



# PUBLIC NOTICE

Federal Communications Commission  
445 12<sup>th</sup> St., S.W.  
Washington, D.C. 20554

News Media Information 202 / 418-0500  
Internet: <https://www.fcc.gov>  
TTY: 1-888-835-5322

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## INCENTIVE AUCTION TASK FORCE AND MEDIA BUREAU SEEK COMMENT ON POST- INCENTIVE AUCTION TRANSITION SCHEDULING PLAN

MB Docket No. 16-306  
GN Docket No. 12-268

Comment Date: October 31, 2016  
Reply Comment Date: November 15, 2016

### I. INTRODUCTION

1. The Federal Communications Commission (Commission or FCC) delegated authority to the Media Bureau (the Bureau) to establish construction deadlines within the 39-month post-auction transition period for television stations that are assigned to new channels in the incentive auction repacking process.<sup>1</sup> Pursuant to the Commission's direction, the Bureau, in consultation with the Incentive Auction Task Force (IATF), the Wireless Telecommunications Bureau (WTB), and the Office of Engineering and Technology (OET), is developing a plan for a "phased" transition schedule.<sup>2</sup> This Public Notice invites comment on the proposed plan, which is detailed in Appendix A.<sup>3</sup> As discussed in section III.5 below, in preparing their submissions commenters should be mindful of the Commission's prohibited communications rule, which prohibits broadcasters and forward auction applicants from communicating any incentive auction applicant's bids or bidding strategies to other parties covered by the relevant rules.

### II. BACKGROUND

2. In order to balance "the need for a post-incentive auction transition timetable that is flexible for broadcasters and that minimizes disruption to viewers"<sup>4</sup> with the need for a schedule that "provide[s] certainty to wireless providers and [is] completed as expeditiously as possible"<sup>5</sup> the Commission established a 39-month period for reassigned stations to transition to their post-auction

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<sup>1</sup> 47 C.F.R. § 73.3700(b)(1)(vi); *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, GN Docket No. 12-268, Report and Order, 29 FCC Rcd 6567, 6797, para. 563 (2014) (*IA R&O*), *affirmed*, *National Association of Broadcasters v. FCC*, 789 F.3d 165 (D.C. Cir. 2015) (*NAB v. FCC*). All comments, reply comments, letters, and *ex parte* submissions referenced in citations below can be found in GN Docket No. 12-268.

<sup>2</sup> *IA R&O*, 29 FCC Rcd 6567, para. 563.

<sup>3</sup> Additionally, the Bureau plans to hold a webinar about the proposed post-auction transition scheduling plan on October 13, 2016. More information about that webinar will be forthcoming.

<sup>4</sup> *Id.* at 6796 para. 559.

<sup>5</sup> *Id.*

channel assignments.<sup>6</sup> In delegating authority to the Bureau to establish construction deadlines within the transition period, the FCC directed the Bureau to tailor the deadlines to stations' individual circumstances.<sup>7</sup> The Commission determined that a phased construction schedule would facilitate efficient use of the resources necessary to complete the transition.<sup>8</sup> It also recognized that a phased transition schedule was likely to produce deadlines that "vary by region, by the complexity of construction tasks, or by other factors the Bureau finds appropriate."<sup>9</sup> The FCC also directed the Bureau to account for "the needs of forward auction winners and their construction plans."<sup>10</sup>

3. Interested parties have submitted numerous *ex parte* filings regarding the post-auction transition. T-Mobile, AT&T, and NAB all support conducting the transition on a regional basis and in a manner that is both orderly and flexible enough to account for unforeseen circumstances.<sup>11</sup> Interested parties have also identified key issues to consider in developing a transition plan, including: the availability of human capital such as tower crews<sup>12</sup> and RF and structural engineers;<sup>13</sup> manufacturing

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<sup>6</sup> *Id.*

<sup>7</sup> *See id.* at 6580, para. 34 ("Stations will be assigned deadlines within that period tailored to their individual circumstances"); *id.* at 6800, para. 569 ("We recognize that some stations will face significant challenges in completing the post-auction transition to their new facilities. The Media Bureau will take such challenges into account when assigning individual construction deadlines.").

<sup>8</sup> *See id.* at 6801, para. 571 ("We recognize that resources needed for the transition process are limited. By structuring a phased transition, our goal is to mitigate the impact of these limitations by eliminating the need for all stations to obtain their equipment or schedule a tower crew at the same time."); *id.* at 6567, para. 563 (concluding that a phased construction schedule is most likely to ensure a successful transition for all broadcasters).

<sup>9</sup> *Id.* at 6797, para. 563; *see id.* at 6798-99, para. 566 ("We conclude that the flexibility to evaluate and address all of the relevant variables through a phased construction schedule based on the actual outcome of the auction will be critical to the success of the transition.").

<sup>10</sup> *Id.* at 6798, para. 565.

<sup>11</sup> *See, e.g.,* Letter from T-Mobile USA, Inc., *Broadcaster Repacking Proposal* (filed Mar. 3, 2016)(T-Mobile Proposal) (proposing a regional repacking approach that balances the needs of urban and rural areas evenly); Letter from Competitive Carriers Association (filed May 5, 2016) (supporting a regional repacking approach like the one proposed by T-Mobile); Letter from AT&T Services, Inc. (filed Mar. 14, 2016) ("A regionally prioritized plan, coupled with strong project management, is essential to managing key dependencies and to controlling constraints and challenges."); Letter from AT&T Services, Inc., Attach., *Broadcaster Relocation Planning* (filed Aug. 5, 2016)(proposing a regionalized approach focusing on large urban PEAs connected with rural areas and addresses complications along international borders); Letter from National Association of Broadcasters (filed Mar. 21, 2016)(supporting a regional approach that prioritizes the most populated areas first and is both orderly and flexible).

<sup>12</sup> *See, e.g.,* Belo IA NPRM Comments at 6-7 (filed Jan. 25, 2013) ("[T]he number of crews with the right kind of experience to work with heavy steel equipment on very high towers may now be five or fewer."); *Media Bureau Seeks Comment on Widelity Report and Catalog Costs of Potential Expenses and Estimated Costs*, GN Docket No.12-268, Public Notice, 29 FCC Rcd 2989, 3011-12 (MB 2014) (*Widelity Report*) (estimating no more than 14 qualified tower crews to work on complex sites and 30 to 40 other crews that can handle simpler jobs. It may be possible to supplement with crews from Canada and members of international tower crews); Letter from Digital Tech Consulting, Attach., *Response to T-Mobile and CCA Reports on the Broadcast Spectrum Repacking Timeline, Resource and Cost Study*, 17-21 (filed Mar. 17, 2016) (DTC Responsive Study) (estimating 21 qualified tower crews for complex sites and four additional regional crews for simpler projects); Letter from T-Mobile USA, Inc., Attach., *On Time and On Budget: A Response to Digital Tech Consulting, Inc.'s March 2016 Presentation on the State of Broadcaster Relocation Resources*, 36 (filed May 11, 2016) (T-Mobile Responsive Study)(identifying 51 qualified tower crews).

<sup>13</sup> *See, e.g.,* Letter from T-Mobile USA, Inc., Attach., *On Time and On Budget: Completing the 600 MHz Incentive Auction Repacking Process within the FCC's 39-Month Relocation Deadline and the Budget Established by Congress*, 35 (Feb. 17, 2016) (T-Mobile Study) (estimating the availability of 19 structural engineering firms); T-Mobile Responsive Study at 45 and 47 (identifying 51 qualified RF consulting engineering firms and additional

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capacity, especially the ability of antenna manufacturers to meet industry demand;<sup>14</sup> the potential impact of external factors, such as local permitting/zoning<sup>15</sup> and weather;<sup>16</sup> and the degree to which towers will need to be modified in order to comply with new safety standards.<sup>17</sup> The record developed to date also

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structural engineering firms); Letter from Digital Tech Consulting, Attach., *Broadcast Spectrum Repacking Timeline, Resource and Cost Analysis Study*, 21-22 (filed Nov. 6, 2015) (DTC Study) (estimating the availability of 7 structural engineering firms); DTC Responsive Study at 22 (estimating the availability of 39 qualified RF consulting engineers); *Widely Report*, 29 FCC Rcd at 3014 (estimating the availability of approximately 35 qualified RF consultants).

<sup>14</sup> See, e.g., Anonymous Broadcast Licensees Widely Report Comments at 2 (filed Apr. 21, 2014) (“Once demand floods the market, there will not be seasoned, well-known quality manufacturers to produce and lead times will be long.”); GatesAir Widely Report Comments at 6 (filed Apr. 21, 2014) (“Manufacturers, including GatesAir, lack both the existing capacity and the ability to ramp up production capacity at a pace necessary to conform to the schedules described in the Widely Report.”); Association of Public Television/Corporation for Public Broadcasting NPRM Comments at 25 (filed Jan. 25, 2013) (“following the conclusion of the digital transition, manufacturers have not had reason to maintain the same level of capacity that existed in 2009....”); DTC Study at 24-25 (“There are primarily two antenna manufacturers that have the product designs, experience and the confidence of U.S. broadcasters that utilize their products.”). Cf. DTC Study at 26-28 (anticipating that transmitter production or other RF components will not be time limiting or constrained by manufacturing capacity); T-Mobile Study at 20-21 (contending that DTC understated manufacturing capacity for antennas); T-Mobile Responsive Study, 28-30 (discussing the sufficiency of current antenna manufacturing capacity); *Widely Report*, 29 FCC Rcd at 3017 (“We do not anticipate that there will be problems acquiring new transmitters if the process of ordering equipment is orderly and broadcast stations order equipment as early as possible.”); *id.* at 3024 (“If the process of ordering equipment and materials is orderly, manufacturers can effectively schedule production, delivery, and installation of antennas.”).

<sup>15</sup> See, e.g., R. Mertz IA NPRM Comments at 4 (filed Jan 25, 2013) (“additional time will be needed, and particularly for complications such as zoning issues. . . .”); Transmit Widely Comments at 5 (filed Apr. 20, 2014) (“working in areas that trigger environmental and/or historical or tribal consultations will cause delays . . .”); Vermont Broadcasters IA NPRM Reply at 6 (filed Mar. 12, 2013) (discussing permitting issues related to modifications to any towers located on Mt. Mansfield). Cf. T-Mobile Responsive Study at 13-15 (arguing that variations in time to acquire local building permits and approve any necessary zoning modifications “is neither unexpected nor unpredictable: the areas and sites most likely to encounter procedural hurdles are widely known....”). See also *id.* at 13-14 (citing *Acceleration of Broadband Deployment by Improving Wireless Facilities Siting Policies*, WT Docket No. 13-238, Report and Order, 29 FCC Rcd 12865, 12930, para. 153 (2014) (noting that the 2014 *Broadband Infrastructure Order* adopted rules limiting the ability of state and local jurisdictions to delay zoning requests for communications facilities and that the Commission included “broadcast service equipment” in the scope of transmission equipment covered by the provision in order to further “the success of the post-incentive auction transition of television broadcast stations to their new channels.”)).

<sup>16</sup> See, e.g., Belo IA NPRM Comments at 6 (filed Jan 25, 2013) (“weather conditions often present obstacles and construction seasons may, in any event, be short.”); NYSBA NPRM IA Comments at 19 (filed Jan. 25, 2013) (“Tower work cannot be done during the winter months (November through April) in all of the upstate markets and to some extent even in NYC.”); DTC Study at 3, 31-32, and 36 (“from November through March, sites in the upper half of the U.S. will be unlikely candidates for antenna change-out projects.”); Transmit Widely Report Comments at 5 (filed Apr. 20, 2014) (“many transmission sites can only be worked on for narrow periods of the year for . . . weather reasons”). Cf. T-Mobile Study at 42 (contending that parties have “overstated the impact of weather on the ability to perform the necessary work... BTTi has repeatedly been involved in antenna change-out projects on tall towers in northern states during the winter months and, in its experience, installations under these types of conditions are not at all uncommon.”); Letter from T-Mobile USA, Inc., 2 and 12 (filed Apr. 12, 2016) (“While weather plays a role in planning, the tower-climbing experts said that they are able to safely climb towers and complete antenna installations in nearly any weather aside from excessive wind conditions or temporary storms. High heat and intense cold will not ordinarily stop an antenna-installation project.”).

