Spectrum Holdings proceeding along with the other reconsideration requests filed in that proceeding. Unlike the other requests in the Mobile Spectrum Holdings proceeding, T-Mobile's request that the Commission reconsider the spectrum reserve trigger is interrelated with arguments in this proceeding that the $1.25 benchmark that it adopts for the average price component of the final stage rule is not an appropriate benchmark for purposes of triggering the spectrum reserve. The Commission notes that T-Mobile's Petition for Reconsideration also requests that the Commission change the size of the maximum spectrum reserve at initial clearing targets, an issue that was raised in several of the comments in response to the *Auction 1000 Comment PN.* The Commission does not address this issue here. Rather, the Commission affirms in the Mobile Spectrum Holdings Order on Reconsideration that it will not increase the maximum amount of reserved spectrum. The Commission finds that this determination continues to further its underlying goals, particularly in light of its adoption herein of $1.25 as the average price component of the final stage rule. Second, the Commission affirms that the maximum spectrum reserve will be set based on the initial clearing target and will be reduced in a PEA in the transition to a new stage only if actual demand by reserve-eligible bidders in the prior stage does not reach the maximum. Third, the Commission clarifies the criteria determining whether an applicant will qualify to bid on reserved spectrum in a PEA.

149. Next, the Commission addresses implementation issues raised in the *Auction 1000 Comment PN.* In particular, the Commission adopts its proposals that, for a given PEA in which the Commission offers fewer Category 1 blocks than the nationwide clearing target, the maximum number of reserved spectrum blocks, will be based on the total number of Category 1 blocks and Category 2 blocks (if any) offered in that PEA. In addition, the spectrum reserve only will include Category 1 blocks, and the demand determining the actual amount of reserve at the time the spectrum reserve is triggered will be the demand by reserve-eligible bidders for Category 1 blocks. Further, the Commission adopts its proposal that the actual spectrum reserve in a PEA with only one reserve-eligible entity bidding on Category 1 blocks at the time the spectrum reserve is triggered will be no more than 20 megahertz. However, the Commission rejects commenters' proposals to adopt a cap of 20 megahertz on the amount of reserved spectrum that any reserve-eligible bidder may acquire in a PEA if there is more than one reserve eligible entity bidding at the time the reserve is triggered. Lastly, the Commission declines to adopt various other proposals offered by commenters in response to the *Auction 1000 Comment PN.*

(i) Background

150. In the *Mobile Spectrum Holdings R&O,* the Commission established a market-based spectrum reserve. The Commission first established the *maximum* amount of licensed spectrum that will be reserved in each PEA for reserve-eligible entities in the forward auction for different initial clearing targets. The Commission affirms these maximum amounts in the *Mobile Spectrum Holdings Order on Reconsideration.* The Commission notes that if the available amount of spectrum (Category 1 and Category 2 licenses) offered in a PEA at the initial stage is 30 megahertz or less, there will be no spectrum reserved in that PEA, as the maximum reserve chart in the *Mobile Spectrum Holdings R&O* did not provide for a spectrum reserve at those clearing levels.

151. If the auction does not close, the maximum amount of reserved spectrum in each PEA in subsequent stages will be the smaller of the maximum amount of reserved spectrum in the previous stage or the amount that the reserve-eligible bidders demanded at the end of the previous stage. For example, if the initial clearing target is 70 megahertz, the maximum reserve will be 30 megahertz in the next stage, provided that reserve-eligible bidders continue to demand that amount. If reserve-eligible bidders demand less than 30 megahertz at the end of the initial stage, the maximum reserve for the next stage will be that demand. The same rule holds for any subsequent stages as well. In addition, the Commission determined

that the *actual* amount of reserved spectrum will depend on the demand by reserve-eligible bidders when the final stage rule is satisfied. To be reserve-eligible, an entity must not hold an attributable interest in 45 megahertz or more of below-1–GHz spectrum in a PEA, or must be a non-nationwide provider. The Commission noted that it would revise the short-form application to provide for a certification by an applicant intending to bid on reserved spectrum that it meets the qualification criteria. If any entity plans to file a pre-auction divestiture application to come into compliance with the below-1–GHz holdings threshold, it will have to file in sufficient time to qualify by the short-form application deadline. Additional details regarding completing the short-form application will be provided in the *Application Procedures PN.*

152. In the *Auction 1000 Comment PN,* the Commission proposed that in a given PEA, the maximum number of reserved spectrum blocks would be based on the total number of Category 1 and Category 2 blocks offered in that PEA. Further, the Commission proposed that the spectrum reserve would include only Category 1 blocks. The Commission proposed that the actual number of reserved blocks would be based on demand for Category 1 blocks by reserve-eligible bidders at the time the auction reaches the spectrum reserve trigger. As a result, in the Commission's implementation, if demand for Category 1 blocks in a PEA by reserve-eligible bidders is less than the maximum reserved spectrum, then fewer reserved blocks would be available in that PEA. Alternatively, the Commission sought comment on whether it should include Category 2 blocks in the spectrum reserve in any PEAs with fewer Category 1 blocks than the maximum spectrum reserve. Further, the Commission proposed that the amount of reserved spectrum in any PEA be limited to 20 megahertz if there is only one reserve-eligible bidder demanding blocks when the trigger is reached.

(ii) Spectrum Reserve Trigger

153. The spectrum reserve is designed to provide the opportunity for multiple service providers to have access to low-band spectrum, while also ensuring that all bidders bear a fair share of the cost of the forward auction. To facilitate its underlying goals, the *Mobile Spectrum Holdings R&O* tied the *actual* amount of the spectrum reserve to the quantity demanded by reserve-eligible bidders in each PEA at the point the final stage rule is satisfied in the forward auction. The final stage rule is a reserve price with two components, both of which must be satisfied. The first component requires that the average price per MHz-pop for licenses in the forward auction meets or exceeds a specified price per MHz-pop benchmark (average price component). The second ''requires that the proceeds of the forward auction be sufficient to meet mandatory expenses set forth in the Spectrum Act and any Public Safety Trust Fund amounts needed in connection with FirstNet'' (cost component). The Commission rejects various requests that it either eliminate or modify the link between the spectrum reserve trigger and the final stage rule.

154. First, the Commission rejects T-Mobile's request, in its petition for reconsideration of the *Mobile Spectrum Holdings R&O,* that the Commission eliminate the link between the spectrum reserve trigger and the average price component of the final stage rule, as well as more recent requests by commenters to eliminate the link between the spectrum reserve trigger and the cost component of the final stage rule or eliminate the link to the final stage rule altogether. In particular, the Commission disagrees with arguments that linking the spectrum reserve trigger to one or the other component of the final stage rule undermines its goals in establishing the spectrum reserve. Rather, the Commission affirms that linking the spectrum reserve trigger to the average price component is important to ''fairly distribute the responsibility for satisfying the costs of the Incentive Auction among all bidders,'' particularly in light of its decision to set the average price component at $1.25. Moreover, linking the spectrum reserve trigger to the cost component ensures that the existence of the spectrum reserve will not reduce the amount of spectrum being cleared for mobile broadband use. The Commission found in the *Mobile Spectrum Holdings R&O* that satisfaction of both components of the final stage rule would ensure that reserve-eligible bidders pay significant prices for spectrum, that they are paying the same price as other bidders at the time that the final stage rule is met, and that the final stage rule is met before the spectrum reserve is implemented. In essence, the Commission concluded that linking the spectrum reserve with satisfaction of the final stage rule ensured that reserve-eligible bidders would be contributing ''a fair share'' of the final stage rule requirements, including ''a portion'' of the value of the spectrum for the public and the costs of clearing the spectrum.

155. The Commission also disagrees with T-Mobile, Sprint, and CCA that the link between the spectrum reserve trigger and one or both components of the final stage rule creates a significant risk of undesirable strategic bidding by non-reserve-eligible bidders. The Commission finds that the clock auction format of the forward auction, together with the auction procedures it adopts in the *Auction 1000 Bidding Procedures Public Notice,* place significant limitations on the possibility for such undesirable strategic bidding. First, those procedures will not allow bidders to switch demand away from a product except when there is excess demand for the product and its price is rising, thereby limiting the ability of non-reserve-eligible bidders to drive up prices prior to the spectrum reserve being triggered without incurring significant risk. Second, the efficacy of a strategy to drive up prices will be limited: For instance, since ''jump bidding'' cannot occur in a clock auction, bidders will be limited in their ability to strategically bid up particular markets relative to other markets. In an SMR auction, ''jump bidding'' occurs when an entity bids more than what is required or necessary to be a currently winning bidder. Jump bidding is not possible in a clock auction. Moreover, in a clock auction, prices increase at a steady rate as long as there is any excess demand; in an SMR auction, prices can increase more quickly the greater the extent of excess demand.

156. In addition, by limiting the use of extended rounds to situations where bidding has come close to meeting the final stage rule during the clock phase, the Commission limit the potential for bidders to successfully implement an undesirable strategic bidding strategy by taking advantage of a higher clock increment in the top 40 markets in an extended round. Further, in response to Sprint's contention that uncertainty about when the final stage rule will be met will cause reserve-eligible bidders to inefficiently maintain bidding activity across multiple PEAs and across bidding categories, the Commission notes that it will make publicly available during the auction on a round-by-round basis information showing how close forward auction revenues are to the final stage rule. This will enable reserve-eligible bidders to assess how their current bidding activity will affect the spectrum reserve in each PEA when the final stage rule is met. Accordingly, the Commission denies T-Mobile's petition for reconsideration insofar as it requests that the spectrum reserve trigger should not be linked to the

average price component of the final stage rule, and it rejects proposals by commenters to delink the spectrum reserve trigger from the cost component or both components of the final stage rule.

157. The Commission also rejects recent arguments that tying the spectrum reserve trigger to the cost component of the final stage rule increases the risk of foreclosure pricing. Commenters contend that, because the cost component must be satisfied before the reserve is triggered, high clearing costs under a high clearing target could allow non-reserve eligible bidders to intentionally increase prices to foreclosure levels in key markets in the early rounds of bidding, forcing reserve-eligible bidders to reduce demand prior to the split and thereby reducing the amount of reserved spectrum. Moreover, they argue, because the auction system does not reset prices if the auction drops to the next lower clearing target, the impact of any such foreclosure bidding would be carried forward to these later stages, even if clearing costs drop. To address these possibilities, T-Mobile proposes a ''safety valve'' of retaining the $1.25 price per MHz-pop trigger in the top 40 PEAs, but amending the other component of the trigger to be either (1) an average of $2 per MHz-pop in the top 40 PEAs; or (2) the cost component of the final stage rule, whichever is met first. Other parties propose a single spectrum reserve trigger of $2 per MHz-pop for the top 40 markets, either generally or limited to spectrum clearing targets of more than 84 megahertz. Verizon and AT&T oppose T-Mobile's ''safety valve'' proposal, arguing that triggering the reserve before the cost component is met will result in lower auction revenue and threaten the success of the auction.

158. The Commission affirms its decision to tie the spectrum reserve trigger to the cost component of the final stage rule as well as the average price component and decline to adopts T-Mobile's ''safety valve'' or another alternative trigger. The foreclosure scenarios that T-Mobile and other competitive carriers fear are extremely unlikely. The clock auction format, as well as the bidding procedures the Commission adopts, including the no-excess supply rule and the limitation on the use of an extended round, will limit the ability of certain bidders to strategically bid up prices in order to disadvantage others, and impose on any such bidders the risk of being forced to purchase unwanted spectrum at high prices. Further, T-Mobile's ''hangover effect'' scenario is premised on an assumption—that clearing costs will steeply decline in subsequent auction stages—that is not founded in the record. On the other hand, the Commission previously found that tying the spectrum reserve trigger to *both* components of the final stage rule—the cost component as well as the average price component—is necessary to ensure that the reserve does not cause a reduction in the spectrum clearing target and to ensure that reserve-eligible bidders contribute a fair share of the costs of meeting the auction's revenue requirements. The Commission is not persuaded that the benefits of tying the spectrum reserve trigger to both components of the final stage rule are outweighed by the risk of foreclosure that T-Mobile and others have identified. Untying the reserve trigger from the cost component also would place the onus on the Commission to accurately predict clearing costs—which is difficult to do, as T-Mobile has argued in its initial advocacy to untie the reserve trigger from the average price component of the final stage rule—rather than allowing the market to determine when the reserve is triggered. Accordingly, the Commission affirms its judgment to tie the spectrum reserve trigger to the cost component of the final stage rule. In so affirming, the Commission considered information that T-Mobile and Sprint filed in support of their arguments along with a request for confidential treatment. In light of the Commission's decision, it dismisses as moot Verizon's requests that the Commission strike this information from the record without consideration or, alternatively, reject the request for confidential treatment and make the information public, and the Commission declines to address the merits of Verizon's arguments in support of these requests.

159. The Commission emphasizes, however, that it takes very seriously its duty to ensure the integrity of its auctions. To this end, all auctions are monitored carefully, and appropriate actions will be taken if undesirable strategic behavior is discovered. The Commission also adopts additional measures to help it meet this objective. For instance, the Commission adopts a smaller minimum clock price increment than it proposed in the *Auction 1000 Comment PN* and authorizes clock price increments to be changed on a PEA-by-PEA basis. This allows a smaller increment to be used in specific PEAs should clock prices rise too fast in some markets relative to others. Its auction procedures typically provide for this tool, which has been available in past Commission auctions and implemented to maintain a balance of price increases across geographic license areas.

160. The Commission also rejects arguments against tying the spectrum reserve trigger to the average price benchmark of $1.25 in the top 40 PEAs proposed in the *Auction 1000 Comment PN*. T-Mobile contends that the benchmark price should be set as low as possible and no more than $1.25 in the top 25 PEAs, while Sprint proposes that the spectrum reserve be set at the beginning of the clock phase, subject to a condition subsequent of spectrum being de-reserved if reserve-eligible bidders do not, in aggregate, demand quantities equivalent to the supply. They argue that tying the spectrum reserve trigger to the average price benchmark of $1.25 in the top 40 PEAs will allow strategic bidding by the two largest providers to foreclose their major competitors, both on a nationwide and market-specific basis. CCA states that there should not be a price per MHz-pop reserve trigger; however, if the Commission chooses to move forward with a price per MHz-pop reserve trigger, then it should be set at no more than $1.25 per MHz-pop in the largest 40 PEAs, based on gross bids, which is what the Commission proposed in the *Auction 1000 Comment PN*. By contrast, AT&T and Verizon argue that $1.25 is too low a trigger, and will result in too much spectrum being allocated to the spectrum reserve and a windfall for reserve-eligible bidders. They contend that $1.25 is not an appropriate ''market price'' to ensure that reserve-eligible bidders pay their fair share, noting that this price is only approximately half of prices paid in the AWS–3 auction and significantly less than prices paid in the 700 MHz auction.

161. The Commission rejects the various arguments that the price benchmark should be increased or decreased for purposes of triggering the spectrum reserve. Contrary to arguments by AT&T and Verizon, ensuring that reserve-eligible bidders pay a ''fair share'' does not require that the Commission determine the ''true competitive market value of the 600 MHz spectrum'' and set the spectrum reserve trigger price ''as close as possible'' to that value, or that the Commission determine and set a price that represents the exact point at which foreclosure of reserve-eligible bidders could occur. The Commission previously concluded that satisfaction of both components of the final stage rule would ensure, among other things, that reserve-eligible bidders pay significant prices for spectrum, and that they are paying the same price as other bidders at the time that the final stage

rule is met. Consistent with that conclusion, the Commission affirms that tying the spectrum reserve trigger to satisfaction of the cost component of the final stage rule and an average price component of $1.25 is sufficient to achieve its goal of ensuring that reserve-eligible bidders bear a fair share of the costs of the forward auction.

162. Likewise, the Commission rejects arguments that $1.25 is too high to achieve its pro-competitive goals. The Commission is not persuaded that a fair distribution of the costs of the incentive auction would occur if the price for reserved spectrum is determined solely by competition among reserve-eligible bidders for reserved spectrum instead of being tied to satisfaction of the final stage rule. Moreover, the Commission is not convinced that its approach of tying the spectrum reserve trigger to the final stage rule creates a significant risk of undesirable strategic behavior by non-reserve-eligible bidders, including at the $1.25 average price component that it determine herein represents a portion of the value of the spectrum. In addition, the maximum amount of spectrum in the reserve is tied to bidders' demands in order to balance the underlying goals of the spectrum reserve. If reserve-eligible bidders' demand is insufficient, then the Commission finds that it is appropriate to set aside less than the maximum in order to balance the Commission's objectives. The Commission also rejects T-Mobile's alternate proposal to tie the spectrum reserve to a $1.25 benchmark across only the top 25 PEAs, rather than the top 40 PEAs.