<sup>17</sup> Since 2007, tower safety standards have been upgraded, and the new standard, known as Rev. G, has been adopted by most local governmental bodies. The new standard reflects new requirements for wind loading, icing, safety facilities, foundations and seismic considerations. Any proposed modifications to the tower and antennas

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reflects that service and equipment providers are starting to plan for the transition and to take steps to meet increased demand.<sup>18</sup>

### III. DISCUSSION

4. Based on the record to date and on staff analysis and computer modeling, the Bureau is developing a plan to create a phased transition schedule for broadcasters that are reassigned to a new channel in the repacking. Under this phased approach, stations will be assigned to one of 10 “transition phases” with sequential testing periods and deadlines, or “phase completion dates.” The phase completion date will be the date listed in each station’s construction permit as its construction deadline and will be the last day that a station may operate on its pre-auction channel.<sup>19</sup> We believe this approach will smooth the way for station coordination, promote efficient allocation of limited resources, limit the impact of the transition on consumers, and facilitate FCC monitoring to determine whether schedule adjustments are necessary during the course of the transition process. The proposed approach is also designed to provide information to stations, vendors, and other industry participants in a way that will allow them to plan for and respect the obligations and resource requirements of stations that are assigned to earlier phases. This approach will take into account our international obligations and the agreement to undertake in a joint repacking with Canada.

5. In the sections that follow, we begin by summarizing the steps involved in creating the proposed transition scheduling plan.<sup>20</sup> We then briefly discuss the two computer-based tools that the Bureau proposes to utilize—the “Phase Assignment Tool” and the “Phase Scheduling Tool.” These Tools, and the modeling the staff has conducted in developing the proposed plan, are explained in greater detail in Appendix A.<sup>21</sup> We seek comment on the methodology described in Appendix A for establishing

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may require that the process include either certification or an upgrade to the Rev. G standard. *See, e.g.*, DTC Study at 4 (estimating that the “vast majority” of broadcast towers are not Rev. G compliant and there will be “a significant number of towers that will require modifications to meet code.”); Sinclair Widelity Report Comments at 3 (filed Apr. 21, 2014); NAB Widelity Report Comments at 13 (Apr. 21, 2014). *Cf.* T-Mobile Study at 29-30 (“[b]ased on our analysis of the 1,663 tower structures listed in the FCC Form 2100, Schedule 381 database, we found that approximately 37.3 percent of tower structures already meet the Rev. G standard...[A]n additional 42.7 percent of structures satisfy the TIA Rev. F standard; the structures that satisfy TIA Rev. F generally will require fewer updates than older structures adhering to previously applicable standards.”).

<sup>18</sup> *See, e.g.*, Letter from Gates Air, 2 (filed May 3, 2016) (“GatesAir has been working with clients to perform comprehensive site surveys, which will allow broadcasters...to timely order equipment and begin the transition process as soon as the FCC issues the [*Closing and Reassignment PN*].”); Letter from International Towers, Inc., 2 (filed May 18, 2016) (currently has 5 tall tower crews and planning to add 15 additional tower crews capable of supporting transition activities in 2017); T-Mobile Study at 36 (Additional structural engineering firms that specialize in cellular towers could conduct initial structural analyses of broadcast towers); T-Mobile Responsive Study at 29-30 and 41-42 (arguing that supply of antenna manufacturers and tower crews is either already growing and will grow as the transition draws closer); T-Mobile April 2016 Ex Parte at 2 (representatives for RIO Steel & Tower and Grundy Telecom Integration have expressed their plans to hire additional “experienced climbers”). *See also IA R&O*, 29 FCC Rcd at 6801, para. 571 (“[W]e expect that the equipment manufacturing and tower installation industries will respond to the greatly increased demand resulting from the post-auction transition and will take advantage of this unique opportunity to provide equipment and construction services.”).

<sup>19</sup> A station “must cease operating on [its] pre-auction channel once [that] station begins operating on its post-auction channel or by the deadline specified in its construction permit for its post-auction channel, whichever occurs earlier.” 47 C.F.R. § 73.3700(b)(4)(iii); *see also IA R&O*, 29 FCC Rcd at 6797, para. 564. We interpret “begin operating” to mean when the station begins providing a broadcast television service to the public on its post-auction channel, not simply testing equipment on that channel.

<sup>20</sup> In a subsequent Public Notice that will be released prior to conclusion of the incentive auction, the Bureau will provide timelines and additional details about the post-auction transition process.

<sup>21</sup> Appendix A will allow interested parties to comment on the Bureau’s proposed plan and should they desire to do so replicate the methodology used by the staff. *See* Appx. A at para. 5.

a transition schedule, as well as the alternative constraints we present therein. Based on the development of the record and staff analysis, the Bureau will adopt a post-auction transition scheduling plan that will be used to create a phased transition and assign stations individual construction permit deadlines.

#### **A. Post-Auction Transition Scheduling Process**

6. The initial steps of the post-auction transition scheduling process will occur before the incentive auction closes. Once the final stage rule has been satisfied, no additional stages of the auction will be required.<sup>22</sup> Therefore, while the forward auction bidders continue bidding in the forward auction clock phase and complete the forward auction assignment phase, the Bureau will already have the information it needs to begin to finalize details about the post-auction transition for broadcasters.

7. As soon as the final stage rule is satisfied, the final television channel assignment plan will be determined.<sup>23</sup> The Bureau will use the final channel assignments to establish a phased transition schedule for relocated stations and stations that voluntarily moved to a different band as part of the auction. We propose that the schedule be established using the methodology described in this Public Notice and Appendix A. We anticipate that the Bureau will be able to determine the final channel assignment plan and the phase assignments prior to the conclusion of the forward auction.<sup>24</sup> Therefore, because we recognize the importance of providing broadcasters with as much time as possible to prepare for the transition, we intend to send each eligible station that will remain on the air after the auction a confidential letter identifying the station's post-auction channel assignment, technical parameters, and assigned transition phase.<sup>25</sup> We believe that providing this information on a confidential basis to stations prior to the auction's close will give broadcasters additional time for post-auction transition planning and will enable stations to be ready when the filing window opens for stations to file for their construction permits.<sup>26</sup>

8. Once the forward auction concludes, we will release the *Auction Closing and Channel Reassignment PN (Closing and Reassignment PN)*, which will announce that the reverse and forward auctions have ended and specify the effective date of the post-auction repacking.<sup>27</sup> Among other things, the *Closing and Reassignment PN* will announce the post-auction channel assignment and technical parameters of every station eligible for protection in the repacking process that will remain on the air after the incentive auction. The *Closing and Reassignment PN* will also announce the transition phase, phase

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<sup>22</sup> See *Broadcast Incentive Auction Scheduled to Begin March 29, 2016; Procedures for Competitive Bidding in Auction 1000, Including Initial Clearing Target Determination, Qualifying to Bid, and Bidding in Auctions 1001 (Reverse) and 1002 (Forward)*, GN Docket No. 12-268, Public Notice, 30 FCC Rcd 8975, 9100, para. 271 (2015) (*Auction 1000 Bidding Procedures PN*) (“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....”).

<sup>23</sup> See *Auction 1000 Bidding Procedures PN*, 30 FCC Rcd at 9100, para. 272 (“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.”).

<sup>24</sup> During this period, the Commission and Innovation, Science and Economic Development Canada (ISED) will work together on the joint reassignment and transition of stations.

<sup>25</sup> If a station is not reassigned to a new post-auction channel, its confidential letter will list the station's pre-auction channel and technical parameters.

<sup>26</sup> We anticipate releasing a public notice announcing the issuance of the confidential letters at the time they are sent. While the information provided in the confidential letter will be subject to change in the *Closing and Reassignment PN*, we do not anticipate significant changes.

<sup>27</sup> *IA R&O*, 29 FCC Rcd at 6782-83, para. 525. As stated in the *IA R&O* we may release the auction closing public notice and the *Channel Reassignment PN* simultaneously. Our intention is to combine those into one public notice as described above. See *id.* at 6784, para. 529.



completion date, and testing period for each reassigned station.<sup>28</sup> Stations reassigned to new channels will have three months from the *Closing and Reassignment PN* release date to file construction permit applications proposing modified facilities to operate on their post-auction channel facility specified in the *Closing and Reassignment PN*.<sup>29</sup> The Bureau will then issue each station a construction permit. The construction permit deadline will be the phase completion date for that station.<sup>30</sup>

9. As illustrated below, the transition phases will all begin at the same time but will have sequential phase completion dates. Each phase will have a defined “testing period” that ends on the phase completion date. While stations may engage in planning and construction activities at any time prior to their phase completion date, equipment testing on post-auction channels will be confined to the specified testing periods in order to minimize interference and facilitate coordination. Other than for the first phase, the testing period will begin on the day after the phase completion date for the prior phase.<sup>31</sup>

10. Whether a station needs to coordinate with other stations during the testing period will depend on whether it is part of a “linked-station set,” that is, a set of two or more stations assigned to the same phase with interference relationships or “dependencies.”<sup>32</sup> Stations that are not part of a linked-station set may operate on their pre-auction channels and test on their post-auction channels during the testing period without the need for coordination. Conversely, stations that are part of a linked-station set must coordinate testing with other stations in the set so as to avoid undue interference and must transition to their post-auction channels simultaneously. In order to facilitate coordination, linked-station sets will be identified in the *Closing and Reassignment PN*. The graph below illustrates a hypothetical phased transition schedule under the Bureau’s proposed approach.<sup>33</sup>

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<sup>28</sup> The concept of a station “testing period” is discussed in greater detail below. *See infra* paras. 9-10.

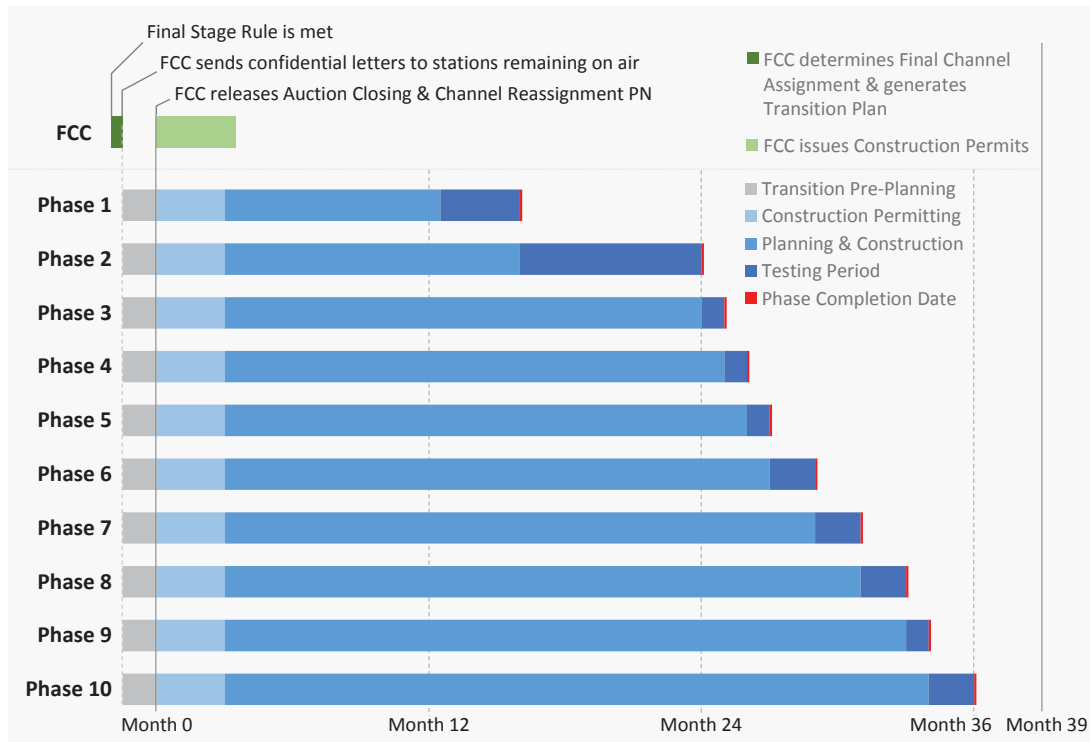
<sup>29</sup> *IA R&O*, 29 FCC Rcd at 6796, para. 559; 47 C.F.R. § 73.3700(b)(1)(i). Stations that determine that they are unable to construct facilities that meet the technical parameters specified in the *Closing and Reassignment PN*, or the contour coverage variance permitted by 47 C.F.R. § 73.7300(b)(1)(ii),(iii), as well as stations otherwise unable to meet the three month construction permit filing deadline, may seek waiver of the filing deadline. *See* 47 C.F.R. § 73.7300(b)(1)(iv)(A); *IA Order*, 29 FCC Rcd at 6791, n. 1571; 47 C.F.R. § 73.7300(b)(1)(ii); *IA Order*, 29 FCC Rcd at 6794, para. 554.

<sup>30</sup> *See supra* para. 4 and n.19. Stations will be required to abide by the deadlines and requirements of the transition scheduling plan. A station that does not comply with the requirements of the plan may be subject to sanction or other action, as permitted under the Commission’s rules. *See, e.g.*, 47 C.F.R. § 1.80; 47 C.F.R. § 73.3598(e).

<sup>31</sup> The proposed plan is premised on the likelihood that winning go off-air bidders have ceased operations on their pre-auction channels prior to the first transition phase testing period, either because they have relinquished their license and gone off air, or because they have implemented a channel sharing arrangement and are now operating on the shared channel.

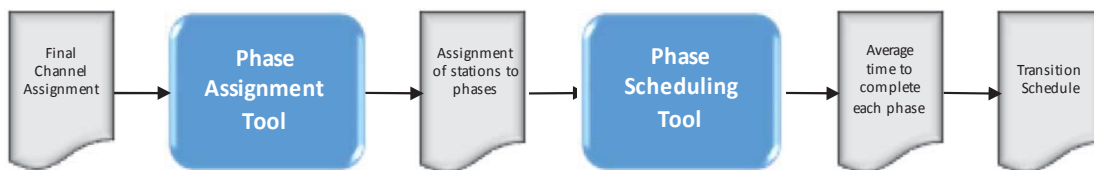
<sup>32</sup> Section II of Appendix A describes dependencies in detail. *See* Appx. A at paras. 6-18.

<sup>33</sup> Section IV.E of Appendix A provides sample results applying the Phase Assignment Tool and Phase Scheduling Tool to 114 MHz and 84 MHz clearing scenarios. *See id.* at para. 51.



**B. Phase Assignment and Scheduling Tools**

11. The Bureau proposes to use two computer-based tools to establish a phased transition schedule. Consistent with the Commission’s direction, we believe that these two tools will allow the Bureau to establish a transition schedule that takes into account the complexity of stations’ individual circumstances, allocates resources fairly, and balances forward auction winners’ needs with those of transitioning broadcasters. The first tool is the Phase Assignment Tool, which will assign television stations to transition phases.<sup>34</sup> The Phase Assignment Tool is intended to group stations together in a way that will support an orderly, managed transition process based on a set of enumerated constraints and objectives. The second tool is the Phase Scheduling Tool, which will estimate the time required for stations in each phase to complete the tasks required to transition in light of resource availability.<sup>35</sup> The Bureau will use the Phase Scheduling Tool to guide it in establishing phase completion dates for each phase. The figure below illustrates the proposed process.



<sup>34</sup> Section III of Appendix A describes the Phase Assignment Tool in detail. *See id.* at paras. 19-22.

<sup>35</sup> Section V of Appendix A describes the Phase Scheduling Tool in detail. *See id.* at paras. 31-50.

## 1. Phase Assignment Tool

12. The Commission is using optimization techniques<sup>36</sup> to determine spectrum clearing targets in the incentive auction and it will also use optimization techniques to determine the final television channel assignment plan.<sup>37</sup> The technical interference issues presented by these determinations are similar to those presented by the post-auction transition process.<sup>38</sup> Accordingly, we propose to use mathematical optimization techniques in the Phase Assignment Tool to assign stations to transition phases based on a defined set of constraints and objectives.

13. Solutions produced by the optimization techniques—i.e., assignments of stations to transition phases—must satisfy all defined constraints. Of the solutions that satisfy each of the constraints, the Tool will select the solution that best meets the defined objectives. When there are multiple defined objectives, we assign a priority for each objective and implement them in order of priority. Each subsequent objective is required to satisfy the previous one. Thus, the higher the objective's priority, the greater its impact on the solution. We propose specific constraints and objectives, including the priority of the objectives, in Appendix A.<sup>39</sup> We believe that the constraints and objectives proposed will result in a solution that minimizes dependencies created by interference issues, ensures that the 600 MHz Band is cleared as expeditiously as possible, clusters groups of stations into the same phase to help manage scarce transition resources, and minimizes the impact of the transition on consumers.

## 2. Phase Scheduling Tool

14. After stations are assigned to phases, the Bureau proposes to use the Phase Scheduling Tool to help determine the phase completion date for each phase. By modeling the tasks required to complete the transition, and accounting for limited resources, this Tool estimates the total time necessary for stations within a phase to complete the transition process.

15. The Phase Scheduling Tool accounts for limited resources by constraining the amount of such resources available to stations within a phase at any given time. If a required resource is unavailable, the stations will obtain access to the required resource according to their "simulation order," and the Tool will estimate the time required for all stations to complete the transition phase based on that order.<sup>40</sup> The Bureau proposes to run the Phase Scheduling Tool with different simulation orders to produce a range of estimated times for each transition phase.<sup>41</sup> The Bureau will use the resulting range of estimated times to guide its determination of a phase completion date for each transition phase.

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<sup>36</sup> Optimization techniques allow identification of a solution, from among possible solutions, that meets defined rules or constraints, and that best meets a defined set of objectives.

<sup>37</sup> See *Auction 1000 Bidding Procedures PN*, 30 FCC Rcd at 8984-85, para. 14 and 9100, para. 271.

<sup>38</sup> For instance, among other technical constraints, the clearing target determination and final channel assignment plan selection procedures require application of the technical repacking constraints to take into account any fixed constraints specific to an area or a channel that would prevent an assignment of a station to a channel. The procedures also use prioritized objectives to determine a solution that not only respects such constraints, but takes account of the Commission's other goals. See *id.* at 8984-86, paras. 14-16 and 9100-05, paras. 271-81.

<sup>39</sup> See Appx. A at para. 20.

<sup>40</sup> See *id.* at paras. 31-36. The Phase Scheduling Tool divides the various processes involved in a station transitioning to its post-auction channel into two sequential stages: the "Pre-Construction Stage" and the "Construction Stage." See *id.* at paras. 38-39. The Tool assumes that a station assigned to an earlier transition phase will begin its Pre-Construction Stage processes involving a constrained resource (*e.g.*, ordering an antenna or tower crew) before a station assigned to a later phase.

<sup>41</sup> By generating results for multiple simulation orders, the Tool produces a range of estimated completion times for each phase. See *id.* at para. 35.



16. Appendix A details the specific tasks or processes that we propose to model in the Phase Scheduling Tool for each stage of the transition process, as well as the estimated time and resource availability for each task.<sup>42</sup> The proposed estimates are based on information from the Widely Report, submissions from stakeholders, and informational discussions with tower crew companies, antenna and transmitter manufacturers, and broadcasters.<sup>43</sup> We believe that the proposed estimates are conservative and reasonable.

### C. Other Issues

#### 1. Temporarily Increased Pairwise (Station-to-Station) Interference

17. Before transitioning to their post-auction channels, stations ideally should be able to test equipment on their new channels. During the transition, however, many stations would likely cause undue interference to one another if they test or operate on their post-auction channels without first coordinating with large numbers of other stations to avoid causing such interference. Appendix A sets forth in detail the results of the staff's analysis and modeling of transition-related interference relationships between stations.<sup>44</sup>

18. The Commission has in the past allowed temporary increases in interference to broadcasters in order to facilitate transitions to new services. For example, the Commission permitted new wireless licensees in the 700 MHz Band to cause temporary increases of up to 1.5 percent interference to broadcasters.<sup>45</sup> In doing so, the Commission balanced “the public interest benefits of an accelerated deployment in the 700 MHz Band against the importance of sustaining a minimally disruptive transition to DTV for consumers”<sup>46</sup> and emphasized that it has a “forward-looking preference toward those services that are the end-points” of the transition.<sup>47</sup> In addition, the Commission permitted three-way band clearing agreements that could result in up to two percent temporary interference to the population served of stations that were not parties to the agreement.<sup>48</sup> The Commission rejected broadcasters' arguments that the two percent standard was inappropriate because the interference

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<sup>42</sup> See *id.* at paras. 40-51.

<sup>43</sup> See *supra* para. 3 and accompanying footnotes.

<sup>44</sup> See Appx. A at paras. 6-18.

<sup>45</sup> See *Qualcomm Incorporated Petition for Declaratory Ruling*, WT Docket No. 05-7, Order, 21 FCC Rcd 11683 (2006)(*Qualcomm Order*). The Commission adopted certain restrictions on new wireless licensees in the lower 700 MHz band to prevent them from interfering with incumbent broadcasters that continued to operate on those frequencies. See 47 C.F.R. § 27.60. Alternatively, the rules provided that the new wireless licensees could demonstrate through an engineering study that broadcasters would be protected. In response to a petition filed by Qualcomm asking the Commission to declare that two percent would be an appropriate interference standard, the Commission adopted an incremental approach whereby the percentage of permissible interference increased each year: year one: 0.5 percent; year two: 1 percent; beyond year two until end of DTV transition: 1.5 percent. *Qualcomm Order*, 21 FCC Rcd at 11698, para. 30.

<sup>46</sup> *Id.* at 11697, para. 31.

<sup>47</sup> *Id.*

<sup>48</sup> *Service Rules for the 746-764 and 776-794 MHz Bands*, WT Docket No. 99-168, CS Docket No. 98-120, MM Docket No. 00-39, Third Report and Order, 16 FCC Rcd 2703 (2001) (*Upper 700 MHz Band 3<sup>rd</sup> R&O*), on reconsideration, 16 FCC Rcd 21633 (2001) (*Upper 700 MHz Band Recon Order*). With a three-way band clearing agreement, a broadcaster with two “in-core” (channels 2-59) allotments (analog and digital) would give up one to enable a broadcaster with “out-of-core” operations (channels 60-69) to move in-core, thereby freeing out-of-core spectrum for the new wireless licensees. Three-way agreements presented the potential for interference between broadcast stations. Unless the station moving from an out-of-core channel to an in-core channel adopted the exact same technical parameters as the existing in-core station, there was a potential for new interference to existing stations and allotments that were not a party to the agreement. The Commission determined that stations that were not parties to the agreement could receive up to two percent interference.

permitted would be for the benefit of new wireless licensees and not broadcasters' efforts to transition to DTV,<sup>49</sup> explaining that clearing the 700 MHz band was an integral part of the DTV transition.<sup>50</sup>

19. The staff's analysis indicates that allowing temporary pairwise interference increases above the 0.5 percent authorized by the rules governing permanent interference<sup>51</sup> is likely to significantly reduce inter-dependencies between stations, thereby reducing the amount of coordination needed to allow testing of a station's post-auction facility.<sup>52</sup> We propose during the transition to allow temporary pairwise interference increases of up to two percent, which we believe will produce substantial benefits without undue disruption to television service during this limited period.<sup>53</sup> Pairwise interference increases beyond the 0.5 percent permitted by the Commission's rules will not be permitted past conclusion of the post-auction transition period.

## 2. Temporary Channel Assignments

20. Another means of reducing the size or number of linked-station sets, and facilitating a station's ability to operate on its pre-auction channel while testing on its post-auction channel, would be to assign some stations to temporary channels during the transition. A station assigned to a temporary channel would have to transition twice: once to its temporary channel and then to its post-auction channel during a later transition phase. We do not propose to assign temporary channels as part of the phased transition scheduling plan.<sup>54</sup> We tentatively conclude that the benefits of using temporary channels are not great enough to warrant their use in light of the potential burdens. For example, using temporary channels would require stations to move twice, which may confuse viewers. Stations would also need to acquire additional equipment, which would place additional demands on resources and increase overall transition costs. Nevertheless, we invite comment on using temporary channel assignments and on issues that would be raised if we were to do so. Whether we ultimately decide to use temporary channels as part of the phased transition scheduling plan depends on how the record develops and whether we adopt other, effective means of reducing the number and size of linked-station sets.

21. Should we decide to use temporary channel assignments, we tentatively conclude that temporary channels may be assigned to full power or Class A stations and may be located anywhere in the post-auction VHF or UHF television bands, as well as in the new 600 MHz wireless band.<sup>55</sup> Temporary channel assignments would replicate pre-auction coverage area and population served and would be listed in the *Closing and Reassignment* PN along with ultimate post-auction channel assignments. We propose

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<sup>49</sup> During the DTV transition, the Commission permitted DTV stations to cause up to two percent interference to the population served of other stations without the impacted stations' consent, provided no new interference could be caused to any station that would experience interference to 10 percent or more of its population. 47 C.F.R. § 73.623(c)(2). We note that, unlike the interference involved in the two precedents discussed above, the two percent interference standard applied during the DTV transition was not "temporary"—although the standard later was reduced to 0.5 percent, the increased interference allowed under the higher standard remained after the transition.

<sup>50</sup> See *Upper 700 MHz Band Recon Order*, 16 FCC Rcd at 21641-42, paras. 14-15; *Upper 700 MHz Band 3<sup>rd</sup> R&O*, 16 FCC Rcd at 2713, para. 22.

<sup>51</sup> See 47 C.F.R. § 73.616(e); see also *IA R&O*, 29 FCC Rcd at 6649-50, para. 179 (limiting pairwise interference increases to no more than 0.5 percent of a station's population served on its post-auction channel with no cap on the aggregate interference a station may receive).