(iii) Determination of Maximum Spectrum Reserve for a New Stage

163. As the Commission set out in the *Mobile Spectrum Holdings R&O,* the maximum amount of reserve established based on the initial spectrum clearing target will not be reduced in any later stages of the incentive auction based on lower clearing targets, although it will be subject to demand by reserve-eligible bidders. The Commission concluded in the *Mobile Spectrum Holdings R&O* that the maximum amount of licensed spectrum that will be reserved in each market will be identified at the initial stage. In the *Auction 1000 Comment PN,* the Commission reiterated that the maximum reserve will be set according to the initial clearing target.

164. Accordingly, AT&T's claim is incorrect that its prior decision established that the maximum spectrum reserve amount would be tied to the spectrum clearing target in each stage, not just the initial stage. The Commission finds that this procedure is consistent with its goals for the spectrum reserve: basing the maximum reserve amount on the initial spectrum clearing target will ensure the efficacy of the reserve and will protect its competitive goals by preventing the reserve from being reduced if the final stage rule is not satisfied in the initial stage and reserve-eligible bidders continue to demand the maximum level. By contrast, reducing the maximum reserve amount based on later clearing targets, regardless of demand by reserve-eligible bidders, would likely create incentives for non-reserve-eligible bidders to suppress demand at the initial stage in order to reduce the amount of the spectrum reserve.

165. Contrary to AT&T's assertions, this procedure is consistent with its observation that every bidder will have the opportunity to bid for and win at least half of the 600 MHz Band spectrum in each PEA. Generally, if non-reserve-eligible bidders bid actively on spectrum in the initial stage, the bidding either will meet the final stage rule, or due to insufficient demand by reserve-eligible bidders, the bidding will not meet the final stage rule (thus reducing the spectrum reserve for the next stage). In either case, the market-based spectrum reserve rule would not have prevented non-reserve-eligible bidders from winning at least half of the 600 MHz Band spectrum in each PEA.

(iv) Attribution for Purposes of Qualifying to Bid on Reserved Spectrum

166. For purposes of qualifying to bid on reserved spectrum as a non-nationwide provider, the Commission clarifies that an entity is subject to the attribution criteria set forth in 47 CFR 20.22(b). For example, all interests of ten percent or more by a nationwide provider in a non-nationwide provider will eliminate that non-nationwide provider from being considered reserve-eligible as a non-nationwide provider, though that provider still could qualify based on low-band holdings of less than 45 megahertz. An entity can qualify to bid on reserved spectrum by either: (1) Holding an attributable interest in less than 45 megahertz, on a population-weighted basis, of below-1–GHz spectrum in a given PEA; or (2) being a non-nationwide provider. Attributable holdings include, for example, controlling interests, non-controlling interests of 10 percent or more, and long-term *de facto* transfer leasing arrangements and long-term spectrum manager leasing arrangements that enable commercial use. In the *Mobile Spectrum Holdings R&O,* the Commission adopted criteria to attribute partial ownership and other interests in spectrum holdings for purposes of applying a mobile spectrum holding limit to the licensing of spectrum through competitive bidding (as well as applying the initial spectrum screen to secondary market transactions).

167. The *Mobile Spectrum Holdings R&O* stated that ''non-nationwide providers'' include any provider other than Verizon Wireless, AT&T, Sprint, and T-Mobile, but that Order also included attribution rules ''for purposes of . . . applying a mobile spectrum holding limit'' in the auction. Those attribution rules were intended to ensure the integrity of its underlying rule, by permitting eligibility for the reserved spectrum only when appropriate to enhance competitive choices beyond nationwide providers and when eligibility would present a lesser risk of anti-competitive behaviors due to ''relative lack of resources.'' Accordingly, the Commission clarifies that the attribution criteria set forth in 47 CFR 20.22 govern the application of all aspects of the mobile spectrum holding limit in the incentive auction, regardless of whether an entity is attempting to qualify to bid on the spectrum reserve as a holder of less than 45 megahertz of low-band spectrum in the relevant market or as a non-nationwide provider.

168. CCA has expressed concern about the potential impact that attribution of long-term leases of spectrum from nationwide providers to otherwise non-nationwide providers may have on the eligibility of those non-nationwide providers to bid on reserve spectrum. To address this concern, although the Commission will attribute long-term transfer leasing arrangements set forth in 47 CFR 20.22(b)(vii) for purposes of qualification based on low-band spectrum holdings, the Commission will not attribute such leasing arrangements to lessees and sublessees for purposes of qualifying as a non-nationwide provider. Attributing long-term leasing arrangements in individual PEAs for purpose of qualification based on low-band spectrum holdings is consistent with the Commission's intent that entities lacking significant low band spectrum resources in those PEAs should have an opportunity to bid on reserved spectrum, and such attribution is consistent with the Commission's methodology for competitive review of spectrum acquisition. However, attributing long-term leasing arrangements to lessees from nationwide providers for purposes of qualifying as a non-nationwide provider—which would have the effect of disqualifying providers ''with

networks that are limited to regional and local areas'' from bidding on reserved spectrum as a non-nationwide provider—would be inconsistent with its intent to ''permit bidding on 600 MHz reserve spectrum by regional and local service providers in all PEAs, including those where such a provider holds more spectrum than its 45 megahertz holding threshold of the available low-band spectrum.'' As the Commission indicated in the *Mobile Spectrum Holdings R&O,* non-nationwide service providers enhance competitive choices for consumers in the mobile wireless marketplace, and help promote deployment in rural areas.

169. CCA has similarly expressed concern that it would be inconsistent with the intent of the reserve, in certain unique circumstances involving limited equity interests, to apply an attribution rule that would prevent non-nationwide providers from bidding for reserved spectrum or participating in the auction entirely. CCA notes as examples various insignificant passive equity interests that nationwide providers have in certain long-standing rural partnerships and argues that the FCC should consider certain limiting factors so as not to foreclose those partnerships from bidding on reserve spectrum. The Commission agrees. In particular, where the nationwide provider is not the managing partner of the rural partnership, has not and will not provide funding for the purchase of the licenses in spectrum auctions by the rural partnership, including the incentive auction, the rural partnership is of long standing, the nationwide provider's interest in the rural partnership is non-controlling and is less than 33 percent, and the partnership's retail service is not branded under the name of the nationwide provider, non-attribution may enhance competitive choices for consumers by giving the partnerships an opportunity to gain access to low-band spectrum through the spectrum reserve, and without creating an undue risk of anti-competitive behaviors due to the rural partnership's relative lack of resources. The Commission will specify in the *Application Procedures PN* how such rural partnerships can secure status as non-nationwide providers for purposes of qualifying to bid on the spectrum reserve.

(v) Applying the Spectrum Reserve in PEAs With Category 1 and Category 2 Blocks

170. The Commission adopts its proposal that, for a given PEA in which the Commission offers fewer Category 1 blocks than the nationwide clearing target, the maximum number of reserved blocks will be determined by the total number of Category 1 blocks and Category 2 blocks (if any) offered in that PEA. This approach will help facilitate the availability of more reserved spectrum in the limited number of PEAs in which the Commission offers fewer Category 1 blocks than the nationwide clearing target, relative to an approach based solely on Category 1 blocks. The Commission notes that in a limited number of PEAs, it will offer fewer licenses (either Category 1 or Category 2) than the nationwide clearing target because blocks with greater than 50 percent impairment will not be made available for acquisition. In these instances, the Commission's balancing of goals to facilitate post-auction competition and to provide opportunities for all bidders to acquire 600 MHz spectrum does not support setting the maximum spectrum reserve based on the nationwide clearing target, rather than based on the total number of Category 1 and Category 2 licenses. Thus, if there are 50 megahertz of Category 1 blocks and 10 megahertz of Category 2 blocks made available in a PEA at the initial stage, the available amount of spectrum offered in that PEA will be 60 megahertz, with a corresponding maximum reserve of 20 megahertz. That, in turn, will promote its competitive goals for the reserve by providing an opportunity for reserve-eligible bidders, who likely will be more reliant than non-reserve eligible bidders in particular PEAs on 600 MHz Band spectrum, to utilize the market-based reserve to expand coverage and enter new geographic areas. As the Commission has noted, this auction will be the last offering of a significant amount of nationwide ''greenfield'' low-band spectrum for the foreseeable future and access to this spectrum by smaller bidders is particularly important to increasing competition and choice in the wireless marketplace. If a particular stage of the auction is not the final stage, the maximum amount of reserved spectrum in each PEA in subsequent stages will be the smaller of the maximum amount of reserved spectrum in the previous stage or the amount that the reserve-eligible bidders demanded at the end of the previous stage. Similarly, the Commission notes here that, in PEAs in which it offers fewer Category 1 blocks than the nationwide clearing target, the maximum amount of reserve established in the initial stage in a PEA will not be reduced in any subsequent stages of the incentive auction so long as there are a sufficient number of Category 1 blocks being offered in that PEA that are demanded by reserve-eligible bidders. For example, if there are 50 megahertz of Category 1 blocks and 10 megahertz of Category 2 blocks made available in a PEA at the initial stage, with a maximum reserve of 20 megahertz, the maximum reserve will remain 20 megahertz at each subsequent stage, provided that 20 megahertz of Category 1 blocks continue to be offered in that stage and reserve-eligible bidders demanded that amount in the prior stage.

171. In addition, the Commission adopts its proposal that the spectrum reserve will include only Category 1 blocks. That is, in the limited number of PEAs in which there are both Category 1 and Category 2 blocks, Category 1 blocks will be allocated to the spectrum reserve up to the maximum number of reserved spectrum blocks, assuming that reserve-eligible bidders demand up to that maximum. The Commission notes that any remaining Category 1 blocks, as well as all Category 2 blocks, will be unreserved, and both reserve-eligible and non-reserve-eligible bidders will be able to bid on these blocks. This also will help ensure the efficacy of the pro-competitive policies that the Commission adopted in the *Mobile Spectrum Holdings R&O* by ensuring that reserve-eligible bidders, who by definition currently hold little or no low-band spectrum, have access through the spectrum reserve to unimpaired or minimally-impaired spectrum blocks in areas with impairments. Limiting the spectrum reserve to Category 1 blocks also will simplify the forward auction for bidders by limiting the number of license categories that must be ''split'' at the time the spectrum reserve is triggered.

172. The Commission declines to adopt AT&T's alternative proposal to fill the reserve first with Category 2 blocks in the PEA, followed by any Category 1 blocks necessary to meet the reserve allocation. AT&T and Verizon assert that the approach the Commission adopts will undermine its incentive auction goals by preventing them from acquiring the spectrum they need to effectively serve their customers, and will result in lower spectrum clearing targets and auction revenues. The Commission disagrees. First, the Commission notes that AT&T and Verizon themselves are eligible to acquire reserved 600 MHz spectrum in those PEAs where they have the most need, that is, in those PEAs where they hold less than one-third of currently suitable and available low-band spectrum. Indeed, AT&T and Verizon will be eligible to bid on reserved spectrum in PEAs that cover

approximately 40 percent of the total population of the United States. And, of course, they can bid on substantial amounts of non-reserved spectrum nationwide.

173. According to the simulations conducted by staff, approximately 84 to 88 percent of PEAs (and 88 to 93 percent of high-demand PEAs) will contain only Category 1 blocks, and even in PEAs with Category 2 blocks the vast majority of blocks offered in the forward auction will fall into Category 1. And the record reflects that Category 2 blocks are of substantial value and will provide utility to wireless service providers for future advanced broadband deployment. Accordingly, the Commission is not persuaded that the approach it adopts to implementing the spectrum reserve will have a significant impact on either the amount of spectrum that is repurposed through the auction or on auction revenues. Moreover, as stated above, in the limited number of areas with Category 2 blocks for sale, its approach is critical to realizing the pro-competitive goals of the *Mobile Spectrum Holdings R&O* by ensuring that service providers that lack a sufficient mix of low-band and high-band spectrum to compete robustly have the opportunity to gain access to low-band spectrum.

174. Likewise, the Commission rejects Mobile Future's argument that its approach will harm consumers by ''skew[ing]'' access to 600 MHz Band spectrum. Rather, its approach will benefit consumers by promoting competition and reducing the potential for competitive harm. Contrary to Mobile Future's suggestion, its decisions to allocate Category 1 blocks to the reserve up to the maximum number (subject to demand by reserve-eligible bidders), while counting both Category 1 and Category 2 blocks towards the maximum number, are not inconsistent. The two decisions involve separate issues. The Commission first needs to decide how much licensed spectrum is in the maximum spectrum reserve. In the *Mobile Spectrum Holdings R&O,* the Commission determined that the maximum spectrum reserve is to be based on the ''Licensed Spectrum in the Initial Clearing Target.'' Its decision here implements that determination: Both Category 1 and Category 2 licenses are going to be auctioned and are included in the initial clearing target. And placing only Category 1 blocks in the reserve makes sense to provide reserve-eligible bidders with the best opportunity to increase competition and choice in the wireless marketplace.

175. The Commission also rejects AT&T's claim that its approach to implementing the spectrum reserve in PEAs with impairments violates the Spectrum Act as an auction-specific restriction that would dramatically increase the barriers to AT&T's ''participation'' in this ''system of competitive bidding.'' AT&T has not demonstrated that its approach, which will apply in a limited number of markets and is necessary to carry out its goals in establishing the spectrum reserve, undermines its reasoning in the *Mobile Spectrum Holdings R&O* that the reservation of spectrum in the incentive auction is fully consistent with its authority under Title III and the Spectrum Act. More specifically, AT&T has not demonstrated that its approach transforms an otherwise permissible application of the spectrum reserve into an approach that is no longer a rule of ''general applicability'' or a provision that would ''prevent'' any entity ''from participating'' in a ''system of competitive bidding.''

176. The Commission also rejects proposals from prospective reserve-eligible bidders to reserve the least impaired Category 2 blocks in any PEAs with fewer Category 1 blocks than the maximum spectrum reserve. As the Commission explained in the *Auction 1000 Comment PN,* to implement separate reserved categories for both Category 1 and Category 2 blocks in individual PEAs where they exist would significantly complicate the design of the auction by necessitating an additional bidding category, potentially extending the length of the auction and requiring additional procedures for dividing bidder demands at the time the spectrum reserve is triggered. Reserving only Category 1 blocks will simplify the auction design and promote its goal of a successful auction. Indeed, T-Mobile recognizes that dividing both Category 1 and Category 2 blocks into reserved and unreserved categories would create significant complications of managing four simultaneous auction clocks—two in the reserved and two in the non-reserved blocks—across the large number of licenses expected to be offered in the incentive auction. The Commission also concludes that filling out the reserve with Category 2 blocks would create an imbalance between its pro-competitive goals and ensuring that all bidders, including non-reserve-eligible bidders, have an opportunity to acquire a significant amount of 600 MHz Band spectrum in the incentive auction.

177. Finally, the Commission adopts its proposal that the actual number of reserved blocks will be based on demand for Category 1 blocks by reserve-eligible bidders at the time the forward auction reaches the spectrum reserve trigger, *i.e.,* when the final stage rule is satisfied. The Commission rejects arguments that the actual number should be based on reserve-eligible bidders' demand for Category 1 and Category 2 blocks. Given its decision to limit reserve blocks to Category 1 blocks, the most logical measure for determining demand at the reserve trigger are the Category 1 blocks.

(vi) Other Proposals Related to Bidding by Reserve-Eligible Entities

178. As the Commission indicated in the *Mobile Spectrum Holdings R&O,* and after opportunity for comment in the *Auction 1000 Comment PN,* in order to balance the needs of all bidders and to promote competition within the forward auction, the Commission adopts its proposal to limit the maximum amount of reserved spectrum in a PEA to 20 megahertz if there is only one reserve-eligible bidder demanding Category 1 blocks when the spectrum reserve trigger is reached. The Commission notes that DISH supports this proposal; no commenter has opposed it. The Commission does not believe the public interest benefits of a maximum of 30 megahertz of reserved spectrum would be realized without more than one reserve-eligible bidder in a PEA.

179. CCA, T-Mobile, and U.S. Cellular argue that, regardless of the number of reserve-eligible bidders in a PEA, no reserve-eligible bidder should be permitted to purchase more than 20 megahertz of reserved spectrum in any PEA in order to protect license diversity among reserve-eligible bidders. The Commission finds that giving more than one reserve-eligible bidder an opportunity to acquire reserve spectrum in smaller, more rural PEAs where 30 megahertz of reserve spectrum is available will further its goal of facilitating post-auction competition in those areas. Competition in these areas is generally less robust than in larger, more urban areas. As the Commission has observed, ''92 percent of non-rural consumers, but only 37 percent of rural consumers are covered by at least four 3G or 4G mobile wireless providers' networks and more than 1.3 million people in rural areas have no mobile broadband access.'' The Commission has frequently stressed the importance of competition and consumer choice in rural as well as in urban areas. The policies in the *Mobile Spectrum Holdings R&O* were intended to ''ensure that all Americans, regardless of whether they live in an urban, suburban, or rural area, can enjoy the benefits that competition provides.'' The Commission found there that regional

and local service providers enhance competitive choices for consumers in the mobile wireless marketplace, and are ''important sources of competition in rural areas, where multiple nationwide service providers may have less incentive to offer high quality services.'' Accordingly, the Commission adopts a cap of 20 megahertz for smaller PEAs where 30 megahertz of reserve spectrum is available. The Commission defines smaller PEAs as those with a population of 500,000 or less, which corresponds to PEAs 118–416, excluding PEA 412 (Puerto Rico). The population density of PEAs with population of 500,000 or less correlates more closely with that of rural areas as previously defined by the Commission. The average population density of PEAs with a population greater than 500,000 is 333 pops/square mile, whereas the average population density for the smaller PEAs is 76 pops/square mile. The Commission observes that 76 pops/square mile roughly corresponds with the 100 pops/square mile approach it takes in defining rural areas. Geographic area and population data can be found on the Commission's Web site. In addition, the Commission notes that this threshold provides an objective and easily administrable delineation between larger urban and smaller rural PEAs and one that provides consistency with the definition it already will be applying in this auction for other purposes. This threshold also identifies ''where rural service providers are most likely to offer service''. By adopting the cap of 20 megahertz on reserve spectrum in the smaller PEAs, the Commission promotes the dissemination of licenses among a wide variety of applicants, and avoid the excessive concentration of licenses. In addition, the cap prevents any single reserve-eligible bidder from foreclosing other reserve-eligible bidders from obtaining reserve spectrum in the significant number of smaller PEAs where this is a potential risk. Thus, the Commission finds that the cap of 20 megahertz on reserve spectrum will help ensure that multiple service providers have access to low-band spectrum, and promote ''the rapid deployment of new wireless broadband technologies to all Americans, including those residing in rural areas.''

180. In response to concerns raised by AT&T and DISH that adopting a cap could decrease competition in the bidding for reserved spectrum, the Commission first notes that it is adopting a cap of 20 megahertz in the smaller PEAs only, and thus, to the extent those concerns are valid, there will be no decrease in competition in the bidding for reserved spectrum in the larger, more urban PEAs. The Commission finds that in smaller PEAs, any such concerns are outweighed by the benefits to post-auction competition of facilitating access by multiple bidders to reserved spectrum. In balancing the competing factors identified in Section 309(j), the Commission believes it is important to take account of concerns about the degree of competitive mobile voice and broadband service in rural areas, as well as the important contributions that rural service providers can offer in promoting such competitive service and incentives for increased deployment in these more rural areas. In addition, the Commission disagrees with DISH's assertion that restricting reserve-eligible bidders to acquiring a maximum of 20 megahertz of spectrum within a single PEA could unnecessarily limit the network and business strategies of reserve-eligible participants. While the Commission caps the amount of reserved spectrum that any entity can acquire in order to extend the benefits of the reserve to multiple providers in smaller PEAs, a reserve-eligible bidder has an opportunity to acquire more than 20 megahertz of 600 MHz spectrum by bidding on unreserved licenses. Accordingly, the Commission adopts a 20 megahertz cap in the smaller PEAs nationwide on the amount of reserved spectrum that an individual bidder can win in the forward auction in those PEAs where the spectrum reserve is set at 30 megahertz when the final stage rule is satisfied.

181. The Commission also declines to adopt U.S. Cellular's proposal of a special round after the spectrum reserve trigger is met that would provide reserve-eligible bidders prior notice and the opportunity to shift their demand for reserved blocks to compensate for any difference between actual demand on the maximum spectrum reserve. U.S. Cellular has not demonstrated how this special round could be implemented without undercutting its auction design goals by adding undue complexity and reducing the speed of the auction. In addition, the Commission is making significantly more information available to forward auction bidders, including information indicating how close forward auction revenues are to satisfying the final stage rule.

182. Finally, the Commission rejects AT&T's contention that a change to its bidding procedures is necessary to avoid strategic behavior by reserve-eligible bidders. In particular, AT&T contends that, once the spectrum reserve is triggered, reserve-eligible bidders' demand for spectrum in a given PEA should be assigned to the lowest-price spectrum available between the reserved and unreserved categories. The Commission disagrees with AT&T's assertion that implementation of this proposed change is necessary to avoid an opportunity for manipulative bidding by reserve-eligible bidders because those bidders could bid for unreserved blocks instead of reserved blocks even when the reserved price is lower. In rejecting claims by certain bidders that AT&T could engage in strategic bidding behavior, the Commission adopts procedures that will not allow bidders to switch demand away from a category in a PEA except when there is excess demand and the price is rising. These procedures limit the ability of reserve-eligible bidders to shift from reserved to unreserved blocks in a given PEA and thereby narrow the circumstances under which the bidding strategies suggested by AT&T would be possible. They also discourage these strategies by limiting the ability of a reserve-eligible bidder to return to reserved blocks without driving up the prices of those blocks. Moreover, AT&T's approach could reduce competition for non-reserved spectrum by reserve-eligible bidders, contrary to its goal of encouraging competitive bidding for non-reserved blocks as well as reserved blocks. The Commission is not persuaded that additional safeguards are necessary to prevent strategic behavior by reserve-eligible bidders once the spectrum reserve is triggered.

3. Acceptable Bid Amounts

a. Opening Bids

183. The Commission will set minimum opening bids at $5,000 per bidding unit for all spectrum blocks offered in the forward auction, regardless of category. At the beginning of the clock phase of the forward auction in the initial stage, a bidder will indicate how many blocks in a generic license category in a PEA it demands at the minimum opening bid price. The *Application Procedures PN* will set forth the minimum opening bid amount for the 5+5 megahertz generic blocks for each PEA in the forward auction, calculated according to these procedures.

184. The Commission finds there is no need to discount minimum opening bids for blocks in Category 2. Because its minimum opening bids serve primarily as a starting point for bidding, not as estimates of final prices, there is no need to base them upon the extent to which a spectrum block may be impaired (*i.e.,* which category a block

falls into—Category 1 or 2). Further, winning bidders will receive an impairment-based discount off the final clock phase price for licenses that are subject to impairments, regardless of whether they are Category 1 or Category 2 licenses.

185. A minimum opening bid amount of $5,000 per bidding unit should, as intended, help to accelerate the competitive bidding process. Basing minimum opening prices on the number of bidding units associated with blocks in a particular PEA serves to incorporate past pricing information into the calculation of minimum opening prices. By setting higher minimum opening prices in markets that have historically commanded relatively higher prices, the Commission expects to reduce the number of rounds it will take for demand to equal supply in those markets. Moreover, incorporating the results from Auction 97 will ensure that minimum opening prices reflect relative value differences that bidders have placed on different geographic areas most recently. Its experience in past spectrum license auctions indicates that this will be an effective tool for accelerating the competitive bidding process, a particularly important goal for the incentive auction given the interdependency between the reverse and forward auctions.

186. Its approach is consistent with Section 309(j) of the Communications Act, as amended, which calls for prescribed methods of establishing minimum opening bid amounts when FCC licenses are subject to auction, unless the Commission determines that a minimum opening bid amount is not in the public interest. This approach is also consistent with the precedent of its AWS–3 auction procedures, where the Commission set the minimum opening bid amount at twice the upfront payment for each license.

b. Clock Increments

187. The Commission adopts its proposal to set clock prices for a subsequent bidding round by adding a fixed percentage to the previous round's price, but modify the range to be broader than the range of five to 15 percent the Commission proposed. The Commission will use an increment of between one percent and 15 percent to provide additional flexibility to offer appropriate prices to bidders. Further, the Commission sets the initial increment at five percent. This initial increment is consistent with AT&T's suggestion to use increments at the bottom of the proposed increment range. While the Commission anticipates applying the same percentage increment to all categories in all PEAs, increments may be changed during the auction on a PEA-by-PEA or category-by-category basis as stages and rounds continue. This discretion provides a tool to ensure that price increases over a broad range of markets remain relatively balanced. The Commission finds that setting the increment in a round in the range of one to 15 percent, beginning with five percent, will allow the auction system to manage the auction at a reasonable pace, offering appropriate price choices to bidders.

188. After each round, the system will announce a clock price for the next round, which will be the highest price to which a bidder can respond during the round. In this clock auction, a bidder will be required to confirm its demands in every round, although it will not need to bid at a higher price. Unlike in an SMR auction, there are no provisional winners in the forward auction. For each category in each PEA, the clock price will be higher than the previous round's price by the fixed percentage increment. For example, if the price for the first round is $10, and the price increment is 20 percent, the clock price for second round will be $12. As long as total demand for blocks in a category exceeds the supply of blocks, the percentage increment will be added to the clock price from the prior round. If demand drops to equal supply in a round, then the clock price for the next round will be set by adding the percentage increment to the price (potentially an intra-round bid price) at which demand became equal to supply. If demand is equal to or less than supply at the minimum opening price, the increment will be added to the minimum opening price. Further, if at the beginning of a round supply exceeds demand and during the round demand increases to equal supply, then the increment will be added to the beginning of round price, which may be the minimum opening price.

c. Intra-Round Bids

189. The Commission adopts its proposed procedures to permit a bidder to make intra-round bids by indicating a point between the previous round's price and the new clock price at which its demand for blocks in a category changes. The previous round's price may be the clock price for the previous round or, if there was not excess demand, the minimum opening bid or the price at which demand equaled supply. In placing an intra-round bid, a bidder will indicate a specific price, and a quantity of blocks it demands if the price for blocks in the category should increase beyond that price. The auction system will not permit a bidder to place inconsistent bids for blocks in a category in a PEA during a round. For example, a bidder cannot indicate that it wishes to decrease its demand at a low intra-round price and then, in the same round, indicate that it wishes to increase its demand for blocks in the same category in a PEA at a higher intra-round price.

190. Intra-round bids will be optional; a bidder may choose to express its demands only at the clock prices. The decision to permit intra-round bidding will allow the auction system to use relatively large clock increments, thereby speeding the forward auction, without running the risk that a jump in the clock price will overshoot the market clearing price—the point at which demand for blocks equals the available supply. The more complicated bid processing in the reverse auction, involving multiple bidding options and feasibility checking, means that allowing intra-round bidding would unduly slow the progress of the reverse auction, as well as making participation more complicated for reverse auction bidders.

4. Reducing Demand, Bid Types, and Bid Processing

191. A forward auction participant will bid by indicating a quantity of blocks in a PEA it demands at a price, indicating that it is willing to pay that price for the specified quantity. A bidder cannot demand more blocks in a category than the supply of available blocks. A bidder can express its demands at the clock price or at an intra-round price, and bid quantities can represent an increase or a decrease over the bidder's previous demands for blocks in a category. Under the procedures the Commission adopts, the auction system will treat bids as requests; the bid processing procedures it adopts, however, will ensure that a bidder will never win a block at a price higher than it indicates it is willing to pay. Bids generally must be consistent with rules on bidding eligibility. Accordingly, bids to increase demand will be applied subject to the bidder having sufficient bidding eligibility as measured by the number of bidding units associated with the blocks a bidder demands. If a bid would reduce the quantity of blocks a bidder demands in a category in a PEA, the auction system will apply the reduction only if the reduction will not result in aggregate demand falling below the available supply of licenses. This restriction ensures that the final stage rule, once met, will continue to be satisfied. Absent such a restriction, blocks with

bids that were counted toward meeting the reserve price could later become unsold, leaving revenue below the necessary minimum. For this reason, and because the Commission agrees with T-Mobile that the restriction provides ''a meaningful safeguard against anticompetitive or predatory auction behavior,'' the Commission finds that the benefits of the restriction outweigh concerns, expressed by AT&T, about a potential exposure risk to bidders. Moreover, the Commission agrees with T-Mobile that AT&T overstates the significance of an exposure problem. Further in this regard, the Commission declines AT&T's recommendation to allow bidders a limited number of withdrawals to mitigate an exposure problem.

192. The Commission also adopts its proposal to process bids in order of price point after a round ends, where the price point represents the percentage of the bidding interval for the round. For example, if the price for the previous round is $5,000 and the new clock price is $6,000, a price of $5,100 will correspond to the 10 percent price point, since it is 10 percent of the bidding interval between $5,000 and $6,000. Considering bids in increasing order of price point allows the auction system to determine an ascending processing order when prices in different PEAs may be at very different absolute levels. Once a round ends, the auction system will process bids in ascending order of price point, considering first intra-round bids in order of price point and then bids at the clock price. The system will consider bids at the lowest price point for all categories in all PEAs, then look at bids at the next price point in all areas, and so on. Importantly, for a given category in a given PEA, the uniform price for all of the blocks in the category will stop increasing when aggregate demand no longer exceeds the available supply. If no further bids are placed, the final clock phase price for the category will be the stopped price.

193. In order to give bidders more flexibility in managing their demands in certain situations, the Commission adopts its proposal to allow bidders to make two additional types of bids in addition to the ''simple'' bids mentioned below: ''all-or-nothing'' bids and ''switch'' bids. These additional bid types will enable bidders to indicate that they want a bid to be implemented fully or not at all or that they wish to switch demand from one license category to another at a certain price. In a given round, a bidder may place at most one of the three bid types for a given category in a PEA. Because all-or-nothing and switch bids are optional, a bidder can choose not to submit such bids. The Commission finds that the bid types and associated processing procedures it adopts will provide bidders with the flexibility they need to modify their demands as the bidding progresses while ensuring that the reserve price conditions, once satisfied, will continue to be satisfied.

a. Simple Bids

194. A simple bid indicates a desired quantity of a product at a price. If it is not possible for the auction system to apply the simple bid in its entirety, a simple bid may be applied partially. A simple bid requesting a reduction in demand will be applied in full if there is sufficient excess demand for blocks in the category. That is, the auction system will apply the reduction provided that there is sufficient aggregate demand at the bid price to allow the reduction to be applied without the total demands of all bidders falling below available supply in the category. If there is some excess demand, but not enough to grant the full requested reduction, the auction system will partially apply the reduction, thereby reducing the bidder's demand by fewer than the requested number of blocks. A simple bid requesting an increase in demand will be applied in full as long as the bidder has sufficient bidding eligibility, measured by the total number of bidding units associated with the blocks the bidder demands in that round, at the time the bid is processed. If the bidder does not have sufficient eligibility, the auction system will apply the increase to the extent possible given the bidder's available bidding eligibility.

195. Formally, to the auction system, a simple bid to reduce demand at an intra-round price indicates that a bidder is willing to pay up to the intra-round bid price for a quantity of blocks that is unchanged from its previously demanded quantity. At the intra-round bid price, the bidder is willing to accept the unchanged quantity, the changed quantity, or any quantity in-between. At a price above the intra-round bid up to the clock price for the round, the bidder is willing to accept the changed quantity indicated by the intra-round bid.

196. Because the auction system will process bids in increasing order of price point and the uniform price for blocks in a category stops increasing when demand falls to equal supply, a bidder placing a simple bid for a reduction that is partially applied will not pay a price above its bid price for its unreduced quantity. If a requested reduction cannot be applied at all, it must be the case that demand fell to equal supply at a previous, lower price. Alternatively, demand could fall to equal supply at the same price point, in the case of ties, which are broken pseudo-randomly. Further, in the case where fewer blocks are demanded than are available at the minimum opening bid price, the price will remain at the minimum opening bid. In that case, the bidder that placed the simple bid will still demand its unreduced quantity at a price it indicated it would accept. In sum, a simple bid requesting a reduction will either be fully applied, partially applied with the price stopping at the bid price, or not applied but with the stopped price below the bid price.

197. In the event that a bid is not applied, or not fully applied, the auction system will maintain the unapplied demands in a queue, prioritized by price point, should subsequent changes in aggregate demand or a bidder's eligibility later make it possible to apply the bid. Bids are only held in the queue during the processing of bids for a single round. For example, if a bidder's reduction request is only partially applied because aggregate demand is insufficient, but another bidder requests an increase in demand at a higher price point, it may then be possible to fully apply the bid reduction request that was only partially applied earlier in the bid processing for the round and held in the queue. And if a bidder's request to increase demand is not applied or not fully applied because the bidder has insufficient bidding eligibility at that price point, and its request to reduce demand in another category is later applied at a higher price point, freeing bidding eligibility, the system may then be able to fully apply the increase.

b. All-or-Nothing Bids

198. An all-or-nothing bid also indicates a desired quantity of blocks at a price but differs from a simple bid in that it will not be applied partially. Hence, an all-or-nothing bid is useful if the bidder wants the bid to be implemented fully or not at all. An all-or-nothing bid requesting a reduction in demand will be applied only if there is sufficient excess demand at that price point to apply the full reduction. If not, the auction system will not apply the bid, and will move on to consider bids at higher price points. The uniform price for the category may continue to increase as long as there is excess demand. The bidder will still demand its unreduced quantity, at a price which may increase up to the round's clock price. This is in contrast to a simple bid that may be partially applied, and

which, hence, stops the price from increasing if it cannot be fully applied. Thus, in making an all-or-nothing bid that requests a reduction, the bidder affirmatively indicates that it will accept the round's clock price for its unreduced demand if the bid cannot be fully applied at the bid price.