<sup>52</sup> See Appx. A at paras. 16, 27-28. During the post-auction transition the percentage of increased pairwise interference is relative to a station's pre-auction baseline interference-free population.

<sup>53</sup> Temporary pairwise interference increases of up to 2 percent could occur at any time during the transition on either a station's pre-auction and post-auction channels. It could affect both reassigned stations and those that will remain on their pre-auction channels.

<sup>54</sup> See Appx. A at para. 20 and 26.

<sup>55</sup> A station would only be assigned a temporary channel within its post-auction band. *Id.* at 20.

to limit such assignments to stations in complex “cycles” of inter-dependency, which are discussed in detail in Appendix A.<sup>56</sup> We also propose to limit such assignments to channels that are close to a station’s ultimate channel assignments, and to relatively low power stations (*e.g.*, Class A stations or other stations similar in power), in order to limit the associated burdens and costs.<sup>57</sup> Because we anticipate that stations would need to commence operations on temporary facilities early in the transition, we propose to require that stations assigned to temporary channels apply for special temporary authority (STA) within 90-days of the *Closing and Reassignment PN*’s release.<sup>58</sup> We do not believe that requiring broadcasters to license their temporary channel facilities is appropriate in light of the temporary nature of the operations.

22. *Must-Carry Rights.* If we decide to use temporary channel assignments, we tentatively conclude that stations will have must-carry rights on their temporary channels. We believe the statute may reasonably be interpreted to extend such rights. Section 614 of the Communications Act of 1934, as amended, defines an eligible full-power television station entitled to must-carry as one that is “licensed and operating on a channel regularly assigned to its community by the Commission that, with respect to a particular cable system, is within the same television market as the cable system.”<sup>59</sup> Consistent with the broad definition of “license” in section 153 of the Act, we believe the term “licensed” in this context may be interpreted to include an STA.<sup>60</sup> We also believe that the term “channel regularly assigned to [the station’s] community by the Commission” in this context may be interpreted to encompass a temporary channel assignment.<sup>61</sup> While this language could be read to refer to a channel allotted to a particular community in the DTV Table of Allotments (DTV Table),<sup>62</sup> the FCC has explained that it “will not use a codified Table of Allotments or rulemaking procedures to implement post-auction channel changes.”<sup>63</sup> During the post-auction transition period, therefore, temporary or permanent channels will be “regularly assigned” to communities on a case-by-case basis in response to applications rather than by amending the DTV Table. Further, as a practical matter, channels assigned on a temporary basis would enable stations to serve the same coverage area and population as they did on their pre-auction channels, meaning that the stations will continue to serve the same communities of license set forth in the Table as they did before the auction.

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<sup>56</sup> *Id.*

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

<sup>58</sup> A licensee that is assigned a temporary channel must comply with all filing and notification requirements, construction schedules, and all other post-auction deadlines that would apply to construction of the station’s ultimate post-auction facility. *See* 47 C.F.R. §§ 73.3700(b)-(e). We will permit a station to seek expanded or alternate facilities in its STA to the extent it would otherwise be permitted in relation to its post-auction channel assignment.

<sup>59</sup> 47 U.S.C. § 534(h)(1)(A).

<sup>60</sup> 47 U.S.C. § 153(49) (defining “license” as “that instrument of authorization required by this chapter or the rules and regulations of the Commission made pursuant to this chapter, for the use or operation of apparatus for transmission of energy, or communications, or signals by radio, by whatever name the instrument may be designated by the Commission”). *See also Complaint of Johnson Broadcasting, Inc.*, Memorandum Opinion and Order, 9 FCC Rcd 3574, 3576, para. 13 (Cable Services Bur., 1994) (holding that a station operating pursuant to program test authority qualifies for must carry rights; stating that the “authorization granted KNWS-TV to commence operation was clearly a ‘license’ as that term is defined in the Administrative Procedure Act, which defines ‘license’ to include ‘the whole or a part of an agency permit, certificate, approval, registration, charter, membership, statutory exemption or other form of permission.’”) (quoting 5 U.S.C. § 551(8)).

<sup>61</sup> 47 U.S.C. § 534(h)(1)(A).

<sup>62</sup> *See* 47 C.F.R. § 76.5(b).

<sup>63</sup> *IA R&O*, 29 FCC Rcd at 6789-90, para. 544. The Commission authorized the Bureau to reissue a DTV Table in the future, but until that occurs there will be no DTV Table. *See id.* at 6789, n.1545 (“After the Commission completes the repacking and channel substitution process, the Media Bureau will resume using the current rulemaking process to make new channel allotments and intends to initiate a proceeding to amend § 73.622 of the rules to reflect all new full power channel assignments in a revised Table of Allotments.”).

23. We do not believe that MVPDs would be unduly burdened by extending must-carry rights to stations on temporary channels. MVPDs are eligible for reimbursement when they “reasonably incur costs in order to continue to carry broadcast stations that are reassigned as a result of the auction.”<sup>64</sup> Such costs include the reasonable costs to set up delivery of a signal that the MVPD is required to carry under the Commission’s must-carry rules or under retransmission consent contracts.<sup>65</sup> Under this standard, MVPDs likewise would be eligible for reimbursement of all eligible costs in order to continue to carry a reassigned station operating on a temporary channel. Finally, we believe that extending must-carry rights to a station’s temporary facility will further the important interests Congress sought to advance through the must-carry provisions, specifically “preserving the benefits of free, over-the-air local broadcast television and promoting the widespread dissemination of information from a multiplicity of sources.”<sup>66</sup>

24. *Interference Protection.* If we decide to use temporary channel assignments, we propose that any temporary channel assignments in the 600 MHz Band would be subject to the inter-service interference (ISIX) protections adopted in the *ISIX Third Report and Order*,<sup>67</sup> as well as the other interference protections provided for in our rules<sup>68</sup> and any temporary pairwise interference adopted for the post-auction transition.<sup>69</sup> Although STA operations are not protected against interference under our normal rules, we believe that the public interest would be served by extending the same protections to temporary channels that would apply to any licensed facility during the post-auction transition. In addition, a full power or Class A station operating on a temporary channel could displace a low power television (LPTV) station.<sup>70</sup> We propose that an operating LPTV station displaced by a temporary channel assignment could file for a new channel during the post-auction LPTV displacement window.<sup>71</sup> Depending on the station’s proximity to Mexico or Canada, coordination approval may be required from that particular country.

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<sup>64</sup> *Id.* at 6814, para. 603. See 47 U.S.C. § 1452(b)(4)(A)(i)(ii).

<sup>65</sup> *IA R&O*, 29 FCC Rcd at 6284, paras. 628-29.

<sup>66</sup> *Carriage of Digital Television Broadcast Signals: Amendments to Part 76 of the Commission’s Rules*, CS Docket No. 98-120, Second Report and Order and First Order on Reconsideration, 20 FCC Rcd 4516, 4534, para. 37 (quoting *Turner Broadcasting Systems, Inc. v. FCC*, 520 U.S. 180, 189-90 (1997)).

<sup>67</sup> See *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, GN Docket No. 12-268, ET Docket No. 13-26, ET Docket No. 14-4, Third Report and Order and First Order on Reconsideration, 30 FCC Rcd 12049, 12073-74, paras. 53-55 (2015) (requiring 600 MHz licensees that want to commence operation prior to the end of the Post-Auction Transition period “to protect television stations that are operating co-channel or adjacent channel at that time and television stations that will be operating co-channel or adjacent channel by the end of the Post-Auction Transition Period.”).

<sup>68</sup> See, e.g., 47 C.F.R. § 73.616 (post-transition DTV station interference protections).

<sup>69</sup> See *supra* para. 19.

<sup>70</sup> Consistent with the Commission’s previous interpretation, section 336(f)(7)(B) of the Act would not apply to temporary channel assignments for Class A stations for purposes of the post-auction transition because these temporary channels will be assigned by the Commission, not proposed by Class A licensees. See *IA R&O* at para. 244; *IA Recon Order* at para. 70. See also 47 U.S.C. § 336(f)(7)(B) (the Commission “may not . . . approve a modification of a class A license, unless the . . . licensee shows that the class A station for which the . . . modification is sought will not cause” interference to LPTV stations, permittees, and applicants).

<sup>71</sup> See *IA R&O*, 29 FCC Rcd at 6635-36, para. 659 (directing the Bureau to open a special filing window for operating LPTV and TV translator stations that are displaced as a result of the repacking process or the reverse or forward auction. The window will be opened after reassigned full power and Class A stations have submitted their construction permit applications and had an opportunity to request alternate channels or expanded facilities). Alternatively, displaced LPTV stations could go silent or seek temporary authorization to operate its facility at variance from its authorized parameters in order to prevent interference.

25. *Reimbursement Eligibility.* The Commission anticipated the possibility of using temporary channels to facilitate the transition and stated that the reasonably incurred costs of equipment needed to move to temporary channels are eligible for reimbursement.<sup>72</sup> Thus, such costs would be eligible for reimbursement in the same manner as costs related to construction of permanent post-auction channel facilities. As discussed above, MVPDs likewise should be eligible for reimbursement of all eligible costs in order to continue to carry a reassigned station operating on a temporary channel.

### 3. Challenges to Individual Deadlines

26. As explained above, the *Closing and Reassignment PN* will announce the transition phase, phase completion date, and testing period for each reassigned station. We recognize that individual stations may wish to raise concerns regarding their particular phase assignments, phase completion dates, and/or testing periods once the *Closing and Reassignment PN* is released. In considering any such concerns, we must be mindful of the potential impact of requests for changes or adjustments on other stations and on the overall phased transition schedule. While we tentatively conclude that we will rely on existing rules and procedures to address any such concerns, we also seek comment on whether to establish an alternative process. If we take the former approach and allow stations to challenge the *PN* as it impacts them, should we waive any rules or procedures in order to facilitate the transition?

### 4. Proposals for Expanded Facilities or Alternate Channels and Extension Requests

27. We recognize that some stations may seek to construct an expanded facility or alternate channel that differs from the technical parameters assigned in the *Closing and Reassignment PN*.<sup>73</sup> Further, during the transition period some stations may request extensions of their construction deadlines and may seek authority to continue operating on their pre-auction channel after their phase completion date.<sup>74</sup> In evaluating any such requests, we propose to examine the impact that grant of the request would have on the phased transition schedule; for example, by evaluating whether such modification may create new or affect existing dependencies (i.e., daisy chains or cycles). Any requests for expanded facilities or alternate channels by stations in the border regions with Mexico or Canada will require coordination approval from the country in question. The Bureau will view favorably requests that are otherwise compliant with our rules and have little or no impact on the phase assignments or transition schedule.<sup>75</sup> However, any request that the staff determines would be likely to delay or disrupt the transition, such as by causing pairwise interference above two percent to another station, creating additional linked-station sets, necessitating another station move to a different transition phase, or that is likely to cause a drain on

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<sup>72</sup> See *id.* at 6823-24, para. 627 (“We will treat interim facilities as a relocation expense eligible for reimbursement and will reimburse costs for such facilities that are reasonably incurred in order for a station to meet its construction deadline or to avoid prolonged periods off the air while repacking changes are made.”); *id.* at n.1756 (explaining that one appropriate use of an interim facility is when “a station may need to operate on a different channel with different facilities than its final channel or facilities”).

<sup>73</sup> 47 U.S.C. § 73.7300(b)(2); see *IA R&O 29 FCC Rcd* at 6794, n.1572 (requests for alternate channels or expanded facilities must “meet all existing technical and interference requirements and...serve the public interest”).

<sup>74</sup> While a station may request an extension of its construction permit deadline as set forth in 47 C.F.R. § 73.3700(b)(5), grant of such a request only permits the station additional time to complete its construction on its final channel and does not permit a station to continue operating on its pre-auction channel. See *IA R&O 29 FCC Rcd.* at 5806, para. 584. In order to do so a licensee must request special temporary authority (STA). *Id.*

<sup>75</sup> If an application for an alternate channel or expanded facilities is granted, the initial deadline listed in the construction permit for the alternate channel or expanded facilities will be the same as the deadline in the station’s initial construction permit. See *id.* at 6793-94, n.1570. Thus, any station requesting an expanded facility or alternate channel will be required to abide by the construction deadline and other transition schedule requirements applicable to the phase to which the station is assigned unless otherwise modified by the Bureau.



limited transition resources required by other stations, will be viewed unfavorably.<sup>76</sup> The Bureau will view requests that have such adverse effects on the transition schedule more favorably if the requesting station demonstrates that it has the approval of all the stations that would be affected if the request were granted, or it agrees to take steps during the transition period to mitigate the impact of the proposed request—such as by accepting additional levels of temporarily increased interference or operating at variance from its pre-auction licensed parameters (i.e., operating with reduced facilities). After evaluation, the Bureau may choose to modify transition phase assignments and construction deadlines to enable grant of a request.<sup>77</sup> To the extent that the Bureau denies a request for a station to continue operating on its pre-auction channel past its phase completion date, the Bureau will work with the impacted licensee to remain on-air while construction of its post-auction facility is completed. Each circumstance will be evaluated on a case-by case basis.

## 5. Prohibited Communications

28. Commenters should be mindful that Commission rules prohibit broadcasters and forward auction applicants from communicating any incentive auction applicant's bids or bidding strategies to other parties covered by the relevant rules.<sup>78</sup> The relevant prohibitions will apply prior to, during, and after the period for comment.<sup>79</sup> The prohibition covers related parties, as well as covered broadcast licensees and forward auction applicants.<sup>80</sup>

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<sup>76</sup> This presumption is not meant to discourage stations from proposing transition solutions that would reduce reimbursement costs or implement a market-wide transition plan that broadcasters may independently develop. *See, e.g.,* Letter from American Tower Corp., 10-16 (Aug. 31, 2016) (proposing broadband antenna solutions for large markets). Nonetheless, we expect such proposals would be created with the transition schedule in mind and disclose either how implementation of the proposal may interfere with the transition schedule, or demonstrate that implementation would not interfere with other stations' transition efforts.

<sup>77</sup> In the *IA R&O*, the Commission stated that it would consider "granting longer construction periods for alternate channels or expanded facilities in situations where extenuating circumstances justify such an extension." *See IA R&O* at 6794, n.1570. If the Bureau determines that granting a particular request would not cause adverse effects on the transition schedule, or that granting a request would be beneficial to the transition plan, the Bureau may adjust the phase assignment of the requesting station, or if necessary, other stations as well. However, we propose that no station will be assigned to an earlier transition phase than it was originally assigned to without its consent.

<sup>78</sup> Specifically, "all full power and Class A broadcast television licensees are prohibited from communicating directly or indirectly any incentive auction applicant's bids or bidding strategies to any other full power or Class A broadcast television licensee or to any forward auction applicant." 47 C.F.R. § 1.2205(b)(1). In addition, "all forward auction applicants are prohibited from communicating directly or indirectly any incentive auction applicant's bids or bidding strategies to any full power or Class A broadcast television licensee," 47 C.F.R. § 1.2105(c)(6)(ii), and "from cooperating or collaborating with respect to, communicating with or disclosing, to each other or any nationwide provider that is not an applicant, or, if the applicant is a nationwide provider, any non-nationwide provider that is not an applicant, in any manner the substance of their own, or each other's, or any other applicants' bids or bidding strategies (including post-auction market structure)." 47 C.F.R. § 1.2205(c)(1).

<sup>79</sup> The prohibition applicable to communications involving broadcast licensees began on the deadline for filing applications to participate in the reverse auction and will continue to be in effect until the post-auction public notice closing the auction. 47 C.F.R. §§ 1.2205(c)(6) and 1.2205(b)(1). The prohibition applicable to communications by forward auction applicants not involving broadcast licensees applies until the down payment deadline for winning forward auction bids. 47 C.F.R. § 1.2205(c)(1).

<sup>80</sup> For purposes of the prohibition, covered broadcasters "shall include all controlling interests in the licensee, and all officers, directors, and governing board members of the licensee," 47 C.F.R § 1.2205(a)(1), and a forward auction applicant "shall include all controlling interests in the entity submitting a short-form application to participate in an auction (FCC Form 175), as well as all holders of partnership and other ownership interests and any stock interest amounting to 10 percent or more of the entity, or outstanding stock, or outstanding voting stock of the entity submitting a short-form application, and all officers and directors of that entity[, and i]n the case of a consortium, each member of the consortium shall be considered to have a controlling interest in the consortium." 47 C.F.R

(continued....)



29. We previously have cautioned that statements to the public may create a risk of prohibited communications when the public statement should be expected to result in a communication that violates the rule.<sup>81</sup> Accordingly, comments submitted to the Commission may violate one of the prohibitions even though not made directly to another party covered by the rule. Moreover, a communication that does not explicitly state a bid or bidding strategy but conveys information that leaves little doubt about an incentive auction applicant's bids and bidding strategies may violate the rule regardless of the communicating party's intent.<sup>82</sup>

30. A covered party may also violate the prohibition any time it conveys information that might communicate known past or future bids or bidding strategies of any other covered party. Information regarding past, as well as future, bids and bidding strategies is covered by the prohibitions. Furthermore, the prohibitions apply to more than a party's desired auction outcome and steps the party has taken or will take to achieve it. The fact that a party is not communicating its own bids or bidding strategies, or is communicating only the irrevocable results of another's bids or bidding strategies, will not preclude the statements from violating the prohibition. For example, a broadcaster that is not participating in the auction may not communicate that a prospective channel sharing partner no longer will need to share with it because it has exited the auction. Similarly, a forward auction applicant whose initial eligibility has decreased may not communicate that it has foregone prior plans to pursue particular markets due to reduced eligibility.

31. These prohibitions should not, however, preclude any party from addressing relevant issues regarding the post-auction transition. Until the final stage rule is met, all broadcasters reasonably might be expected to plan for a potential relocation to a new channel in their pre-auction band, regardless of participation in the reverse auction or current bidding status. Statements of general applicability, not related to a particular broadcaster's circumstances or a forward auction applicant's plans, generally should not disclose any incentive auction applicant's bids or bidding strategies.<sup>83</sup> This is true with respect to statements regarding the technical interdependencies to be considered by the Phase Assignment Tool or the resource constraints relevant to the Phase Scheduling Tool, even if the statements might be applicable to the station's individual transition as well. A party's statements of general applicability will not violate the prohibition solely because they are consistent with its bids or bidding strategy. Rather, to be prohibited, statements must communicate bids or bidding strategies, either directly or by leaving little doubt regarding what they are, regardless of the lack of a direct statement.

#### **IV. ADMINISTRATIVE MATTERS**

##### **A. Comment Filing Procedures**

32. Pursuant to sections 1.415 and 1.419 of the Commission's rules,<sup>84</sup> interested parties may file comments and reply comments on or before the dates indicated on the first page of this document. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS).<sup>85</sup>

(Continued from previous page) \_\_\_\_\_  
§ 1.2105(c)(5)(i).

<sup>81</sup> See *Guidance Regarding the Prohibition of Certain Communications During the Incentive Auction, Auction 1000*, Public Notice, 30 FCC Rcd 10794, 10798, para. 12 and n.18 (WTB 2015) (*Prohibited Communications PN*).

<sup>82</sup> *Id.* at 10796-97, para. 8.

<sup>83</sup> Furthermore, given that public statements regarding whether or not a broadcaster applied to participate in the incentive auction are not deemed to violate the rule, a broadcaster that has disclosed that it did not apply to participate will not disclose bids or bidding strategies by discussing the details of its own transition. For reasons already discussed, such a broadcaster that may share its post-auction channel with an auction participant must, however, exercise caution to avoid disclosing the bids or bidding strategies of its prospective channel partner.

<sup>84</sup> 47 CFR §§ 1.415, 1.419.

<sup>85</sup> See *Electronic Filing of Documents in Rulemaking Proceedings*, 63 FR 24121 (1998).

- Electronic Filers: Comments may be filed electronically using the Internet by accessing the ECFS: <http://apps.fcc.gov/ecfs/>.
- Paper Filers: Parties who choose to file by paper must file an original and one copy of each filing. If more than one docket or rulemaking number appears in the caption of this proceeding, filers must submit two additional copies for each additional docket or rulemaking number.

33. Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

- All hand-delivered or messenger-delivered paper filings for the Commission's Secretary must be delivered to FCC Headquarters at 445 12<sup>th</sup> St., SW, Room TW-A325, Washington, DC 20554. The filing hours are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes and boxes must be disposed of before entering the building.
- Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743.
- U.S. Postal Service first-class, Express, and Priority mail must be addressed to 445 12<sup>th</sup> Street, SW, Washington DC 20554.

34. People with Disabilities: To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an e-mail to [fcc504@fcc.gov](mailto:fcc504@fcc.gov) or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (tty).

#### **B. Ex Parte Presentations**

35. The proceeding shall be treated as a "permit-but-disclose" proceeding in accordance with the Commission's *ex parte* rules.<sup>86</sup> Persons making *ex parte* presentations must file a copy of any written presentation or a memorandum summarizing any oral presentation within two business days after the presentation (unless a different deadline applicable to the Sunshine period applies).<sup>87</sup> Persons making oral *ex parte* presentations are reminded that memoranda summarizing the presentation must (1) list all persons attending or otherwise participating in the meeting at which the *ex parte* presentation was made, and (2) summarize all data presented and arguments made during the presentation. If the presentation consisted in whole or in part of the presentation of data or arguments already reflected in the presenter's written comments, memoranda or other filings in the proceeding, the presenter may provide citations to such data or arguments in his or her prior comments, memoranda, or other filings (specifying the relevant page and/or paragraph numbers where such data or arguments can be found) in lieu of summarizing them in the memorandum. Documents shown or given to Commission staff during *ex parte* meetings are deemed to be written *ex parte* presentations and must be filed consistent with § 1.1206(b) of the rules. In proceedings governed by § 1.49(f) of the rules or for which the Commission has made available a method of electronic filing, written *ex parte* presentations and memoranda summarizing oral *ex parte* presentations, and all attachments thereto, must be filed through the electronic comment filing system available for that proceeding, and must be filed in their native format (e.g., .doc, .xml, .ppt, searchable.pdf). Participants in this proceeding should familiarize themselves with the Commission's *ex parte* rules.

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<sup>86</sup> 47 C.F.R. §§ 1.1200 *et seq.*

<sup>87</sup> See 47 C.F.R. § 1.1203.

### **C. Initial Regulatory Flexibility Act Analysis**

36. The Regulatory Flexibility Act of 1980, as amended (“RFA”),<sup>88</sup> requires that a regulatory flexibility analysis be prepared for notice and comment rule making proceedings, unless the agency certifies that “the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities.” The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”<sup>89</sup> In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.<sup>90</sup> A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).

37. With respect to this Public Notice, an Initial Regulatory Flexibility Analysis (“IRFA”) under the Regulatory Flexibility Act<sup>91</sup> is contained in Appendix B. Written public comments are requested on the IRFA, and must be filed in accordance with the same filing deadlines as comments on the Public Notice, with a distinct heading designating them as responses to the IRFA. The Commission will send a copy of this Public Notice, including the IRFA, in a report to Congress pursuant to the Congressional Review Act. In addition, a copy of this Public Notice and the IRFA will be sent to the Chief Counsel for Advocacy of the SBA, and will be published in the *Federal Register*.

### **D. Paperwork Reduction Act Analysis**

38. This document does not contain proposed information collection(s) subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. In addition, therefore, it does not contain any new or modified information collection burden for small business concerns with fewer than 25 employees, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4).

### **E. Congressional Review Act**

39. The Commission will send a copy of this Public Notice to Congress and the Government Accountability Office pursuant to the Congressional Review Act, *see* 5 U.S.C. § 801(a)(1)(A).

### **F. Additional Information**

40. For additional information on this proceeding, contact Sasha Javid, [Sasha.Javid@fcc.gov](mailto:Sasha.Javid@fcc.gov); Erin Griffith, [Erin.Griffith@fcc.gov](mailto:Erin.Griffith@fcc.gov), (202-418-0660), Shaun Maher, [Shaun.Maher@fcc.gov](mailto:Shaun.Maher@fcc.gov), (202- 418-2324), or Evan Morris, [Evan.Morris@fcc.gov](mailto:Evan.Morris@fcc.gov), (202) 418-1656. Press contact: Charles Meisch, [Charles.Meisch@fcc.gov](mailto:Charles.Meisch@fcc.gov), (202) 418-2943.

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<sup>88</sup> *See* 5 U.S.C. § 603.

<sup>89</sup> *See* 5 U.S.C. § 601(6).

<sup>90</sup> *See* 5 U.S.C. § 601(3).

<sup>91</sup> *See* 5 U.S.C. § 603.

## APPENDIX A

### Phase Assignment and Scheduling Tools

#### I. INTRODUCTION

1. This appendix sets forth a proposed methodology for assigning construction deadlines to stations based on the staff's analysis and the record developed to date. Potential "dependencies," or interference relationships, between certain television stations on pre-auction and post-auction channels will impact the transition process. As the Commission recognized, stations with dependencies must coordinate in order to test equipment or begin operating on their new channels without causing interference.<sup>1</sup> Coordination may involve stations agreeing to operate at lower power or accept increased interference for short periods of time while the stations involved are performing tests. Dependencies can involve numerous and/or distant stations, however, making successful coordination extremely challenging. The FCC staff has analyzed these dependencies to develop a means of breaking them in order to reduce the need for coordination and to make remaining coordination more manageable. These possible solutions that were considered include assigning stations to separate "transition phases," allowing temporary interference increases, and assigning stations to temporary channels.