199. A bidder making an all-or-nothing bid that requests a reduction may add a ''backstop'' to the bid that would allow the bid to be applied partially at a higher price, as long as the bidder makes only a single all-or-nothing bid for the category in the PEA in the round. The auction system will allow a backstop bid only if a bidder submits a single all-or-nothing bid for the category because bid processing could become excessively complex if bidders submit multiple all-or-nothing bids with backstops. The backstop will ensure that the price for the category cannot go higher than the specified higher price if the all-or-nothing bid is not applied. The backstop is essentially a simple bid that may be applied partially, thereby stopping the price from increasing further.

200. An all-or-nothing bid that requests an increase in demand will be applied only if the bidder has sufficient bidding eligibility for the full increase at the price point of the bid. If an all-or-nothing bid requesting an increase or decrease in demand is not applied, it will be held in the processing queue in case it should later become possible to apply it.

c. Switch Bids

201. To place a switch bid, the bidder will indicate a desired quantity of blocks in the category in which it wishes to reduce its demand at a given price point, and will identify another category in the same PEA that it wishes to switch into at the price point. While processing the bid, the auction system will apply as much of the requested reduction as possible considering excess demand, and then will apply an increase in the bidder's demand in the other category by the same number of blocks. Because all blocks in a PEA, regardless of category, will have the same number of associated bidding units, the eligibility freed up by the reduction portion of a switch bid will always cover the corresponding increase in demand. The unapplied portion of a switch bid will be held in the processing queue in case it can be applied later in the round's bid processing.

5. No Bidding Aggregation

202. The Commission will not incorporate package bidding procedures into the forward auction because of the additional complexity such procedures would introduce into the auction. Further, consistent with its proposal in the *Auction 1000 Comment PN,* the Commission declines to adopt an alternative to package bidding under which it would create an aggregation of the largest PEAs in advance of the auction. The Commission is not persuaded that creating a bidding aggregation will serve its goal of encouraging entry by a broad range of potential wireless service providers. In particular, several commenters share its concern that the alternative aggregation approach the Commission sought comment on would discourage small or regional entities with an interest in only a subset of the PEAs in the aggregation from participating in the forward auction. Further, larger carriers may have interests in only some of the largest PEAs, or may wish to acquire a different number of licenses in different large PEAs, thus making an FCC defined bidding aggregation undesirable for them, also. Therefore, the Commission declines to adopt a bidding aggregation and will instead permit bidders to bid for blocks in any or all of the individual PEAs.

6. Bidding Eligibility and Activity Rule

203. In order to ensure that the auction moves quickly and to promote a sound price discovery process, bidders will be required to maintain a minimum, high level of activity in each round of the auction in order to maintain bidding eligibility. The Commission will use upfront payments to determine initial (maximum) eligibility, the maximum number of blocks as measured by their associated bidding units a bidder demands at the start of the auction. Bidding eligibility will be reduced as the auction progresses if a bidder does not meet the activity requirement.

204. Specifically, bidders must be active on at least 95 percent of their bidding eligibility in all regular clock rounds to maintain their bidding eligibility. An activity rule requires bidders to bid actively throughout the auction to maintain bidding eligibility, rather than wait until late in the auction before participating. In the forward auction, the activity rule will provide an incentive for bidders to participate in each round of the auction. However, the activity requirement may be further altered (by, for example, establishing a 98 or 100 percent threshold) before and/or during the auction as circumstances warrant. Any changes to the activity requirement will be announced via the auction system.

205. The activity rule will be satisfied when a bidder has bidding activity on blocks with bidding units that total at least 95 percent of its current eligibility in the round. If the activity rule is met, then the bidder's eligibility will not change in the next round. Failure to maintain the requisite activity level will result in a reduction in the bidder's eligibility, possibly curtailing or eliminating the bidder's ability to place additional bids in the auction. A bidder's activity level will reflect its demands as applied by the auction system during bid processing. Thus, if a bidder requests a reduction in the quantity of blocks it demands in a category, but the auction system does not apply the requested reduction because demand for the category would fall below the available supply, the bidder's activity will reflect its unreduced demand.

206. While the record supports an activity rule that requires significant bidder participation, some commenters argue that the proposed 92–98 percent threshold is too aggressive, will disadvantage smaller carriers, and may limit a bidder's ability to move its bids between markets. Commenters propose setting the threshold at 80 percent and only increasing it during later stages of the auction. The Commission finds that the 95 percent threshold it adopts is appropriate for the clock phase of the forward auction. Although the Commission has sometimes used an 80 percent activity requirement in simultaneous multiple round (SMR) auctions, having an activity requirement significantly below 100 percent in the clock phase of the forward auction would create uncertainty with respect to the exact level of bidder demand, interfering with the basic clock price-setting and winner determination mechanism, providing less helpful price-discovery information to bidders, and unduly prolonging the bidding process. As bidders plan their bidding strategies, they need accurate information about relative prices and the level of excess demand in different markets, and if significant bidding eligibility is held back, the available price and demand information will be less reliable. At the same time, the Commission recognizes that some flexibility will be helpful for bidders choosing between two categories of generic licenses across as many as 416 PEAs. The Commission finds that the 95 percent threshold it adopts will satisfy the requirements of the clock auction format and ensure that accurate price discovery information is available for bidders, while also providing bidders

with adequate flexibility. Further, based on its experience with prior spectrum license auctions, the Commission expects that the activity rule it adopts will foster an appropriate bidding pace and ensure that each stage of the forward auction closes within a reasonable period of time.

207. For these same reasons, the Commission does not provide for activity rule waivers to preserve a bidder's eligibility in the forward auction. In previous FCC SMR auctions, when a bidder's eligibility in the current round was below a required minimum level, the bidder was able to preserve its current level of eligibility with a limited number of activity rule waivers. Several commenters support the use of such waivers in the forward auction. Allowing such waivers, however, would cause the same problems that the Commission is concerned about with respect to the activity requirement. Thus, the auction system will require bidders to reconfirm their bids in every round and will not provide bidders with activity rule waivers.

208. While acknowledging that a clock auction format weighs against activity rule waivers, U.S. Cellular is concerned that, in their absence, bidders will need more time to adjust their bidding strategies in order to maintain their bidding eligibility before the first round following an increase to the activity requirement and after that round, if bidding surges ensue. CTIA is concerned that bidders may never have time to establish a comfort level with the auction system, and asks the Commission to ensure bidders are comfortable before moving to higher activity levels. As is typical in its spectrum license auctions, these concerns will be considered in setting the bidding schedule and determining whether to move to higher activity levels as the clock phase portion of the forward auction progresses.

7. Final Stage Rule

209. The Commission adopts procedures to implement the final stage rule, which establishes reserve price conditions that, when met, will determine that bidding in the incentive auction will end with the current stage and clearing target. The Commission recently reaffirmed the adoption of the first component as a part of the final stage rule. Accordingly, to the extent commenters repeat prior challenges to that component, those arguments have been answered. To the extent they seek reconsideration of the rule's adoption on other grounds, those arguments should have been made in a petition for reconsideration and need not be addressed in the *Auction 1000 BIA Procedures Public Notice.* The Commission addressed elsewhere challenges to the use of the final stage rule in connection with establishing the spectrum reserve. Specifically, the Commission adopts the proposed $1.25 average price and 70 megahertz licensed spectrum clearing benchmarks, as well as the proposed method to evaluate whether the final stage rule criteria have been satisfied. The Commission adopts a modified version of the procedures it proposed for triggering an extended round in order to limit the size of the shortfall that an extended round will attempt to close.

a. First Component

210. The Commission adopts a $1.25 average price and 70 megahertz licensed spectrum benchmark, as well as its proposed procedures for evaluating whether the first component of the final stage rule has been satisfied. The forward auction spectrum benchmark of 70 megahertz of licenses corresponds to a spectrum clearing target of 84 megahertz. Hence, the first component, which aims to ensure that winning bids for forward auction licenses reflect competitive prices, will be satisfied if, for a given stage of the auction: (1) The clearing target is at or below 70 megahertz and the benchmark average price per MHz-pop for Category 1 blocks in high-demand PEAs in the forward auction is at least $1.25 per MHz-pop; or (2) The clearing target is above 70 megahertz and the total proceeds associated with all licenses in the forward auction exceed the product of the price benchmark of $1.25 per MHz-pop, the forward auction spectrum benchmark of 70 megahertz, and the total number of pops associated with the Category 1 blocks in high-demand PEAs.

211. Based on its review of the record and past auction experience, the Commission finds that the proposed $1.25 average per MHz-pop benchmark price balances the statutory objective of seeking to recover ''a portion'' of the value of the spectrum for the public with the goal of a successful incentive auction that allows market forces to determine the highest and best use of spectrum. A number of commenters supported a benchmark price of $1.25. The Commission disagrees with commenters who argue that $1.25 is either too low or too high. While recent auction results may suggest that final forward auction prices ultimately will be higher, the benchmark price is not a predictor of final auction prices, but rather a reserve price or ''floor,'' consistent with the Commission's obligation to protect the public interest in its spectrum resources. Although final prices from Auction 97 (AWS–3) were not yet available at the time the Auction 1000 *Comment PN* was released, the general price level in that auction was already apparent and the Commission considered it in proposing the $1.25 benchmark.

212. The auction system will determine whether the price benchmark is satisfied based on the average prices for Category 1 spectrum blocks in the 40 high-demand markets. The high-demand markets include PEAs 1–40. PEAs are numbered in decreasing order of population, except that PEAs in the states are ranked before those in the territories and protectorates. Accordingly, PEAs 1–40 are the 40 most populous PEAs within the 50 states. Had territories not been ranked after the states, Puerto Rico would have been included in the most populous group. Commenters agree that it is unnecessary to evaluate the final stage rule based on all of the PEAs, although some commenters propose focusing instead on the top 25 largest markets. Since the purpose of the average price benchmark is to establish a reserve price that appropriately balances the Commission's goals, not to predict ultimate spectrum values, it declined to broaden its focus to all markets because that would fail to promote a faster auction. While reducing the number of markets evaluated for purposes of the final stage rule might ''promote an even faster auction,'' the Commission is not persuaded that the clock prices for the top 25 largest markets would ''serve as a 'good leading indicator of final auction revenues' to the same extent as the prices in the top 40 PEAs.'' In addition, limiting consideration of bids to Category 1 blocks will be more consistent with the price benchmark derived from past auctions, which did not include licenses impaired in a manner comparable to Category 2 licenses. Moreover, in evaluating whether the price benchmark is satisfied, the auction system will rely on gross bids, rather than bids net of individual bidders' bidding credits or any adjustments for impairments.

213. The 70 megahertz licensed spectrum benchmark the Commission adopts corresponds with the spectrum recovery scenario in which an 84 megahertz clearing target is selected and licenses for 70 megahertz of spectrum are offered in the forward auction. Incorporating a spectrum benchmark into the final stage rule's first component ''recognizes that if the incentive auction repurposes a relatively large amount of spectrum for flexible uses, per-unit market prices

may be expected to decline consistent with the increase in available supply.'' In proposing this threshold for the spectrum benchmark, the Commission explained that a 70 megahertz spectrum benchmark would repurpose the UHF spectrum between television channel 37 and the 700 MHz Band and would enable multiple bidders to obtain low-band spectrum, thereby promoting its competitive goals for the incentive auction. No commenters disagreed with its proposal. The Commission is adopting the 70 MHz benchmark for the specific purpose of establishing the final stage rule. It should not be construed as a target or projection for the amount of spectrum the Commission anticipates clearing in the incentive auction.

214. For clearing targets higher than 84 megahertz, the auction system will consider current auction proceeds for all licenses in evaluating whether the first component of the final stage rule is satisfied. Accordingly, for forward auction stages in which more than 70 megahertz of licensed spectrum is available in the forward auction, the first component will be satisfied if current auction proceeds for all blocks—Category 1 and Category 2, in all PEAs—exceed the proceeds generated by the Category 1 blocks in the 40 high-demand PEAs at the benchmark price of $1.25 per MHz-pop and benchmark clearing target of 70 megahertz. On balance, when the clearing target is relatively high, the Commission finds that the simplicity of comparing total auction proceeds for all blocks to the benchmark proceeds, which is based only on the high-demand PEAs, outweighs any concern for consistency in including only some markets in both sides of this metric. Total auction proceeds information will be available to the public after each round, and the proceeds benchmark is a fixed number for each clearing target, making it very easy to evaluate whether this component of the final stage rule is satisfied. Moreover, in stages with higher clearing targets, the $1.25 benchmark price is relaxed as long as overall revenues are sufficient; hence the tie to the high-demand PEAs is less important in this context.

b. Second Component—Cost Elements

215. The Commission adopts its proposed procedures for implementing the second component of the final stage rule. Bidding in the reverse auction will determine the first cost element—winning bidder payments required for broadcasters. With respect to the second element, the Commission's relevant administrative costs, it estimates these costs at $226 million. The Commission intends to update these costs no later than the commencement of bidding in the clock phase of the forward auction. For the third element, the Commission proposed that broadcaster relocation costs be estimated at $1.75 billion, the maximum amount that the Spectrum Act permits it to deposit in the TV Broadcaster Relocation Fund. To be prudent, the Commission will use that estimate when calculating expenses for the purposes of evaluating the costs component of the final stage rule. The actual amount that will be needed to reimburse broadcasters from the TV Broadcaster Relocation Fund will not be known until sometime after the auction. The Spectrum Act provides that the forward auction must generate proceeds sufficient to meet the Commission's estimate of the total expenses, as opposed to the actual amount. While the Commission concluded in the *Incentive Auction R&O* that the forward auction proceeds also must cover any Public Safety Trust Fund amounts still needed to provide the funds for FirstNet specified in the Spectrum Act, proceeds from the recent H Block and AWS–3 spectrum auctions are sufficient to fully fund the $7 billion provided to FirstNet. Therefore, the procedures the Commission adopts need not include any amounts to cover FirstNet expenses.

216. The Commission adopts its proposed approach to bidding credits and other discounts from clock phase prices for purposes of applying the second component of the final stage rule. The auction system will consider current total proceeds (for all PEAs and both categories of blocks), net of any discounts based on impairments and small business bidding credits claimed by particular bidders on their short-form applications for Auction 1002. The auction system will presume that the bidder with the largest bidding credit will win the quantity of blocks on which it is bidding and then proceed to the bidder with the next largest bidding credit and so on, until there are no more blocks left. Moreover, since bidders will be bidding on generic blocks rather than specific licenses at the time the final stage rule is evaluated, the auction system will presume that bidders with larger bidding credits will win blocks that are less impaired and thus, subject to less adjustment based on the extent of impairment. If the supply of blocks in a category exceeds the aggregate demand in that category, the system will presume that any unsold blocks will be those that are least impaired. While this approach will likely underestimate net proceeds, it will not be possible to know more exact amounts at the time of the evaluation, and the Commission finds that it is appropriate to adopt a conservative approach when ensuring that statutory requirements are met.

217. The Commission will not make adjustments for any Tribal lands bidding credits in evaluating the second component of the final stage rule. Instead, consistent with previous spectrum auctions, any subsequent Tribal lands awards will be limited to available funds that exceed the relevant reserve price. This rule is applicable in, among others, ''any auction with reserve price(s) in which the Commission specifies that the provision shall apply.''

c. Evaluation Each Round

218. As long as the final stage rule has not yet been met, the auction system will evaluate after each round of forward auction bidding whether forward auction proceeds are sufficient to satisfy the two components of the final stage rule. In a new stage, the final stage rule will be evaluated after bidding in the first clock round of the forward auction is complete. The auction system will make the needed calculations as part of the round results processing in order to establish as soon as possible whether the incentive auction will conclude after forward auction bidding ends at the current clearing target. Data indicating the progress of the auction in meeting the various components of the final stage rule will be made public after each round of the forward auction.

d. Allocating Demand for Purposes of the Spectrum Reserve

219. The Commission adopts its proposed procedure to allocate demand in order to initiate bidding for the spectrum reserve. At the time the final stage rule is met, Category 1 blocks in each PEA will be split into separate reserved and unreserved categories, with a separate price clock for each new category. In the first round following the round in which the final stage rule is met, the clock price will be the same for reserved and unreserved Category 1 blocks, but prices for the two categories may diverge in later rounds depending upon the extent of excess demand in the separate categories going forward. To allocate the pre-''split'' demands of bidders for Category 1 blocks into the reserved and unreserved categories, the auction system first will assign all demand by non-reserve-eligible bidders to the unreserved category, and then will assign demand by reserve-eligible bidders to the reserved category up to the point where demand for reserved blocks is equal to supply.