2. Under this proposal, stations would be assigned to a limited number of transition phases. The phases will begin at the same time, but have sequential end dates. Equipment testing on post-auction channels will be confined to set "testing periods." With the exception of the first phase, the testing period for subsequent phases will begin on the day after the end of the preceding phase.<sup>2</sup> Every station must cease operating on its pre-auction channel at the end of its assigned phase, also known as the "*phase completion date*."

3. The proposed methodology would utilize two computer-based tools to assign stations to phases and establish phase completion dates for each phase. First, stations would be assigned to phases using the Phase Assignment Tool, which applies optimization techniques to identify, among solutions that satisfy a set of defined rules or constraints, a solution that best meets a separate set of defined objectives. Section III below discusses the Phase Assignment Tool.

4. After stations are assigned to phases, the Phase Scheduling Tool would be used to help determine the phase completion date for each phase.<sup>3</sup> The Phase Scheduling Tool estimates the total time necessary for stations within a phase to perform the tasks required to complete the transition process. In addition to accounting for factors likely to impact the transition time required for individual stations, such as transmission power and tower height, the Phase Scheduling Tool accounts for delays created by resource limitations which may dictate when a station can obtain access to resources like new antennas or tower crews. It generates a range of time estimates that the staff will consider in establishing a phase completion date for each transition phase. In Section IV below, we discuss the Phase Scheduling Tool, and the specific inputs we propose to use including: the specific tasks required for stations to transition and the estimated time required to complete each task.

5. With the information provided in this Appendix, interested parties will have sufficient information to replicate the methodology proposed for determining the overall transition schedule. The Phase Assignment Tool implements the objectives and constraints described in this Appendix using commercially-available optimization software. The Phase Scheduling Tool leverages an open source

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<sup>1</sup> *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, GN Docket No. 12-268, Report and Order, 29 FCC Rcd 6567, 6798, para. 566 and n.1597 (2014) (*IA R&O*), *affirmed*, *National Association of Broadcasters v. FCC*, 789 F.3d 165 (D.C. Cir. 2015). All comments, reply comments, letters, and *ex parte* submissions referenced in citations below can be found in GN Docket No. 12-268.

<sup>2</sup> See *infra* Appx. A § IV.E (Sample Output) (Figure 12 and 13).

<sup>3</sup> See *infra* Appx. A § IV (The Phase Scheduling Tool).

discrete event simulation software package using inputs described in detail in this Appendix. The data presented in this Appendix is the output of applying this methodology to representative final television channel assignment plans for 114 MHz and 84 MHz spectrum clearing scenarios,<sup>4</sup> and also making certain assumptions regarding Canada and Mexico based on ongoing coordination with those countries.<sup>5</sup>

## II. DEPENDENCIES AND MEANS OF BREAKING THEM

6. Before transitioning to their post-auction channels, stations ideally should be able to test equipment on their new channels. During the transition, however, there is a potential for undue interference between stations that are still operating on their pre-auction channels and stations testing or operating on their post-auction channels.<sup>6</sup> In developing a proposed transition plan, the staff has sought to avoid undue interference while providing as much flexibility as possible for stations to test equipment prior to commencing operations on their new channels. The staff’s “Precedence Daisy-Chain Graph” explicitly captures any interference that may occur between stations operating on their pre-auction and post-auction channels.

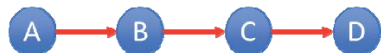
7. The Graph is constructed as follows: nodes are stations and a directed arc connects two nodes (say  $s$  and  $s'$ ) when station  $s$  cannot transition until station  $s'$  has transitioned to its post-auction channel because the current channel of station  $s'$  interferes with the future channel of station  $s$ . This relationship is called a *dependency*.

### Example 1: Dependency



8. In Example 1, suppose Station A and Station B have co- and adjacent-channel interference restrictions on all channels. Station A is reassigned from channel 25 to channel 18. Station B is reassigned from channel 45 to channel 26. Station A must vacate channel 25 before Station B can move to channel 26 so that neither station will experience undue interference. Therefore, the graph includes a directed arc from Station A to Station B since Station A must transition before Station B (Station B is *dependent* on Station A in order to transition).

### Example 2: Daisy-Chain



9. Multiple dependencies can be connected, forming a *daisy-chain*. Example 2 illustrates a daisy chain of 4 stations. Station A must transition before Station B. Station B must transition before

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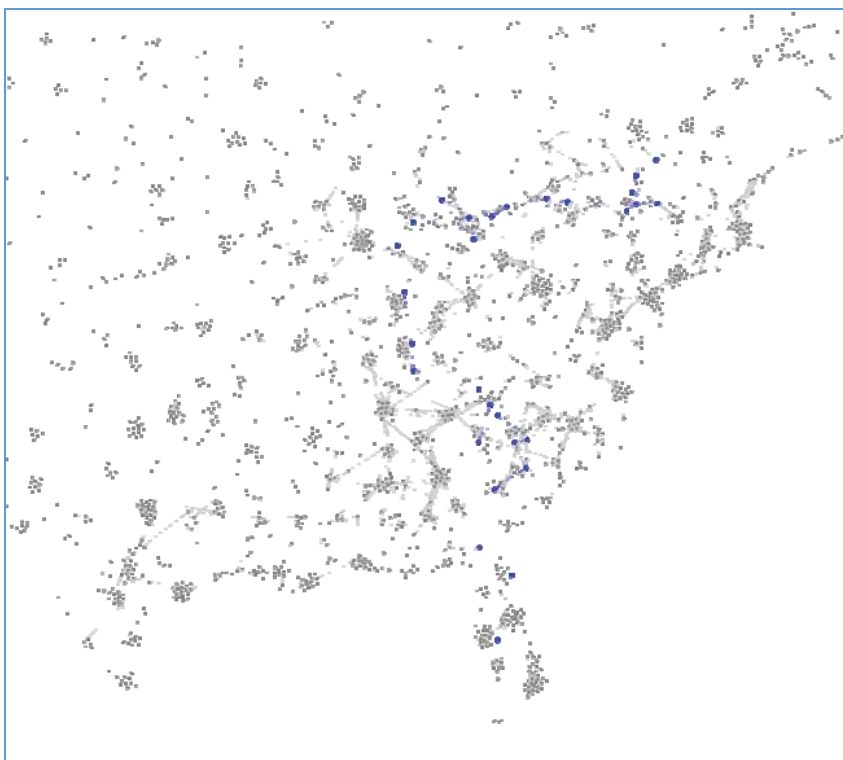
<sup>4</sup> As used herein, “representative” means consistent with the plans generated by the Commission’s Final Television Channel Assignment Plan determination procedure based on numerous auction simulations conducted by the staff. The clearing target for Stage 2 of the auction has now been set at 114 MHz. We therefore in this Appendix are using 84 MHz and 114 MHz as representative examples. We note that we do not anticipate publicly releasing these plans or the underlying simulations, consistent with our practice in this proceeding of releasing such information as appropriate in the interest of transparency and in consideration of the ongoing, internal deliberations regarding it, as well as broadcasters’ confidentiality interests in reverse auction participation. Interested parties can create their own television channel assignment plans for any spectrum clearing scenario by applying the Assignment Plan determination procedure to auction simulations based on their own assumptions of likely outcomes.

<sup>5</sup> See *infra* n.9 and accompanying text.

<sup>6</sup> The Commission’s rules governing interference between stations before and after the post-auction transition will prevent undue interference between stations operating on their pre-auction channels and between stations operating on their post-auction channels, respectively.

Station C. And Station C must transition before Station D. Thus, Stations A, B, and C all must transition before Station D can transition.

10. Daisy-chains can involve numerous stations and multiple transition dependencies. Figure 1 below illustrates a single daisy-chain involving 29 stations in the Northeast in a simulated outcome where the Commission repurposes 84 MHz of broadcast spectrum through the incentive auction.

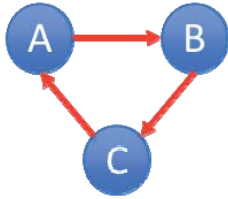


**Figure 1:** Stations are nodes in gray, arcs connecting stations represent a dependency. Nodes in blue are stations involved in a 29-station daisy chain.

11. Successful coordination to avoid undue interference among the stations illustrated in Figure 1 is likely to be extremely challenging, given the number of stations involved and their distance from one another. In order to reduce or eliminate the need for coordination, the chain could be broken by assigning stations to transition during different time periods or phases. At least 29 separate transition phases would be needed to break the chain completely so that every station in the chain could transition without the need for coordination. A large number of transition phases may undercut other potential transition goals, however, such as transitioning stations within the same region at the same time and avoiding the need for multiple channel rescans by viewers. In order to balance these goals, a certain number of stations within a daisy chain may be assigned to the same transition phase, thereby “collapsing” the daisy chain into a more manageable size. For example, the first five or ten stations in the 29-station daisy chain illustrated above could be assigned to the first transition phase. Each station in this collapsed daisy chain would have to coordinate with one or more of the other stations in the chain in order to test their equipment without undue interference. Moreover, as illustrated by Example 3 below, the staff’s analysis indicates that certain dependencies, known as “cycles,” cannot be broken by assigning stations to different transition phases.

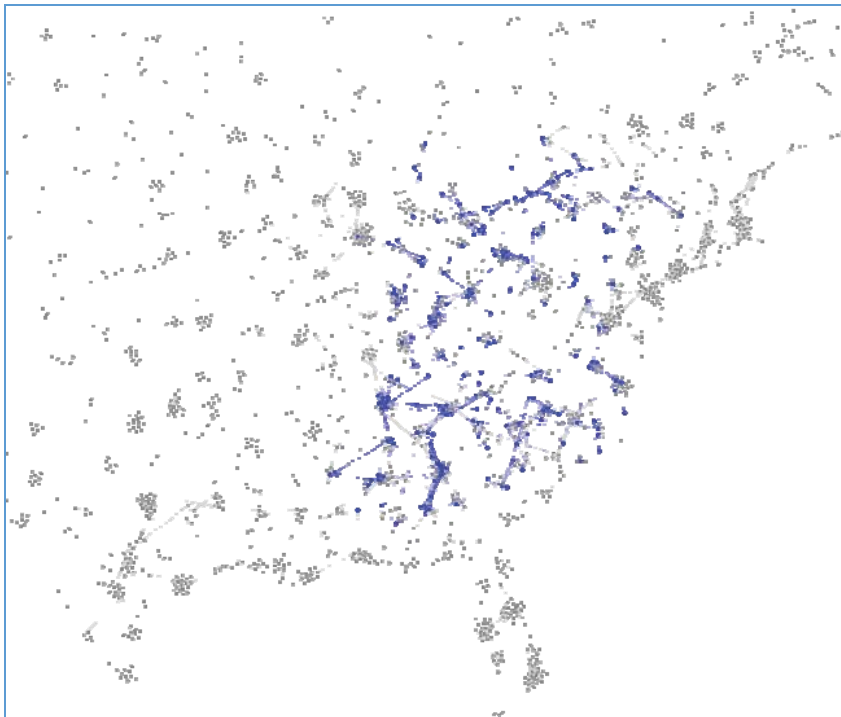


**Example 3: Cycle**



12. Example 3 shows a cycle consisting of three stations. Station A needs to transition from channel 20 to channel 17; while Station B needs to transition from channel 28 to channel 20; while Station C needs to transition from channel 17 to channel 28. Because all three stations cannot operate on either channel 17, channel 20, or channel 28 simultaneously, they must transition from their pre-auction to their post-auction channels simultaneously in order to commence operation on their post-auction channel. They must also coordinate in order to test equipment on their post-auction channels without causing increased interference to one another. In such circumstances, the dependencies between stations cannot be broken by assigning stations to different transition phases. On the other hand, assigning the stations to the *same* transition phase may facilitate their ability to coordinate with one another.

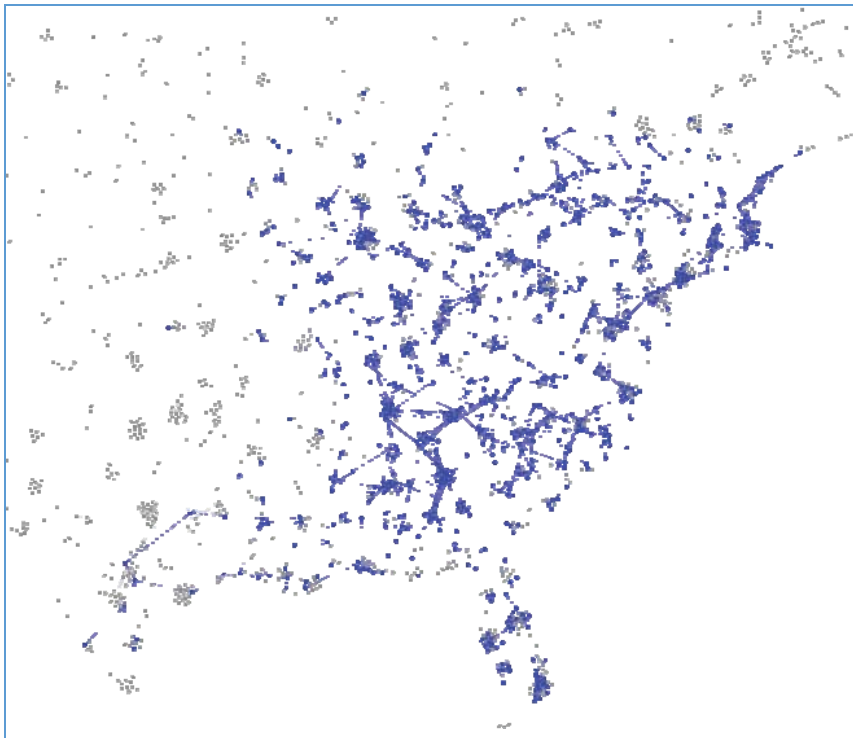
13. Cycles of much greater complexity than Example 3 are likely to occur during the post-auction transition process. Figure 2 below shows another simulated outcome in which the auction repurposes 84 MHz of broadcast spectrum. The cycle consists of 196 stations and reaches from the Southeast region of the United States through the Northeast and into Canada.



**Figure 2:** Stations are nodes in gray, arcs connecting stations represent a dependency. Nodes in blue are stations involved in a 196-station cycle.

14. The problem becomes more complicated when all dependencies are considered. Daisy-chains can intersect and overlap, creating a larger and more complicated daisy-chain. A cycle can also be part of a daisy-chain. Thus, hundreds of stations may be inter-dependent and one station may require tens

(or even hundreds) of stations to transition first in order to be able to begin operating on its post-auction channel. Figure 3 below shows another simulated 84 MHz outcome with a set of 796 inter-dependent stations.



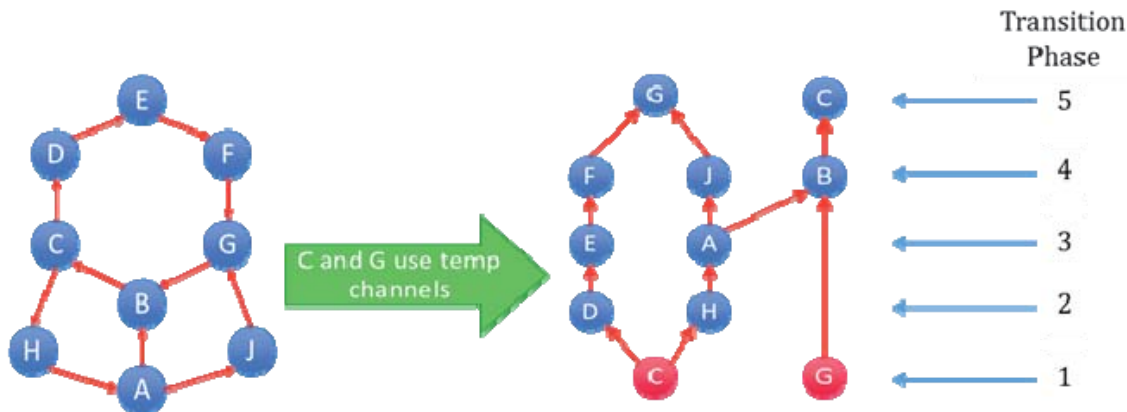
**Figure 3:** Stations are nodes in gray, arcs connecting stations represent a dependency. Nodes in blue are the 796 stations with shared dependencies.

15. As indicated above, transition phases are a potentially useful tool to address dependencies between stations. Stations may be assigned to different phases in order to break daisy chains, or to the same phase in order to facilitate coordination by stations involved in a cycle, or to achieve other goals. We refer to inter-dependent stations assigned to the same phase as a “*linked-station set*” and the individual stations in the linked-station set as “*linked-stations.*”

16. Another means of breaking dependencies is to allow temporary, limited increases in station-to-station (pairwise) interference that exceed the 0.5 percent allowed under the Commission’s rules governing pre-auction and post-transition interference relationships. As discussed in the Public Notice, the Commission has previously allowed such temporary increases in pairwise interference above the 0.5 percent threshold in order to facilitate spectrum transitions. As shown below, the staff’s analysis indicates that allowing temporary, limited increases in pairwise interference would significantly reduce the number of dependencies between stations and in turn reduce the size, number, and complexity of daisy chains and cycles. Additionally, the staff’s analysis indicates that allowing temporary, limited increases in pairwise interference would not result in significant aggregate interference increases.

17. Another means of breaking dependencies would be to assign stations in complicated daisy chains or cycles to operate on temporary channels prior to transitioning to their post-auction channels. Stations assigned to temporary channels would have to “move” twice, first to their temporary channels and then to their ultimate post-auction channels. Below we illustrate how temporary channel assignments could be used to break large cycles.

**Example 4: Temporary Channels**



18. In Example 4, nine stations are part of a complicated cycle and must coordinate their testing because no station can broadcast on its post-auction channel without causing undue interference with at least one other station in the set. However, if two of these stations are assigned to temporary channels (Station C and Station G), then the cycle is transformed into a collection of daisy chains in which stations at the same level of a daisy chain need not coordinate with one another in order to test equipment or operate on their post-auction channels. Since the longest chain in this example has five levels, stations could be assigned to five phases based on how far they are (in the dependence graph) from the stations placed on temporary channels.

**III. THE PHASE ASSIGNMENT TOOL**

19. Under the proposed methodology, stations would be assigned to a limited number of transition phases. Every station in a phase must cease operating on its pre-auction channel at the end of the phase, i.e., the phase completion date. Stations would be assigned to phases using the Phase Assignment Tool. This Section discusses the Phase Assignment Tool as well as the proposed constraints (*i.e.*, rules by which all assignments generated by the proposed tool must abide) and objectives (*i.e.*, goals when creating the assignments). We begin by proposing specific constraints and objectives, followed by a discussion of the results of staff analysis illustrating the rationale underlying the proposal and the tradeoffs involved in choosing among different constraints and objectives.

**A. Proposed Constraints and Objectives**

20. Based on the staff’s analysis and the record developed to date, we propose the following constraints and objectives in assigning stations to phases.

**Constraints:**

- (1) *A station cannot cause more than two percent new interference to another station during the transition. As discussed above, we believe that it is important both to avoid undue interference during the transition and to provide stations with as much flexibility as possible to test equipment on their post-auction channels before transitioning.<sup>7</sup> Although stations may be able to achieve these goals through coordination, coordination may not be feasible in situations involving large-scale and complex dependencies among stations. As discussed in more detail in the next section, the staff’s analysis indicates that allowing temporary, limited increases in pairwise interference would reduce the number and complexity of dependencies without resulting in significant aggregate interference*

<sup>7</sup> See *supra* Appx. A § II (Dependencies and Means of Breaking Them).

increases. Doing so is also likely to promote other potential goals, such as prioritizing the clearing of the 600 MHz Band and reducing the number of channel rescans. Although allowing higher levels of temporary interference—up to five percent—would further reduce dependencies, our proposal to allow no more than two percent represents a compromise between avoiding what the Bureau believes would cause undue interference and limiting dependencies.<sup>8</sup>

- (2) *No stations in Canada will be assigned to transition before the third transition phase and no Canadian stations will be assigned to a temporary channel.* Due to dependencies between domestic and Canadian stations, a joint transition plan with Canada is necessary and is being developed by FCC and ISED. In keeping with our informal discussions with ISED Canada to date, stations in Canada have generally been assigned to later transition phases for this proposal. This constraint will promote efficient use of cross-border resources and respect the minimum notification periods to Canadian TV stations established in ISED's 600 MHz decision.<sup>9</sup>
- (3) *There will be no more than 10 transition phases.* While increasing the number of phases could decrease the number of linked-station sets in each phase, a large number of phases may undercut other transition goals, such as transitioning stations within the same region at the same time and avoiding the need for multiple channel rescans by viewers. We also believe that limiting the number of phases will facilitate monitoring of the transition process. We believe that limiting the number of transition phases to 10 strikes a reasonable balance between these goals. Canadian stations not impeding the transition of U.S. stations may be permitted to continue to operate beyond the 10<sup>th</sup> phase based on rules to be established in Canada.
- (4) *No U.S. stations will be assigned to temporary channels.* Although we do not propose to assign stations to temporary channels, the attached PN invites comment on whether we should use temporary channels. In the event that temporary channels are used to reduce dependencies we propose to potentially apply one or more of the following additional constraints:
  - (a) Only assign temporary channels to stations in complex dependencies.<sup>10</sup>
  - (b) Only assign temporary channels to stations that are in close proximity to the stations' ultimate post-auction channel assignments. As stated above, temporary

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<sup>8</sup> This proposal assumes that all winning bidders affecting the first phase of the transition who have agreed to go off-air completely, or that become a channel sharee of another station with a post-auction channel assignment, will have gone dark before the stations in the first transition phase begin testing of their equipment (e.g., two months before the end of the first transition phase). This assumption is reasonable given the expected timeline for paying winning stations and the estimated time for the first phase to complete.

<sup>9</sup> See *Decision on Repurposing the 600 MHz Band*, August 15, 2014, available at <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11049.html>. FCC and ISED Canada are coordinating closely on transition timing, consistent with the agencies' intent to jointly repack TV stations in both countries. See *Statement of Intent Between the Federal Communications Commission of the United States of America and the Department of Industry Canada Related to the Reconfiguration of Spectrum Use in the UHF Band for Over-the-Air Television Broadcasting and Mobile Broadband Services*, U.S.–Can., Aug. 11, 2015, available at <https://transition.fcc.gov/ib/sand/agree/files/PASIIC.pdf> (*Canadian Coordination*). Regarding Mexico, this proposal assumes that Mexican stations will have transitioned to their new channels before the phase completion date of the first transition phase. See *Exchange of Coordination Letters with IFT Regarding DTV Transition and Reconfiguration of 600 MHz Band Spectrum*, U.S.–Mex., July 15, 2015, available at <http://wireless.fcc.gov/incentiveauctions/learn-program/resources.html> (*Mexican Coordination*).

<sup>10</sup> See *supra* Appx. A § II (Dependencies and Means of Breaking Them) (Figure 3) (an example of complex dependencies).

channel assignments would require stations to move twice. Requiring that the temporary channel be “close” to the ultimate channel may reduce the burden and expense associated with double moves. If such an approach is considered, we seek comment on what the definition of “close” should be.

- (c) Only assign temporary channels to stations with relatively low power (e.g., Class A stations). This constraint could limit the cost of the purchase of broadband antennas that would be necessary for stations that must move twice. If such an approach is considered, we seek comment on what the definition of a “relatively low power” should be with regard to a Class A or full power station.
- (5) *All stations within a DMA will be assigned to no more than two different transition phases.*<sup>11</sup> While some parties have suggested that the Bureau could divide the country into specific regions for the transition,<sup>12</sup> it is not possible to create a wholly regionalized plan that will respect interference constraints because the interference constraints create dependencies that may overlap geographic areas. The proposed DMA constraint provides similar benefits to those that would come from a purely regional approach. For example, taking a station’s DMA into account clusters stations in a particular geographic area into the same transition phase. Doing this will make resource allocation more efficient—for instance, tower crews would be able to focus on multiple stations in a specific area during a single phase. Additionally, the constraint will benefit consumers by limiting the number of rescans the consumer will have to complete because of the transition. While this constraint potentially increases the number and/or size of linked-station sets within a transition phase, on balance we believe that the benefits to consumers and stations outweighs the burden caused by this constraint.<sup>13</sup>
- (6) *The difference in the number of stations in the largest transition phase and the smallest transition phase will be no more than 30 stations.*<sup>14</sup> This constraint will attempt to make the number of assigned stations in each of the phases somewhat equal, which in turn will help manage limited resources by ensuring that they can be spread more evenly across the transition phases.
- (7) *Every transitioning station will be assigned to one transition phase.*

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<sup>11</sup> ISED is considering using a similar regional approach for Canadian stations.