220. Specifically, the auction system will first allocate demand for one block to the reserved category for each reserve-eligible bidder in turn, then demand for a second block, and so on until the total demands allocated to the reserved category equal the supply of reserved blocks. The order of reserve-eligible bidders will be chosen pseudo-randomly. Thus, any excess demand will be for unreserved Category 1 blocks. The auction system will apply the remaining demand of reserve-eligible bidders to unreserved Category 1. The Commission adopts this approach because allocating demands in this way—as opposed to assigning all demand by reserve-eligible bidders to the reserved category—avoids the possibility of excess supply of unreserved Category 1 blocks after the split, which could result in unsold licenses and lower revenues than when the final stage rule was deemed to have been met. As noted in the *Auction 1000 Comment PN,* this could occur if the demands for Category 1 prior to the split came disproportionately from reserve-eligible bidders. If all those demands were transferred to the reserved category after the split, demand for unreserved Category 1 blocks could be less than the supply, even if demand exceeds supply in the pre-split Category 1. Excess supply cannot occur in the reserved category because the actual number of blocks that will be reserved in a PEA will not be greater than the number of Category 1 licenses demanded by reserve-eligible bidders at the time the auction reaches the spectrum reserve trigger. Avoiding such an outcome is an important principle in designing the forward auction. In the bidding rounds that follow the implementation of the spectrum reserve, bidders will be able to switch their bids between the separate categories of reserved Category 1, unreserved Category 1, and Category 2 blocks, consistent with its adopted bidding procedures. In this regard, contrary to AT&T's suggestion, the procedure the Commission adopts for allocating demand at the time of the split will not prevent reserved spectrum prices from rising. In rounds after the split, reserve-eligible bidders may switch to bidding for reserved blocks if the price for unreserved blocks is rising more quickly than the price of reserved blocks. The bidding procedures the Commission adopts for the forward auction will mitigate the risk that reserve-eligible bidders can engage in strategic bidding for non-reserved blocks.

221. The Commission clarifies that no bidder's demand for blocks in a category will be allowed to exceed the total available supply in the category in the PEA after the split. This is consistent with the general rule that no bidder's demand for blocks in a category may exceed the total available supply in a category. Thus, if the pre-split demand of a non-reserve-eligible bidder exceeds the supply of blocks in the unreserved category, the bidder's demand for the unreserved blocks will be reduced to the available supply. If, after the system allocates the reserve-eligible bidders' demands to the reserved category, a reserve-eligible bidder's remaining pre-split demand exceeds the total number of blocks available in the unreserved category, the bidder's demand for the unreserved blocks will be reduced to the available supply. Non-reserve-eligible and reserve-eligible bidders will maintain the bidding eligibility associated with any demand that cannot be assigned to a category, and will be able to use such bidding eligibility in other PEAs or in other categories in the next round. For example, assume the supply of Category 1 blocks in a PEA is seven. Prior to the split, reserve-eligible bidder 1 (RE1) and non-reserve-eligible bidder 1 (NRE1) each demand seven blocks, and two other reserve-eligible bidders each demand one Category 1 block. At the split, three Category 1 blocks are reserved, leaving four unreserved blocks. NRE1's demand for Category 1 blocks in the PEA will be reduced to four, and NRE1 will have three blocks' worth of excess eligibility to use in another PEA. Pursuant to the allocation method the Commission adopts, one block worth of RE1's demand will be assigned to one reserved block, and the other two reserve-eligible bidders' demand will be assigned to the other two reserved blocks, so that demand in the reserved category equals supply. Four blocks' worth of RE1's remaining six blocks of demand will be assigned to the unreserved category, and RE1 will have two blocks' worth of excess eligibility to use in another PEA. A reserve-eligible bidder that has its demands reduced can use the eligibility to bid in the reserved category, if it wishes.

8. Extended Round Procedures

a. Triggering an Extended Round

222. The Commission adopts the procedures it proposed for triggering an extended round, with one modification. An extended round will be implemented if the final stage rule is not satisfied but bidding activity has stopped—that is, if demand does not exceed the available supply—for Category 1 blocks in the 40 high-demand markets. High-demand markets are PEAs 1–40. Since bidding in these markets generally serves as a leading indicator of final auction proceeds, the Commission finds that basing the trigger on bidding for Category 1 blocks in the high-demand markets will be a reliable predictor of whether the final stage rule can be satisfied in the current stage. The auction system will not implement an extended round, however, if bidding activity has stopped for Category 1 blocks in the high-demand markets but the gap between current forward auction proceeds (from all blocks in all PEAs) and the amount needed to meet the final stage rule exceeds 20 percent of current auction proceeds. Information on progress toward meeting the final stage rule, including the shortfall, will be made public during the auction. Instead, the auction will move to a new stage without an extended round. This modification of its proposed procedures addresses concerns that bidding dynamics and price discovery may be distorted if the auction system attempts to raise a large portion of auction proceeds in a single round on only a subset of the available blocks.

223. The Commission decline to accept AT&T's suggestion that an extended round not be triggered until bidding has ended in all or almost all of the PEAs. AT&T's suggested approach would undercut the purpose of the extended round, which is to avoid running what may be a very large number of bidding rounds before ascertaining that the final stage rule cannot be met in the current stage.

b. Extended Round Bidding Procedures

224. The Commission adopts its proposed extended round bidding and bid processing procedures, which are described in detail in Appendix G of the *Auction 1000 Comment PN.* Under these procedures, extended round bidding will be conducted only for Category 1 blocks in high-demand markets, the same set of licenses considered in triggering the extended round and applying the first component of the final stage rule. Because bidding will have stopped on these blocks, the currently winning bidders are very likely to become the winning bidders when the clock phase ends and, hence, they will have a strong incentive to try to ensure that the final stage rule can be met. Bidders in less settled markets may be less inclined to accept their allocated share of an extended round increment, which may in turn reduce the chances that the extended round will meet the final stage rule. Moreover, asking participants that are bidding for the most valuable licenses to accept an

extended round increment will not pose an unreasonable burden, since proceeds for comparable licenses typically account for a very large fraction of revenues in other spectrum auctions. This is especially so given the Commission's decision to limit the circumstances in which the extended round will be implemented to ensure that the shortfall in proceeds is not too large. Therefore, the Commission declines to adopt AT&T's suggestion to include all available licenses in the extended round bidding.

225. Under the procedures the Commission adopts, the auction system will set an extended round clock price increment for Category 1 blocks in each high-demand PEA that is 33 percent larger than the increment required to satisfy the final stage rule. The same percentage increment will be applied to Category 1 blocks in each high-demand PEA, such that the additional proceeds over all the areas would equal 133 percent of the amount needed to meet the shortfall. High-demand PEAs where there is excess supply will not be included in extended round bidding. This required amount will be the amount needed to meet the first or second components of the rule, whichever is greater. Setting the clock price 33 percent higher than the minimum amount necessary to meet the reserve price will enable the extended round to satisfy the rule even if a market clearing price in some PEAs is less than proportional to the full gap in proceeds, by permitting bidders in markets with higher market clearing prices to make up for the difference in needed proceeds.

226. A bidder in the extended round will be permitted to accept the clock price for the blocks it demands or to submit an intra-round bid that requests a reduction of one block at a price lower than the clock price. Only bidders that demanded blocks in the previous round in the category may bid in the extended round. A bidder will not be able to request an increase in demand in the extended round. The auction system will consider bids in all PEAs for which there is extended round bidding in increasing order of price point (and random number in the case of ties). A quasi-random number will be associated with each bid as it is submitted. At the lowest price point at which the auction system encounters an intra-round bid in a given PEA, the uniform price applying to Category 1 blocks in that PEA will stop increasing. The auction system will stop processing bids if it reaches a point where the total additional proceeds associated with the extended round prices in the high-demand PEAs together are sufficient to meet the final stage rule. This point may not necessarily correspond to a price-point at which an intra-round bid is submitted. Hence, prices in high-demand PEAs where there is an intra-round bid will stop increasing when bid processing reaches the price point of the first requested reduction if the final stage rule has not yet been met. In high-demand PEAs without a reduction request, prices will stop at the price point at which the final stage rule is met.

227. If the final stage rule is met in the extended round, the uniform price applying to all Category 1 blocks in each high-demand market will increase only as much as needed to meet the final stage rule. Regular clock rounds will resume with the spectrum reserve in place, and clock rounds will continue as long as there is excess demand in any category in any PEA. In PEAs where there was extended round bidding, clock prices for Category 1 blocks in the first new clock round will be based on the extended round stopped price. Where there was no extended round bidding—that is, for Category 2 blocks and Category 1 blocks in non-high-demand PEAs—clock prices in the next clock round will be based on prices from the last regular clock round. However, even if in the extended round the price stopped in a PEA at an intra-round price point at which a bidder requested a reduction, the reduction will not be applied to the bidder's demands, since applying the reduction would result in excess supply. The bidder will still demand the quantity it demanded going into the extended round, but at the stopped price.

228. If the final stage rule cannot be met in the extended round, the current stage of the auction will end and a new stage will begin. In PEAs where there was extended round bidding, clock prices for the first round of the forward auction in a new stage will be based on the extended round stopped price in PEAs where a reduction was requested, and on the extended round clock price if no reduction was requested. If there was no extended round bidding, *i.e.,* for Category 2 blocks and Category 1 blocks in non-high-demand PEAs, clock prices in the new stage will be based on the last regular clock round. In contrast to the case where the final stage rule is met, if a bidder requested a reduction that stopped the price in the extended round, the auction system will apply that reduction to the bidder's demands going into the next stage. Since a bidder can request a reduction of at most one block in the extended round, and the stage transition procedures the Commission adopts generally will reduce the supply of blocks in a PEA by one block, the Commission finds that allowing a single extended round reduction to be applied will not unduly risk creating unsold licenses.

9. Stopping Procedures

229. The auction system will employ a simultaneous stopping rule for the clock phase of the forward auction in the final stage. Specifically, if the final stage rule has been met (with or without an extended round), the clock phase of bidding will end for all categories of licenses following the first round in which there is no excess demand in any category in any PEA. Forward auction bidders that are still expressing demand for a category of a PEA at the time the stopping rule is met will become the winning bidders, and will be assigned specific frequencies in the assignment phase.

B. Assignment Phase

230. The assignment phase will determine which frequency-specific licenses will be won by the winning bidders of generic blocks during the clock phase. In the assignment phase, winning bidders will have the opportunity to bid for preferred combinations of frequency-specific licenses. A bidder can assign a price using a sealed bid to one or more possible frequency assignments for which it wishes to express a preference, consistent with its winning bids for generic blocks in the clock phase. For instance, if a bidder won two Category 1 blocks and one Category 2 block in the clock phase, then it will only be offered the option of bidding for frequency assignments with exactly two Category 1 licenses and one Category 2 license. The bid prices will represent a maximum payment that the bidder is willing to pay for the frequency-specific license assignment, in addition to the final price established in the clock phase for the generic blocks, which may be subject to an impairment discount. The procedures the Commission establishes will determine the optimal assignment of licenses within each PEA by first considering a series of spectral contiguity objectives and then, if there are multiple arrangements that meet the contiguity objectives, determine assignments based on bid amount in the assignment phase. As a simple example, assume four identical blocks are available in a PEA, and two bidders won two blocks each in the clock phase, and each was presented with bidding options for contiguous blocks AB and CD. One bidder bid 10 for AB and 0 for CD, the other bidder bid 12 for AB and

0 for CD in the assignment phase. The auction system will assign AB to the second bidder, and CD to the first bidder.

231. The Commission generally adopts the assignment round procedures proposed in the *Auction 1000 Comment PN,* except that in response to concerns expressed by commenters the Commission will not group PEAs when any of the licenses are at all impaired. This modified approach to grouping PEAs will ensure that bidders can express divergent frequency preferences for impaired licenses across geographic areas.

1. Availability of Auction-Related Information to Bidders

232. Prior to commencement of bidding in the assignment phase, the auction system will inform all winning bidders from the clock phase of the extent to which contiguous blocks feasibly may be assigned in every PEA. This applies to all blocks in the PEA irrespective of whether they are in Category 1 or Category 2, reserved or unreserved, or are impaired to varying extents. More specifically, the auction system will provide information with respect to each PEA on whether, consistent with the contiguity objectives: (1) It is possible to assign contiguous blocks to all winning bidders in the clock phase, or, if not, (2a) that it is possible to assign at least two contiguous blocks to all winning bidders of two or more blocks in the clock phase, or (2b) that it is not possible to assign at least two contiguous blocks to all winning bidders of two or more blocks in the clock phase. The auction system will determine the potential for contiguous frequency assignments, as well as the assignment phase bidding options provided to each bidder, based on the availability of frequency-specific licenses corresponding to Category 1 and Category 2 blocks in the PEA (or group of PEAs), and the contiguity objectives that are possible given the particular mix of bidders and the categories of their clock phase winning. This information will enable a bidder to assess the likelihood of being assigned contiguous blocks, and the extent to which contiguity may be possible across PEAs. Providing such information about all PEAs to all winning bidders, rather than only to winners in each specific PEA, averts the risk that winning bidders in a large number of PEAs will gain an undue advantage over others.

233. In addition to the foregoing information, the auction system will provide to each assignment phase bidder a menu of bidding options consisting of possible configurations of frequency-specific licenses on which it can bid in each PEA in which it holds winning clock phase bids, as U.S. Cellular proposed. These bidding options will be consistent with the bidder's clock phase winnings and information. The auction system may, in some cases, offer a bidder assignment bidding options that include combinations that are not possible for the bidder to win, given the winnings of other bidders, in order to avoid disclosing too much information about the winning bids of other bidders. In other cases, if there is only one possible assignment in a PEA given a bidder's winnings (for example, if a bidder won the only available Category 2 block and no Category 1 blocks), the bidder may not be offered a bidding option but will be assigned to that option by the auction system. Providing such information will facilitate participation in the assignment phase, particularly for smaller bidders with fewer resources to expend on analysis, by limiting the number of frequency configurations on which they need to consider for the assignment phase.

234. The auction system will provide clock phase winning bidders with the information as soon as possible and announce a schedule of assignment phase rounds that will commence beginning no less than five business days later. While CTIA advocates at least 10 days between the provision of detailed information and the commencement of the assignment phase, the Commission finds that five days will be sufficient for bidders to prepare given the information that will be made available to facilitate bidding in the assignment phase.

235. When an assignment round concludes, the auction system also will advise the bidders in each PEA of their own payments and assignments.

2. Structure of the Assignment Phase

a. Grouping of PEAs

236. The Commission adopts its proposed requirements for grouping PEAs for assignment phase bidding purposes, with an additional requirement in response to concerns expressed by commenters regarding bidding for licenses with impairments. Specifically, the auction system will group together PEAs in a single assignment round only if all of the following three conditions are met: (1) The PEAs are one of the following: (a) All high-demand (PEAs 1–40), regardless of Regional Economic Area Grouping (REAG); (b) All in the same REAG and not subject to the small market bidding credit cap (*i.e.,* those PEAs with a population of 500,000 or less, which corresponds to PEAs 118–416, excluding PEA 412); or (c) All in the same REAG and are subject to the small market bidding credit cap; (2) Each PEA in the group has the exact same number of blocks, all of which are Category 1 blocks and are zero percent impaired; and (3) Each PEA in the group has the same mix of clock phase winners and winnings. For example, in all PEAs in the group there are five Category 1 blocks with zero percent impairment. Bidder A won one block in each of the PEAs in the group. Bidder B won one block in each of the PEAs, and Bidder C won three blocks in each of the PEAs

237. These requirements will assure that in any grouping, assignment round bidders will be presented with a set of PEAs with blocks with the same characteristics, which should reduce uncertainty and simplify bidding for all bidders. No PEAs will be grouped in the assignment phase if any of the blocks are considered impaired. That is, all blocks will be considered 0 percent impaired. The Commission's modified approach addresses concerns raised by commenters, including Sprint, U.S. Cellular, and others, that the approach the Commission proposed might not give bidders sufficient flexibility to express preferences for assignments in cases where PEAs with licenses in the same category are impaired differently but are grouped together for bidding.

b. Intra-PEA Contiguity Objectives

238. The auction system will use an optimization process to determine for each PEA or PEA group various possible configurations of frequency-specific licenses consistent with the pattern of winning bidders and block categories from the clock phase. More specifically, the auction system will apply the following contiguity objectives, taking into account both Category 1 and Category 2 blocks: (1) For bidders that win multiple blocks, maximize the number of bidders that are assigned at least two contiguous blocks; (2) for bidders that win multiple blocks, minimize the number of blocks that are non-contiguous to any of the bidder's other blocks; (3) maximize the number of bidders that are assigned only contiguous blocks; and (4) maximize the number of pairs of unsold blocks that are contiguous as long as the impairment of blocks to winning bidders does not increase. These objectives are consistent with comments indicating that carriers place significant value on spectrally contiguous spectrum, as well as some commenters'

arguments that prioritizing inter-PEA contiguity, as opposed to contiguity within PEAs, could disadvantage certain carriers and create opportunities for discriminatory conduct.

239. The contiguity objectives will be applied in the order specified, so that the second objective will only be applied to possible assignments that fully satisfy the first objective, the third objective will only apply to assignments that fully satisfy the first two objectives, and so on. As a result, the fourth objective regarding unsold blocks will not adversely affect the assignment of contiguous blocks as determined by the first three objectives. The Commission adopts the fourth objective, in addition to the three objectives it proposed in the *Auction 1000 Comment PN,* in order to ensure that, if the auction system must choose between an assignment in which any unsold blocks are contiguous or separated, the system will choose the contiguous assignment, thus maximizing the value of blocks retained by the FCC.

240. The Commission declines to adopt CCA's proposal for the auction system to assign the winning bidder of a single license in a PEA the least impaired license block before assigning any others. The Commission disagrees with the premise of CCA's proposal that the first three objectives uniformly favor multi-license or multi-market winning bidders and harm carriers that purchase only one license in a PEA. The contiguity objectives will be applied without regard to the level of impairment and therefore will not favor any bidder or type of bidder. The Commission also declines to adopt U.S. Cellular's proposal for an additional objective which minimizes the difference in the average level of impairment of the same-category license(s) assigned to any two bidders. Since bidders may value impairments differently, the Commission prefers to allow bidders to indicate their own frequency preferences through their bidding in the assignment phase.

c. Sequencing of Assignment Phase Bidding

241. The Commission adopts its proposal to sequence bidding on PEAs or PEA groups in the assignment phase based on total weighted-pops, beginning with the high-demand PEAs and then moving to non-high- demand PEAs by REAG. For assignment phase bidding, assignment rounds for the PEAs in the six smaller REAGs will be sequenced with one of the six continental REAGs. Under this approach, clock phase winning bidders of blocks in the high-demand PEAs will first bid on the PEA or PEA group with the greatest number of weighted-pops. Bidding will continue in descending order of weighted-pops until specific frequencies have been assigned in all the high-demand PEAs. Once frequencies have been assigned for the high-demand PEAs, the auction system will conduct a series of assignment rounds for the non-high-demand PEAs within each of the six REAGs, again in descending order of weighted-pops. The Commission expect that the auction system will run the assignment rounds for non-high-demand PEAs associated with different REAGs in parallel. However, an alternative schedule for the REAG rounds, of which bidders will be given ample notice, may be necessary in the event that running multiple rounds in parallel is deemed too complicated for bidders, the auction managers, or the auction system. Within each REAG, the assignment rounds would be conducted one PEA or PEA group at a time, sequentially.

242. The Commission is not persuaded by arguments that larger bidders would derive a significant advantage from being able to participate in assignment rounds that are sequenced earlier in the assignment phase process, and hence, the Commission declines to adopt the commenters' proposal to randomly sequence the assignment rounds to avoid any timing advantage. The Commission finds that the information it will provide—on bidders' own bidding options and on the potential for contiguous assignments in each PEA—will minimize any ''early mover'' informational advantage. In addition, the second-pricing procedures will simplify bidding strategy for bidders, mitigating any potential advantage from bidding ''experience'' in the assignment phase.

243. The Commission also rejects the assumption that earlier bidding for frequency assignments in the high-demand markets will enable winners of blocks in those markets to establish consistent frequency ''footprints'' that they will later pay a premium to extend, thereby disadvantaging bidders with fewer resources to spend in the assignment phase. The intra-area contiguity objectives will limit bidders' abilities to establish consistent frequency footprints across PEAs. Because the auction system will only allow bids for license combinations that satisfy those contiguity objectives, it is unlikely that a single bidder will have the opportunity to bid for and win a consistent footprint in all areas in which it won blocks. Consequently, the Commission is not persuaded that the sequencing procedures it adopts will lead to a lack of interoperability as a result of larger carriers establishing consistent footprints in one section of the 600 MHz Band, leading equipment manufacturers to tailor equipment only to those frequencies, and note moreover that its rules require interoperability throughout the 600 MHz Band. The *Incentive Auction R&O* adopted a strong interoperability rule that requires that any user equipment certified to operate in any portion of the 600 MHz Band must be capable of operating, using the same technology that the licensee has elected to use, throughout the entire 600 MHz Band.

d. Bidding and Bid Processing

244. Once bids have been submitted, the auction system will perform an optimization to select as the winning license assignment that configuration, consistent with the continuity objectives and the options provided to bidders in advance, for which bidders indicate the greatest willingness to pay. Ties, if any, will be broken by including pseudo-random numbers in the optimization. Bidding in an assignment round is voluntary. If a bidder chooses not to bid in an assignment round, the auction system will assign a zero bid to each of the bidder's available options, or to any option for which the bidder does not submit a bid. Bidders that choose not to bid in an assignment round will be assigned licenses consistent with their winnings in the clock phase of the auction and the contiguity objectives. The Commission declines to implement the suggestion that the auction system process assignment round bids by looking separately at the high bids on various licenses, since bids will be used to select a single configuration of license assignments and the licenses with the highest bids may not be in the same configuration.

245. Under the assignment phase bidding procedures the Commission adopts, winners of either reserved or unreserved Category 1 blocks will be able to bid for the available frequencies in Category 1, and the auction system will assign specific frequencies without regard to the reserve-eligible status of the bidder. In other words, the auction system will not differentiate in the assignment rounds between reserved and unreserved spectrum blocks. Subsequent to making frequency assignments in the assignment phase, in order to determine final license prices, the auction system will determine which license or licenses are deemed as reserved, if a bidder wins both reserved and unreserved Category 1 blocks in a single PEA or PEA group. Consistent

with the record, the procedures the Commission adopts will prioritize the assignment of contiguous blocks within PEAs in order to promote efficient utilization of the 600 MHz Band. Differentiating between reserved and unreserved blocks would undermine this objective by making it more difficult to assign frequency-contiguous spectrum blocks to winners of blocks in an area, particularly if a bidder wins both reserved and unreserved blocks. Further, the Commission is not persuaded that differentiating is necessary to ensure fulfillment of its competitive goals for the auction, especially since all reserved blocks will be Category 1, and therefore relatively substitutable. Accordingly, the Commission declines to assign reserved and non-reserved licenses separately during the assignment rounds.

246. The Commission declines to adopt an assignment approach that would rely on random or quasi-random distribution of licenses, or other non-monetary bidding for frequency preferences, as some commenters suggest. The Commission also declines to adopt the alternative approach advocated by U.S. Cellular and others, under which the auction system would take into account preferences for contiguous blocks within an area and then randomly determine the remaining frequency assignment. The Commission determined in the *Incentive Auction R&O* that the use of competitive bidding procedures would promote the efficiency of the assignment process, and allow more confident bidding for generic licenses in the clock phase of the forward auction, by facilitating the assignment of specific frequencies to the highest-valuing users. Accordingly, the Commission rejected an administrative, random or quasi-random process. Nevertheless, these commenters assert that using competitive bidding will give an advantage to nationwide carriers in obtaining the least impaired blocks in a category, leaving less desirable blocks for the smaller and regional carriers. They argue further that bidding in the assignment phase is likely to depress revenue in the clock phase. The Commission reaffirms that giving bidders the opportunity to bid monetary amounts for specific frequency preferences in the assignment phase, which they will not be able to express in the bidding for generic blocks in the clock phase, will allow the auction system to take bidder interests into account in assigning frequency-specific licenses. Moreover, the Commission agrees that a monetary bidding-based assignment round will allow bidders to express the intensity of preferences for particular licenses, which the points-based approaches generally do not. This will lead to potentially more effective use of the spectrum than would a random assignment mechanism.

247. In addition, the Commission finds that competitive bidding will provide a greater incentive for sincere bidding—since real resources will be at stake—than would a system of ''draft pick'' preferences or points based bidding, as also suggested by commenters. The Commission further rejects arguments that the competitive bidding-based approach it adopts to the assignment phase will depress revenues in the clock phase, potentially causing the auction to move to a lower clearing target because the final stage rule cannot be met. In other spectrum auctions around the world in which similar assignment phase designs have been used, the revenues in the assignment phase have averaged less than 0.5 percent of the total auction revenues. For example, assignment phase revenues were 1.15 percent of total auction revenues in the 2013 UK 4G Auction. In the 2013 Australian Digital Dividend Auction, while the auction data was not released in full, an upper bound of 0.19 percent can be calculated using available public data for assignment phase revenues as a percentage of total auction revenues. Assignment phase revenues were less than 0.01 percent of total auction revenues in the Canadian 700 MHz Auction. On the contrary, bidders may bid more aggressively in the clock phase because they know that they will later have an opportunity to bid for a strongly-held frequency preference in the assignment phase. In addition, given its projections that the initial clearing target procedure will result in a very high proportion of Category 1 blocks with minimal or no impairment, and its decision to make detailed impairment information available to bidders prior to the commencement of bidding in the clock phase of the forward auction, bidders generally are unlikely to hold back their clock phase bids in order to be able to secure the least impaired licenses in the assignment phase. In most PEAs, the Commission expects that there will be insufficient impairment or variety in the degree to which licenses are impaired to warrant such action. The discount on clock phase prices for any license impairments also will help account for variation in value due to impairment, minimizing the incentive to limit clock phase bids to the value of the most impaired generic block in a category. Accordingly, the Commission is not persuaded that clock phase revenues will be significantly suppressed by the use of competitive bidding procedures in the assignment phase.

248. The Commission also disagrees with arguments that a competitive bidding-based approach to the assignment phase will disadvantage smaller carriers. First, the assignment phase structure will level the competitive playing field: The auction system will prioritize assigning contiguous frequency blocks within each PEA before taking bids, without regard to whether potential bidders (the winning bidders in the clock phase) are nationwide carriers or regional entities, reserve-eligible or not, and without taking into account the extent of impairment within a bidding category. By prioritizing intra-area contiguity of licenses, the assignment phase structure will protect all bidders equally from discontiguous frequency assignments, even if a bidder does not submit an assignment round bid. Second, smaller carriers are as likely as larger ones to be able to benefit from expressing assignment phase preferences. Indeed, because the networks of smaller carriers may be less flexible than those of the nationwide carriers, the ability to bid for frequency-specific preferences may be all the more important for smaller carriers. Moreover, because the contiguity objectives will seek to assign two contiguous blocks to each winner *before* trying to assign any winner three or more contiguous blocks, they are likely to benefit carriers that win fewer than three blocks within a PEA over carriers that win more. Third, designated entity bidding credits will apply to assignment phase payments, giving smaller carriers that qualify as designated entities a price advantage over larger carriers in assignment phase bidding.

249. Moreover, under the competitive bidding-based procedure the Commission adopts, bidding strategies will be easier than more complex and unfamiliar procedures advocated by some commenters. For example, the ''serial priority-assessment algorithm'' approach advocated by T-Mobile and U.S. Cellular would require a bidder to understand a new bidding mechanism in which the optimal bidding strategy is not clear and depends on what strategy it expects others to play. Choosing selection order randomly and enforcing rotations among bidders, as advocated by T-Mobile and U.S. Cellular, would result in a less efficient assignment than if bidders can express preferences using monetary bids, which also allow for varying intensity of preferences. In

combination with the ''second-pricing'' approach, the procedures the Commission adopts will allow bidders to follow a clear and familiar strategy: Bid the incremental value of a specific assignment option, knowing that the payment will be equal to or less than that bid amount. For example, assume a bidder's three possible assignments are AB, BC, and CD. All that the bidder needs to do is determine a valuation for AB, BC, and CD. Assume these valuations are $120 million, $110 million, and $100 million, respectively, and the final clock phase price for A, B, and C was $100 million. The bidder would assign a value of $0 to its lowest priority assignment, CD, and submit a bid of $10 million for BC and $20 million for AB. The bidder's valuation would not depend on guesses about others' bids.

e. Assignment Phase Payment Calculations

250. The Commission adopts the procedures it proposed to calculate the assignment phase payment (above the discounted final clock phase price) a bidder will pay for a frequency-specific license using a generalized ''second price'' approach. The final clock phase price of an impaired license will be discounted by an amount proportional to the extent of impairment. Under this approach, the auction system will calculate a payment amount that, if the winning bidder had bid that amount, would have been just sufficient to result in the bidder receiving the same winning frequency-specific license assignment. This pricing approach is a version of a Vickrey-Clarke-Groves mechanism. This payment will be less than or equal to the amount the bidder indicates in its bid that it is willing to pay for the assignment. The Commission find that this approach will simplify bidding strategies for bidders by giving them an incentive to bid what they consider to be full value for the assignment: If the assignment is selected, they will pay no more than would have been necessary to ensure that the assignment won. While U.S. Cellular indicates that inexperience with a second-pricing approach may still lead bidders to ''overbid,'' the Commission is confident that as bidders consider seriously their bidding strategies, this incentive will become apparent to them. Appendix H from the *Auction 1000 Comment PN* includes a detailed explanation of the procedures the Commission will use to determine the assignment round payment.

C. Final Winning Bid Amounts

251. The Commission adopts the procedures proposed in the *Auction 1000 Comment PN* for determining final forward auction prices, on which it received no feedback from commenters. The final price that a winning bidder must pay for a license it wins in the assignment phase will be the final clock phase price for the category of license it won within a given PEA, adjusted by the percentage of any impairment to the frequency block, plus any assignment phase payment, all reduced by any designated entity bidding credit.

252. The Commission clarifies that, in the event a bidder wins both Category 1 reserved and unreserved blocks in the same PEA in the clock phase, in determining final payments, the auction system will deem as reserved that block or blocks that will yield the bidder the lowest price, taking into account the final clock phase price for the category and the impairment discount. The blocks that are deemed reserved will carry the restrictions on transferability, consistent with the conditions on reserved spectrum established in the *Mobile Spectrum Holdings R&O.* This approach will maximize the impairment discount. For example, assume that in the clock phase a bidder won one unreserved Category 1 block and one reserved Category 1 block in a PEA. The assignment phase procedures determined that the bidder would be assigned blocks E and F, where block E is two percent impaired and block F is zero percent impaired. The assignment phase payment is determined to be $100. If the final clock phase prices were $1,000 for reserved blocks and $1,200 for unreserved blocks, then the E block would be deemed unreserved and the F block would be deemed reserved. Conversely, if the final clock phase prices were $1,200 for reserved blocks and $1,000 for unreserved blocks, then the E block would be deemed reserved and the F block would be deemed unreserved. In either event, the bidder's final payment amount for blocks EF, assuming it has no designated entity bidding credit, will be calculated as follows: {1,000 + 1,200*0.98} + {100} = $2,276. If, for example, the bidder is eligible for a designated entity bidding credit, its total payment will be reduced by the amount of the bidding credit, subject to any cap. In the event that the reserved and unreserved blocks have the same final clock phase prices or the blocks are equally impaired, blocks will be designated as reserved in descending order of frequency. While ties in FCC auctions are traditionally broken pseudo-randomly, the Commission finds that this rule is clear and simple to implement, and will result in assigning contiguous reserved licenses in cases where a bidder wins multiple reserved blocks as well as unreserved blocks, which a random assignment mechanism will not necessarily do.

VII. Transition, if Necessary, to Any Subsequent Stage

253. If a stage of the auction ends without satisfying the final stage rule, the auction system will begin a new stage of the auction using a lower clearing target. The reverse auction will be conducted for the applicable clearing target followed by the forward auction. The auction system will announce the new clearing target to bidders, as well as a bidding schedule for the reverse auction. A new stage of the reverse auction will begin not sooner than five business days after the conclusion of the prior stage of the forward auction. CTIA requests that the Commission allow at least two weeks between auction stages. The Commission concludes that five business days will provide the auction system with adequate time to conduct a clearing target optimization and provide forward auction bidders with impairment information for the new stage of the auction. While forward auction bidders need time to analyze new impairment data, the Commission notes that such bidders will have that information for the entirety of the stage of the reverse auction. Additionally, at a lower clearing target, there generally will be fewer impairing stations for forward auction bidders to consider. The Commission concludes that bidders will have sufficient time to process new impairment information and commenters have not provided it with a compelling reason to delay the start of a subsequent stage of the reverse auction by an additional week. Reverse and forward auction bidding in subsequent stages will carry-over from the prior stage—the prices will continue to descend in the reverse auction and continue to rise in the forward.

A. Selecting a New Clearing Target

254. The clearing target for any subsequent stage of the auction generally will be the next lowest clearing target in the 600 MHz Band Plan. As with the initial clearing target, prior to bidding in a new stage, the auction system will make public the new clearing target. In the *Auction 1000 Comment PN,* the Commission also sought comment on the alternative of skipping clearing targets when moving to a new stage. CTIA and EOBC both argue against skipping any clearing targets as the auction advances to

subsequent stages. CTIA is concerned that if the Commission skips a clearing target it could unknowingly bypass an opportunity to clear additional spectrum. The Commission generally agrees. Therefore, in any subsequent stage, the clearing target determination procedure will be applied for the next lowest clearing target. It may be necessary to skip the 108 MHz clearing target to better harmonize our band plan with Canada or Mexico. Under this procedure, the current assignment of participating stations to relinquishment options from the reverse auction will not change. The optimization tool will determine a new provisional television assignment plan for the UHF band using the same objectives as in the initial clearing target optimization, taking into account the additional channel in the TV band and any participating stations that have dropped out of the auction in the previous stage. As part of this process, the optimization procedure may modify the provisional assignment of stations to the 600 MHz Band from the prior stage in order to minimize impaired weighted-pops and carry out the other objectives the Commission adopts. Prior to the start of the reverse auction in a new stage, the auction system will provide forward auction bidders with the same impairment and other information as will be provided to bidders in the initial stage. Based on the new provisional television channel assignment plan, the nationwide impaired weighted-pops will be calculated on a 2x2 cell level. The one-block-equivalent nationwide standard for impairments will then be applied. In the event that the new plan does not meet the standard, the process will be repeated at the next lowest clearing target until a plan is identified that meets the one-block-equivalent impairment standard. The Commission anticipates that only in rare situations would the process result in moving down more than one clearing target.

255. In Attachment A to the *Auction 1000 Bidding Procedures Public Notice,* the Commission provides a description of how its computer model will apply the between-stages clearing target determination procedure the Commission adopts on a step-by-step basis. An updated version of Appendix C to the *Auction 1000 Comment PN* setting forth the technical details and formulas associated with this procedure will be included with the appendices to the *Application Procedures PN.*

B. Reverse Auction Bidding

256. The Commission adopts its proposals for resuming bidding and setting clock prices in the reverse auction in any subsequent stages. In the beginning of a new stage, the auction system will re-evaluate the bidding status of each station that was ''frozen—provisionally winning'' in the prior stage of the reverse auction in light of the reduced clearing target, notifying every such station of its new status, and resetting the base clock price.

257. The auction system will reset the base clock price to the highest ''catch up point'' of all newly-active stations. Active stations are all participating stations that have not exited or become provisional winners. At the start of the new stage, each provisional winner from the prior stage will have its status reevaluated to take account of the new clearing target. In a subsequent stage, the auction system will inform newly-active stations that they will be returned to the active status of ''bidding in current round,'' ''frozen—currently infeasible,'' or ''frozen—pending catch up,'' whichever the case may be, at the beginning of the reverse auction in the new stage. For each newly-active station, its catch up point will be the base clock price at the time that the station became provisionally winning in a previous stage. In the first round of the new stage, the newly-active station(s) with the highest catch up point will become either ''bidding in the current round'' (applicable to UHF or VHF stations) or ''frozen—currently infeasible'' (applicable only to VHF stations), while all newly-active stations with lower catch up points will become ''frozen—pending catch up.'' The auction system will inform reverse auction bidders of their bidding status after each round of the auction and at the start of a new stage. Bidders that have a station that is ''frozen—pending catch up'' or ''frozen—currently infeasible'' may place proxy bid instructions, if they so choose, in accordance with the reverse auction bidding procedures.

258. The base clock price will descend from the reset price (*i.e.,* the highest catch up point of newly-active stations). The auction system will calculate new price offers for bidding stations using the descending clock pricing procedures. Bidders with a newly-active station that is ''frozen—pending catch up'' will not resume bidding in the current round until the base clock price falls below the station's catch up point and its status changes. In order to avoid rounds in which no bidders are able to submit bids, if in any round there would be no stations that have the status ''bidding in the current round'' but there are stations that remain ''frozen—pending catch up,'' the auction system will temporarily adjust the price decrement. Specifically, the auction system will increase the price decrement only for the next round so as to meet the highest catch up point of a station that is pending catch up. This change will be announced to bidders immediately prior to adjusting the decrement. Once the base clock price descends to that point, such bidders will see their station's bidding status change to ''bidding in the current round'' if the station has a feasible channel assignment, or ''frozen—currently infeasible'' if the station is a VHF station and does not currently have a feasible channel assignment. Bidders who are asked to bid in a new stage will be able to bid using the bidding procedures including requesting to switch to another bid option if their station is eligible to do so. Any stations that exited in a prior stage will retain that status and will not resume bidding.

C. Forward Auction Bidding

1. License Inventory by Category and PEA

259. In the forward auction in a subsequent stage, the number of spectrum blocks available in each PEA will generally be reduced by one. The number of Category 1 and Category 2 licenses available in a given PEA may increase or decrease, however, because the clearing target determination procedure between stages may change the assignment of television stations to the 600 MHz Band, altering the extent and location of impairments in the available blocks. Prior to the start of the forward auction in a new stage, the auction system will inform forward auction bidders of the new band plan, including the number of blocks that will be available in each category in each PEA, and the same types of impairment information provided prior to the initial stage of the auction. The auction system will not evaluate whether the final stage rule has been satisfied until after bidding in the first clock round of the forward auction in a subsequent stage is complete.

a. Bidder Demands and Bidding Eligibility

260. The auction system will initiate bidding in the forward auction in any subsequent stage based on bidder demands and bidder eligibility from the end of the previous stage. If a new stage does not follow an extended round because the shortfall to meet the final stage rule was too large, bidder demands and eligibility at the start of the first round of the forward auction in the new stage will be equal to those accepted by the auction system at the end of the last

regular clock round in the previous stage.

261. If the forward auction in a new stage follows an extended round in which the final stage rule was not met, bidder demands will be based on bidding in the extended round for license categories in PEAs that participated in the extended round, and on demands from the last regular clock round for license categories and PEAs that did not participate. More specifically, for categories of blocks for which all bidders indicate that they are willing to accept the full extended round price increment, bidder demands will carry over from the extended round. For categories for which a reduction was accepted, bidder demands from the start of the extended round will carry over to the new stage for all but the bidder whose requested reduction was accepted. Under the procedures the Commission adopts for processing extended round bids when the final stage rule is not met, the auction system will process a demand reduction of up to one block per ''high-demand'' PEA. In some cases the supply of Category 1 blocks in a PEA may not decrease in a subsequent stage in spite of the lower clearing target because the clearing target selection procedure could reduce impairments to licenses in a PEA sufficiently that one or more blocks previously considered Category 2 will be considered Category 1 in the new stage, so that even with a lower total number of blocks, the number of Category 1 blocks will not decrease. The Commission anticipates that, in such cases, bidders previously demanding a Category 2 block, the supply of which will be reduced disproportionately, are likely to shift to bid on the Category 1 blocks, so that demand for the Category 1 blocks will at least equal supply. That bidder's demand will reflect the reduction, consistent with its extended round bid processing procedures. For blocks that are not included in bidding in the extended round, bidder demands that were accepted at the end of the last regular clock round of the previous stage will carry over to the beginning of the next stage. If supply exceeds demand in a category because a bidder on a Category 2 block chose to reduce its demand, taking advantage of the exception to the rule that reductions will not be applied if aggregate demand will fall below supply, the clock price for the second round of the new stage will be also based on the price from the last round in the previous stage (when supply did not exceed demand).

262. In recognition that bidder demand for Category 2 blocks in a PEA may be reduced based on changes to the extent of impairments, the auction system will accept requests to reduce demand for Category 2 blocks in the first round of the forward auction in a subsequent stage, even if the reduction will result in demand falling below supply for that category. Bidder eligibility in a subsequent stage will be based on the bidder's bidding activity at the end of the previous stage. A bidder will begin the first round of the forward auction in the new stage with its eligibility reset based on bidding in the extended round for licenses for which there was bidding in the extended round, and for other licenses on bidding in the last regular clock round.

b. Clock Price

263. The auction system will initiate forward auction bidding in any subsequent stage based on prices from the end of the previous stage. The price increment in the first round of the forward auction in the next stage will be added to the last clock price from the previous stage, or to the intra-round price at which a reduction that brought demand down to equal supply was processed. If an extended round was held, for blocks not subject to extended round bidding (*i.e.,* Category 2 blocks and blocks in non-high-demand PEAs) clock prices for the first round in the new stage will be based on prices from the round preceding the extended round. For categories subject to extended round bidding, the increment will be added to the extended round clock price if no reduction was requested in the category, or the lowest price at which a reduction was requested. If the new stage is triggered without an extended round because the shortfall in proceeds was sufficiently large, these procedures are equivalent to setting clock prices for the first round of the new stage as if it were a new round in the previous stage.

264. The Commission disagrees with T-Mobile's assertion that forward auction clock prices in a subsequent stage should reflect the reduction in payments to provisionally winning reverse auction bidders and relocation expenses resulting from a lower clearing target. Nor is the Commission persuaded to set clock prices in a new stage that are just sufficient to satisfy the final stage rule for the reduced spectrum clearing target. The Commission agrees with AT&T that rolling back prices between stages may provide an incentive for undesirable bidding behavior because bidders may hold back on bidding, knowing ''that prices could be lower in the next round if they allow the auction to fail at the current clearing targets,'' which would reduce the amount of spectrum cleared in the incentive auction. Moreover, the procedures the Commission adopts to prevent an extended round if the needed shortfall to satisfy the final stage rule is too large will limit the extent to which clock prices can increase from stage to stage, mitigating T-Mobile's concern that a failed extended round will set ''an artificially inflated price floor for subsequent stages'' of the auction, potentially leading to reduced bidder demands and fewer blocks in the spectrum reserve. The pricing procedures the Commission adopts will provide a smooth transition between stages and sound incentives for straightforward bidding in the forward auction in any subsequent stages.

VIII. Final Television Channel Assignment Plan Selection Procedure

265. Once the forward auction satisfies the final stage rule, no additional stages will be required: At that time it will be possible to finalize the provisional television channel assignment plan for the remaining television bands using the optimization procedures. The satisfaction of the final stage rule will be publicly announced. The final television channel assignment plan will not be released until after the close of the forward auction. The mathematical formulas for implementing the final television channel assignment selection procedure will be set forth in an appendix to the *Application Procedures PN.* The results of the final television channel assignment plan selection procedure will be announced by the Media and Wireless Telecommunications Bureaus in the *Channel Reassignment Public Notice* after the completion of the reverse and forward auctions.

266. The final television channel assignment plan will include a channel assignment for each eligible full power and Class A television station that will remain on the air post-auction; *i.e.,* those that did not participate in the reverse auction, those that participated but exited the bidding, and those that successfully bid to voluntarily relocate to a different TV band. With the exception of any stations that were assigned to channels in the 600 MHz Band in the final stage of the auction, all provisional television channel assignments will be subject to change in the final television channel assignment plan. The channel assignments of stations provisionally assigned to the 600 MHz Band in the final stage of the auction will not change in the final television channel assignment plan. This approach provides needed certainty for the auction outcome by

ensuring that impairments to forward auction licenses will not change as a result of the final television channel assignment optimization procedure. Every final channel assignment will be required to satisfy the constraints adopted in the *Incentive Auction R&O* to fulfill the statutory mandate that the Commission make all reasonable efforts to preserve each station's coverage area and population served.

267. The auction system will use optimization techniques to determine a final television channel assignment plan. In addition to satisfying the constraints adopted in the *Incentive Auction R&O,* the final television channel assignment plan selection procedure will take into account the following objectives, listed in order of priority: (1) Maximizing the number of channel ''stays,'' or stations assigned to their pre-auction channels instead of being assigned to new channels; (2) minimizing the maximum aggregate new interference experienced by any station; (3) avoiding reassignment of stations with high anticipated relocation costs; and (4) prioritizing assignments to channel 5 in the Low-VHF band and off of channel 14 in the UHF band. The procedure will first optimize for the first objective. It will then optimize for the second objective, which will be constrained by the results of the optimization for the first objective. The procedure will then optimize for the third objective, which will be constrained by the results for the first and second objectives. Finally, the procedure will optimize for the fourth objective, which will be constrained by the results for the first three objectives. The procedure will select a final television channel assignment plan that satisfies the constraints adopted in the *Incentive Auction R&O* and best fulfills the objectives. The final television channel assignment plan will be subject to international coordination with Canada and Mexico.

268. The first objective of maximizing the number of stations assigned to their pre-auction channels will promote a number of important goals. First, it will help to reduce the total cost of reimbursing broadcasters and others for the reasonable costs associated with repacking. Several commenters have expressed concerns regarding the sufficiency of the $1.75 billion in the TV Broadcaster Relocation Fund that Congress made available for reimbursing the reasonable relocation expenses of broadcasters and MVPDs. By minimizing the number of stations that will be required to move off their pre-auction channels and, therefore, minimizing the number of stations that incur relocation expenses eligible for reimbursement from the Fund, the first objective will help to ensure the Fund's sufficiency. Additionally, by reducing the number of stations that must change channels, the first objective will speed the post-auction transition process for other stations and minimize disruption for stations and viewers alike. Finally, the first objective will avoid terrain losses (and potentially viewer losses) that could result from channel changes due to signal propagation differences on different frequencies, consistent with its statutory mandate to make all reasonable efforts to preserve the coverage area and population served of eligible broadcast television licensees.

269. The first objective will constrain the additional objectives; however, the Commission adopts its proposal to allow the optimization procedure to choose a final television channel assignment plan in which the number of stations that are assigned to their pre-auction channels is within 95 percent of the number found in the first objective. The Commission adopts this percentage in order to allow some flexibility to achieve greater benefit in the second and third objectives while still capturing the benefits of the first objective by mostly restricting the assignments to maintain the maximum number of stays. However, the fourth objective will constrain the number of stations that are assigned to their pre-auction channel to be at least as many as found in the third optimization.

270. The second objective of minimizing the maximum aggregate new interference that any station will incur furthers its statutory obligation to make all reasonable efforts to preserve eligible stations' population served, and fulfills its commitment in the *ISIX Order,* 79 FR 76903, December 23, 2014, to take aggregate new interference into account when establishing the final channel assignments. In the *Incentive Auction R&O,* the Commission determined that it would permit channel assignments that would not increase pairwise interference—interference from any one station to another station—by more than 0.5 percent. In response to concerns that this approach could result in stations experiencing new interference of more than 0.5 percent on an aggregate basis, in the *ISIX Order* the Commission explained that, based on staff analysis, few stations were likely to experience new interference above one percent and that any such interference was unlikely to exceed two percent. In order to address the exceptional cases, the Commission stated that it would include an optimization objective in the final television channel assignment plan optimization that would seek to minimize this issue.

271. In order to implement the second objective, the final television channel assignment plan selection procedure will minimize the maximum amount of aggregate new interference that any single station could receive. In the *Auction 1000 Comment PN* the Commission proposed the alternative of minimizing the number of stations that receive aggregate new interference above one percent; however, using that procedure could possibly result in significantly higher interference levels for some stations with minimal benefit. In order to minimize the maximum amount of aggregate new interference that any single station could receive, the procedure will determine each station's predicted aggregate new interference. The optimization procedure will use pairwise constraints to calculate aggregate new interference, which will result in some double counting of interference. This provides a conservative approach to calculating aggregate new interference, making it possible that the amount of interference will be less than predicted. It will then determine an assignment plan that minimizes the maximum aggregate new interference that any station will receive. This approach to minimizing aggregate new interference will help to ensure that no station will receive a disproportionately high amount of new interference. To the extent that any stations are predicted to receive new interference greater than one percent in the final TV channel assignment plan despite the application of the secondary objective, the Commission noted in the *ISIX Order* that stations may seek a remedy through the post-auction facilities modification processes. The Commission received only one comment directly addressing this objective, and it concluded that the approach it adopts to implementing it will best meet its commitment to minimize aggregate new interference while being the most fair to stations overall.

272. The third objective of avoiding reassignment of stations with high anticipated relocation costs will further its efforts to minimize total relocation costs. This objective is consistent with its goals of ensuring the sufficiency of the $1.75 billion TV Broadcaster Relocation Fund and disbursing the Fund as fairly and efficiently as possible.

273. In determining how to estimate relocation costs for purposes of applying the third objective, the Commission adopts a categorical approach, rather

than a station-by-station approach. Such an approach better serves the public interest by simplifying the determination and minimizing administration burdens. In the *Auction 1000 Comment PN,* the Commission proposed to determine costs for purposes of applying this objective by using publicly available data, such as the data compiled for the Media Bureau by Widelity, Inc. or the data provided by broadcasters in the Form 381 Pre-Auction Technical Certification. More specifically, the Commission adopts an approach under which each station will be assigned a weight based on a number of characteristics that generally make a station more costly to relocate to a different channel. A higher number will indicate that a station's channel change is more difficult to implement, and therefore, generally more costly. Also, generally, these more difficult and costly moves will take the greatest amount of time. Minimizing them will help speed the post-auction transition process, thus further minimizing the potential for service disruptions. The optimization software will use the categorical weights to choose a final television channel assignment plan that minimizes relocation costs by avoiding highly-weighted reassignments.

274. A channel change for a full power station will generally be more costly than for a Class A station, and channel changes for stations in the top 30 DMAs will generally be more costly than stations in the remaining DMAs. Accordingly, the Commission will use the following categorical or ''base'' weights: a weight of five for full power stations in the top 30 DMAs; a weight of three for full power stations in all other DMAs; and a weight of one for Class A stations. The Commission used the Widelity Report Case Studies as a basis for these relative values. The Commission used Case Study 1 for Full Power Top 30 DMAs: cost is approximately $2.5 million, Case Study 2 for Full Power not Top 30: cost is approximately $1.5 million, Case Study 3 for Class A stations: cost is approximately $0.5 million. In order to take account of considerations that will likely add significant costs to relocation, the Commission will also add one to a station's base weight for each of the following factors: (1) An antenna on a tower taller than 1000 feet, because work on such a tower requires a specialized crew; (2) a tower in areas with significant ice and wind threat, because such towers may need improvements to satisfy ''Rev. G'' structural standards; (3) collocation on a tower with four or more other television or radio entities; and (4) a station will encounter known extraordinary circumstances if they need to change channels. Examples of some of the more complicated station sites are described in the Widelity report. These weights are meant to reflect relative difficulty when comparing two stations and are not intended to capture all of the unique circumstances potentially encountered by each station; however, they provide a simple and non-burdensome means of estimating relocation costs accurately enough to avoid the most costly and difficult relocations. Should Commission staff determine based on additional information that consideration of additional factors could result in cost savings in keeping with its overall goals of minimizing the expense and disruption to broadcasters during the repacking process, the Commission delegates authority to the Media Bureau to modify the approach it adopts to take into account such factors and direct the Media Bureau to publicly announce the final approach that will be used by the final television channel assignment optimization procedure to minimize relocation expenses.

275. Finally, the fourth objective will seek to assign as many stations as possible that voluntarily move to the Low-VHF band—or that must be reassigned to new channels in that band to accommodate such moves—to channel 5. The Commission adopts this objective in response to the suggestions of several commenters that interest in bidding to move to the Low-VHF band would be increased if winning bidders could be assigned to as high a channel in that band as possible. These commenters assert that the technical characteristics of higher VHF channels are generally better than those of lower VHF channels. The Commission concluded that their suggestion has merit. Additionally, the fourth objective will seek to assign stations in the UHF band to a channel other than channel 14 in order to avoid coordination challenges with private land mobile radio systems (PLMRS). Because the Commission concludes that this objective should not be applied at the expense of the objectives, the fourth objective will be constrained by the second and third objectives and fully constrain the number of stations assigned to their pre-auction band to be at least as many as found after the third objective.

IX. Supplemental Final Regulatory Flexibility Act Analysis

276. As required by the Regulatory Flexibility Act of 1980, as amended (RFA), the Commission has prepared this Supplemental Final Regulatory Flexibility Analysis (SFRFA) of the possible significant economic impact on small entities by the procedures and policies contained in the *Auction 1000 Bidding Procedures Public Notice* and the SFRFA.

A. Need for, and Objectives of, Public Notice

277. The *Auction 1000* Bidding *Procedures Public Notice* determines procedures necessary to carry out the broadcast television spectrum incentive auction and resolves issues raised in the *Auction 1000 Comment PN* released December 17, 2014. In the *Auction 1000 Comment PN,* the Commission sought comment on the proposals for conducting the broadcast television incentive auction, including proposed procedures for the forward auction, the reverse auction, and integration of the reverse and forward auctions, that would implement rules previously proposed in the *Incentive Auction Notice of Proposed Rulemaking* (*Incentive Auction NPRM*), 77 FR 69933, November 21, 2012, and adopted in the *Incentive Auction R&O.* In part, the *Auction 1000 Bidding Procedures Public Notice* also resolves pending petitions for reconsideration of the *Mobile Spectrum Holdings R&O.*

278. Previously, as required by the RFA, the Commission prepared an Initial Regulatory Flexibility Analysis (IRFA) in connection with the *Incentive Auction NPRM* and a Final Regulatory Flexibility Analysis (FRFA) in connection with the *Incentive Auction R&O.* Likewise, the Commission's *Mobile Spectrum Holdings NPRM,* 77 FR 61330, October 9, 2012, included an Initial Regulatory Flexibility Analysis (MSH IRFA) and its *Mobile Spectrum Holdings R&O* included a Final Regulatory Flexibility Analysis (MSH FRFA).

279. Following the release of the *Auction 1000 Comment PN,* a *Supplemental Public Notice,* 80 FR 4816, Jan. 29, 2015, sought comment on how the proposals in the *Auction 1000 Comment PN* could affect either the IRFA or the FRFA. This SFRFA, addresses the effect, to the extent there is any, of the *Auction 1000 Bidding Procedures Public Notice* determinations have on the IRFA and FRFA.

280. As noted in the *Supplemental Public Notice,* the proposals in the *Auction 1000 Comment PN* did not change any of the matters described in the IRFA or FRFA. More specifically, the IRFA and FRFA set forth the need for and objective of the Commission's rules for the broadcast spectrum

incentive auction; the legal basis for those rules; a description and estimate of the number of small entities to which the rules apply; a description of the projected reporting, recordkeeping, and other compliance requirements with small entities and significant alternative considered; and a statement that there are no federal rules that may duplicate, overlap, or conflict with the rules. As further noted in the *Supplemental Public Notice,* the request for comment focused on how the proposals in the *Auction 1000 Comment PN* might affect ether the IRFA or the FRFA.

281. One comment responded specifically to the *Supplemental Public Notice,* filed by the Competitive Carriers Association (CCA). CCA does not assert that any of the matters already described in the IRFA or the FRFA need to be changed in light of the proposals in the *Auction 1000 Comment PN*. Accordingly, the descriptions provided in the IRFA and the FRFA are incorporated herein without change. To the extent there is any variance and it is necessary due to the use of the average price component of the final stage rule as part of the trigger for the spectrum reserve, the MSH IRFA and MSH FRFA likewise are incorporated herein without change.

282. CCA contends, however, that three of its proposals require a ''more fulsome factual, policy, and legal analysis [than was provided in the FRFA] for these proposals for the agency to meet its requirements under the Regulatory Flexibility Act.'' The three proposals to which CCA refers are ''(1) the price per MHz-pop benchmark for determining whether the final stage rule has been satisfied; (2) the upfront payment amounts for the [forward] auction; and (3) the minimum opening bid amounts for the [forward] auction.''

283. As a preliminary matter, the factual, policy and legal analyses supporting these proposals, as well as its related decisions, have been the subject of discussion in the *Incentive Auction NPRM* and the *Incentive Auction R&O*. These topics also have been discussed in the *Auction 1000 Comment PN*. Finally, after CCA filed its comment in response to the *Supplemental Public Notice,* the Commission also addressed the reasons for the final stage rule proposal and decision in the *Second Order* on *Reconsideration* and for all three subjects in the *Auction 1000 Bidding Procedures Public Notice*. More than once, these discussions have addressed comments by CCA, often making the same substantive points that CCA makes in response to the *Supplemental Public Notice*.

284. Nonetheless, in response to CCA's submission of its arguments in response to the *Supplemental Public Notice,* this SFRFA summarizes those reasons to assure that the Commission has accounted properly for any particular impact on small businesses of those decisions.

B. Summary of Significant Issues Raised by Public Comments in Response to the Supplemental Notice

285. *The Average Price Component of the Final Stage Rule*. CCA contends that the average price component of the final stage rule is ''unnecessary, contrary to the Commission's stated purpose of the spectrum reserve, and will negatively affect smaller auction participants.'' Reversing the order in which the two components are presented and discussed by the Commission, CCA refers to the component of the final stage rule that is based on license prices in the forward auction as the second component of the final stage. The Commission maintains consistency with its prior discussions and refers to this instead as the first component. CCA argues that this component is unnecessary because the cost component of the final stage rule is sufficient to assure that forward auction bidders will pay competitive prices, that it is contrary to the Commission's purpose because it creates a risk that the auction will not close, that it is contrary to the purpose of the spectrum reserve because it may result in a lower spectrum amount of reserve spectrum, and that it harms small businesses because they are unable to influence whether it is met.

286. *Bidding Units Based on Price Weighted Population To Determine Forward Auction Upfront Payment Amounts and Minimum Opening Bids*. Although CCA describes the Commission's proposal to use population of license areas weighted by past auction prices as ''an elegant means of accounting for the historical differences in prices between markets,'' CCA ''remains concerned, however, by certain outliers . . . resulting from the Commission's methodology.'' CCA asks for additional information regarding the creation of the price index, specifically ''how results from past auctions for spectrum licensed in Economic Areas and Cellular Market Areas were adapted for use with licenses to be offered based on PEAs.'' Finally, ''CCA objects to the Commission's proposal to incorporate the final results from Auction 97 into the price index for determining bidding units (and, therefore, upfront payments and minimum opening bids), because this exercise could prejudice smaller bidders.'' The Commission finds the arguments raised by CCA to be without merit.

C. Steps Taken To Minimize the Significant Economic Impact on Small Entities, and Significant Alternatives Considered

287. *The Average Price Component of the Final Stage Rule.* The Commission adopted the average price component of the final stage rule in order to assure that forward auction bidders pay competitive prices for licenses, in compliance with the Commission's statutory mandate to recover for the public a portion of the value of the public spectrum resource. The cost component of the final stage rule does not fulfill this mandate because the costs covered are not set in relation to the value of the public spectrum resource. Rather, the cost of paying existing licensees to relinquish spectrum usage rights based on existing broadcasting licenses to make spectrum available for new flexible use licenses, is determined by other factors, such as the value of the existing usage rights. Moreover, there is not a one-to-one relationship between the spectrum subject to the relinquished rights and the spectrum covered by new licenses, either on an individual license basis or collectively. Accordingly, despite CCA's contrary contention, the average price component serves a significant purpose not satisfied by the cost component. The effects of the average price component accordingly must be assessed against the public interest in achieving that purpose.

288. The average price component furthers the public interest in recovering a portion of the value of the public spectrum resource. The attendant risk that the average price component might preclude achieving a given spectrum clearing target is consistent with serving the public interest. All participants in the forward auction, regardless of size, bear that risk. Alternatives that would grant new licenses without recovering the value pursuant to the Commission's decision would be contrary to this purpose.

289. The link between the average price component of the final stage rule and the establishment of the spectrum reserve is similar. Satisfying the final stage rule before establishing the reserve ensures that reserve-eligible bidders pay significant prices for spectrum, that they are paying the same price as other bidders at the time that the final stage rule is met, and that the final stage rule is met before the spectrum reserve is implemented. Fundamentally, linking the reserve with satisfaction of the final

stage rule ensures that reserve-eligible bidders contribute ''*a fair share*'' of the final stage rule requirements, including ''a portion'' of the value of the spectrum for the public, given the average price component. Any alternative to using the final stage rule as a trigger for the reserve would conflict with these goals.

290. The Commission's use of the average price in the top 40 by population Partial Economic Areas (PEAs) is supported by the stated purpose of the procedure, specifically to facilitate a speedy auction by focusing on PEAs more likely to sooner reach their final prices. An alternative that would consider the average price in more areas would risk slowing down the auction and would require assessing an average price over areas for which past price data may not be as reliable as data in the top 40 PEAs. CCA contends that smaller bidders may be less likely to bid in the top 40 PEAs, and therefore less likely to directly influence whether the average price component is met. Presuming, for the sake of argument, that this is true, that also means that such bidders may win licenses despite lower average prices in other PEAs. Smaller bidders that may have relatively less influence over whether the average price component is met therefore benefit from the use of the top 40 PEAs to the extent it enables them to win licenses with lower average prices.

291. At clearing targets that license more than 70 megahertz in the 600 MHz, the gross bids of all licenses will be considered in determining whether the average price component is met, rather than the average price in the top 40 PEAs. In that case, bidders for areas other than the top 40 PEAs will influence whether the average price component is satisfied. Moreover, the effective average price of licenses in such circumstances will be lower than that set for the top 40 PEAs, thereby retaining the benefit of meeting lower average prices in areas outside the top 40 PEAs.

292. *Bidding Units Based on Price Weighted Population To Determine Forward Auction Upfront Payment Amounts and Minimum Opening Bids.* The Commission uses bidding units to determine forward auction upfront payment amounts and minimum opening bids for each PEA. More specifically, the upfront payments and the minimum opening bids are set on a dollar per bidding unit basis. The bidding units reflect the population of the respective PEA, weighted by a price index set based on data from prior spectrum license auctions. The procedure for determining the bidding units, *i.e.,* for weighting the relevant population based on price data from past auctions, is detailed in the *Auction 1000 Bidding Procedures Public Notice.*

293. The price index attempts to capture the information about relative demand and value reflected in those prices. Any change in the relative index for particular PEAs is the intended effect. Using price data from recently completed Auction 97 furthers the Commission's purpose of weighting population based on the demand from bidders for licenses in past auctions. There is no basis for an alternative that would be consistent with this purpose. ''Outliers'' in the data or differences in relative prices in different auctions, whether Auction 97 or any other auction, are reasons to incorporate the data, not reasons to selectively rejects some of it.

294. Using population weighted by a price index to set upfront payments and minimum opening bids establishes the relative amounts involved without determining the final amounts. CCA does not offer any support for its contention that the amounts set by the Commission's decision are too high. Furthermore, contrary to CCA's suggestion that upfront payments must be made without knowledge of the amount of spectrum to be offered in the forward auction, the Commission's decision provides that forward auction bidders will make upfront payments only after the determination of the initial clearing target.

D. Response to Comments by the Chief Counsel for Advocacy of the Small Business Administration

295. Pursuant to the Small Business Jobs Act of 2010, the Commission is required to respond to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration (SBA), and to provide a detailed statement of any change made to the proposed rules as a result of those comments. The Chief Counsel did not file any comments in response to the *Auction 1000 Comment PN* released December 17, 2014.

List of Subjects in 47 CFR Part 20

Commercial mobile services.

Federal Communications Commission.

Marlene H. Dortch,

Secretary.

Final Rules

For the reasons discussed in the preamble, the Federal Communications Commission amends 47 CFR part 20 as follows:

PART 20—COMMERCIAL MOBILE SERVICES

■ 1. The authority citation for part 20 continues to read as follows:

Authority: 47 U.S.C. 151, 152(a), 154(i), 157, 160, 201, 214, 222, 251(e), 301, 302, 303, 303(b), 303(r), 307, 307(a), 309, 309(j)(3), 316, 316(a), 332, 615, 615a, 615b, 615c.

■ 2. Section 20.22 is amended by removing paragraph (b)(4)(vii) and adding paragraph (b)(5) to read as follows:

§ 20.22 Rules governing mobile spectrum holdings.

* * * * *

(b) * * *

(5) The following interests shall be attributable to holders, except to lessees and sublessees for the purpose of qualifying to bid on reserved licenses offered in the Incentive Auction, discussed in paragraph (c) of this section, on the basis of status as a non-nationwide provider:

(i) Long-term *de facto* transfer leasing arrangements as defined in § 1.9003 of this chapter and long-term spectrum manager leasing arrangements as identified in § 1.9020(e)(1)(ii) that enable commercial use shall be attributable to lessees, lessors, sublessees, and sublessors for purposes of this section.

(ii) [Reserved]

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