<sup>12</sup> See, e.g., Letter from T-Mobile USA, Inc., *Broadcaster Repacking Proposal* (filed Mar. 3, 2016)(T-Mobile Proposal) (proposing a regional repacking approach that balances the needs of urban and rural areas evenly); Letter from Competitive Carriers Association (filed May 5, 2016) (supporting a regional repacking approach like the one proposed by T-Mobile); Letter from AT&T Services, Inc. (filed Mar. 14, 2016) (“A regionally prioritized plan, coupled with strong project management, is essential to managing key dependencies and to controlling constraints and challenges.”); Letter from AT&T Services, Inc., *Attach., Broadcaster Relocation Planning* (filed Aug. 5, 2016)(proposing a regionalized approach focusing on large urban PEAs connected with rural areas and addresses complications along international borders); Letter from National Association of Broadcasters (filed Mar. 21, 2016)(supporting a regional approach that prioritizes the most populated areas first and is both orderly and flexible).

<sup>13</sup> The Appendix has additional information about the DMA constraint and provides an example of how changing the number of transition phases that a DMA can be assigned to can increase or decrease the number of linked-station sets. Limiting each DMA to a single transition phase results in approximately two-thirds of all stations having to transition in the same phase, removing the benefits of a phased transition approach. See *infra* Appx. A § III.B.2.c (DMA Restrictions).

<sup>14</sup> If it is not feasible to assign stations in such a way that the difference in the number of stations in the largest transition phase and the smallest transition phase is less than or equal to 30 stations, then an optimization will be performed minimizing the difference between the largest transition phase and smallest transition phase, and subsequent optimizations will be limited to no more than 1.1 times the number found in this optimization.

- (8) *No phase can have more than 125 linked-stations.* The dependencies created by the interference constraints can affect a large number of stations across large geographic areas. This constraint will limit the effect of those dependencies and, to the extent that coordination is needed, facilitate a manageable transition process for broadcasters. Based on staff analysis, we believe the proposed 125-station limit strikes a balance between minimizing dependencies and other goals.<sup>15</sup>
- (9) *No station falling into the “complicated” category for purposes of the Phase Scheduling Tool can be assigned to Phase 1.*<sup>16</sup> The goal of this constraint is to allow adequate time to transition the most challenging stations and to prevent an early phase completion date to be delayed due to the most time consuming transitions.

**Objectives:**

In order to identify a solution that best satisfies the Commission’s transition goals, we propose to apply the following objectives to assignments or “solutions” identified by the Phase Assignment Tool that satisfy the constraints proposed above. The Phase Assignment Tool would prioritize the proposed objectives in the sequence listed below. Subsequent objectives would be constrained by prior objectives.

- (1) *Assign U.S. stations whose pre-auction channels are in the 600 MHz Band to earlier phases in order to clear the 600 MHz Band as quickly as possible, while simultaneously assigning all Canadian stations and U.S. stations whose pre-auction channel is in the remaining television bands (U.S. TV-band stations) to later phases, where possible.* This objective would promote a number of goals. It would help to clear the 600 MHz Band first in order to open it up to wireless licensees to offer new innovative services. It would also prevent Canadian and U.S. stations from competing for limited resources and provide Canada with the time needed for its transition. The Phase Assignment Tool therefore gives weights to assignments where there are stations transitioning from the 600 MHz Band after transition Phase 8. Similarly, the Phase Assignment Tool gives weights to assignments where Canadian stations as well as U.S. TV-band stations are assigned to any transition phase earlier than Phase 9. The weights for stations not transitioning out of the 600 MHz Band before Phase 9 is significantly higher than the weights for U.S. TV-band stations or Canadian stations transitioning early.<sup>17</sup> The Phase Assignment Tool minimizes the sum of all weights incurred by the phase assignments.
- (2) *Minimize the sum, over all DMAs, of the number of times a DMA must rescan.* This objective benefits consumers by minimizing the number of rescans necessary by viewers in a market and creates regionalized clusters that will make resource allocation more efficient. As in constraint #5 proposed above, the use of DMAs attempts to provide similar benefits to those that would flow from a purely regional approach.
- (3) *Minimize the total number of linked-stations.* This proposed objective is different than constraint #8 proposed above, in that it would minimize the *total* number of linked-stations throughout all phases of the transition. This objective seeks to provide as many stations as possible with the ability to test their equipment on their post-auction channel

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<sup>15</sup> If it is not possible to limit the number of linked-stations in a phase to 125, then we propose to apply an objective of minimizing the maximum number of linked-stations in any phase, and constrain all phases to no more than 1.2 times that maximum number.

<sup>16</sup> See *infra* Appx. A § IV.C (Pre-Construction Stage Inputs).

<sup>17</sup> We propose the following weights to assignments: U.S. stations in the 600 MHz Band assigned to phase 9 would add a weight of 20; US stations in the 600 MHz Band assigned to phase 10 would add a weight of 200; US TV-band stations and Canadian stations assigned before phase 9 would add a weight of 1.



while simultaneously broadcasting on their pre-auction channel without the need to coordinate.

- (4) *Minimizing the difference between the number of stations in the largest transition phase and the smallest transition phase.* Like constraint #6 proposed above, by minimizing this maximum difference, this objective attempts to reduce below 30 the maximum difference between the number of stations in different phases. We believe that evening out the number of stations assigned to each transition phase will help manage limited resources by ensuring that they can be spread more evenly across the transition phases.

21. We seek comment on these proposed constraints and objectives. Although the Phase Assignment Tool can enforce any of these constraints and objectives, some conflict with others and cannot be imposed simultaneously and others will have no impact on the solution if placed after a preceding objective.

22. The Phase Assignment Tool could also be used *during* the transition to modify phase assignments. We recognize that unforeseen events may occur during the transition that may warrant adjustments in order to ensure that the transition proceeds in a timely fashion. If we decide to use the Phase Assignment Tool during the transition to modify phase assignments, we propose to restrict reassignments to later transition phases in order to provide certainty to stations that any adjustments will not require them to transition earlier than their originally scheduled phase completion date.

## **B. Preliminary Results of Staff Analysis**

### **1. Baseline Results**

23. This section presents results from running the Phase Assignment Tool using representative final channel assignment plans, for both a 114 MHz and an 84 MHz spectrum clearing scenario. In each scenario, all of the constraints proposed above are satisfied and the proposed objectives were applied. We assumed that Canadian stations will be jointly transitioning with U.S. stations.<sup>18</sup> We also assumed that Mexican stations will have already completed their transition to their new channels below channel 37 prior to the end of the first phase.<sup>19</sup>

24. Figures 4 and 5 below present histograms for the 114 MHz and 84 MHz cases, respectively, showing the total number of stations that transition in each phase and within each phase how many are (a) Canadian stations, (b) U.S. stations whose pre-auction channel is in the 600 MHz Band and (c) other U.S. stations. The figures show that the 600 MHz band is mostly clear of U.S.-based impairments by the end of Phase 8. Also, very few Canadian stations are assigned to early transition phases. Those Canadian stations that are assigned to early transition phases must transition earlier in order to allow U.S. stations or other Canadian stations to transition. Table 1 illustrates the number of stations that are part of linked-station sets in each of the two scenarios.

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<sup>18</sup> All Canadian stations are included in the studies. Those stations that will remain on their channel but be required to convert to digital are not reflected at this time. However, the final joint transition plan and schedule will include all analog and digital Canadian stations. *See supra* n.9 and accompanying text.

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

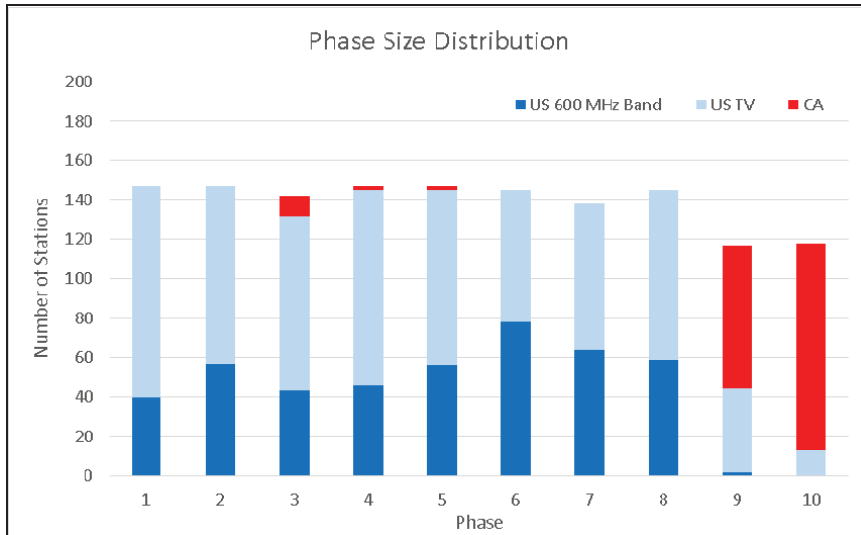


Figure 4: 114 MHz Clearing Scenario

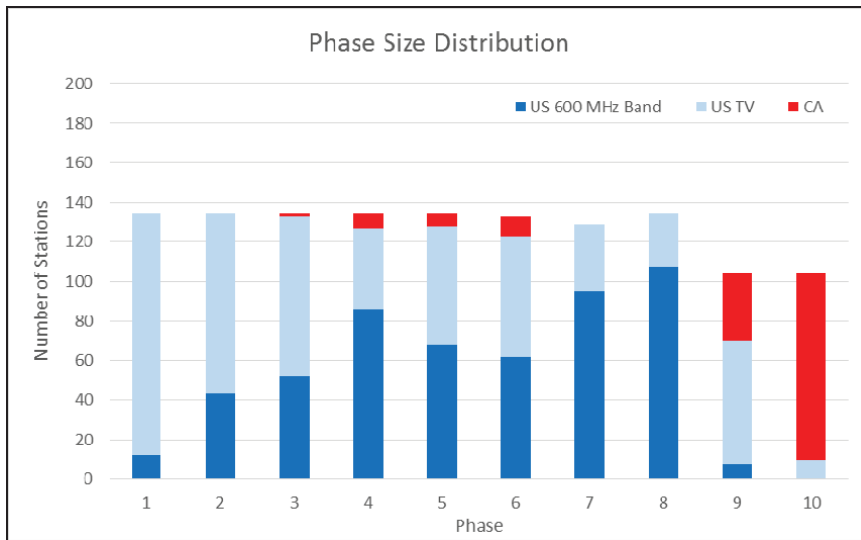


Figure 5: 84 MHz Clearing Scenario

Clearing target	# of stations that must move to new channels	# of linked-stations	Size of the largest linked-station set	Median linked-station set size	# of linked-station sets	# of stations in largest phase	% of U.S. DMAs with more than one rescan
114MHz	1,393	799	105	3	95	147	31%
84 MHz	1,274	710	105	3	85	134	42%

Table 1: Comparison between 114 MHz and 84 MHz scenarios

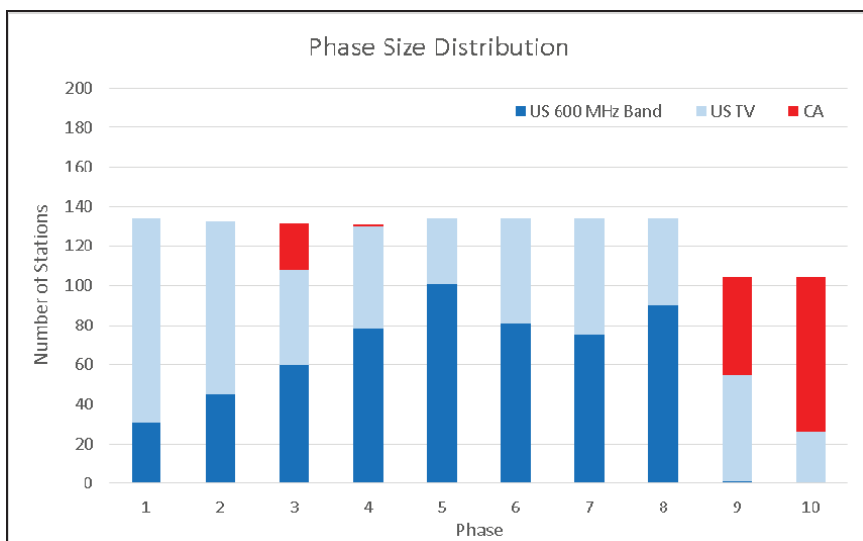
## 2. Preliminary Results with Modified Constraints

25. To illustrate the reasons underlying the constraints and objectives proposed above, this section presents comparable results under an 84 MHz clearing target scenario using alternative

constraints. We chose to use the 84 MHz clearing target to illustrate these tradeoffs because the results are generally similar to those obtained using higher clearing targets. In this 84 MHz scenario the following constraints were applied instead of the proposed constraints above: (a) instead of not allowing any temporary channel assignments, a small number of temporary channel assignments were allowed; (b) instead of allowing temporary pairwise interference increases of up to 2 percent, pairwise interference increases were limited to 0.5 percent and, conversely, allowed to go up to 5 percent; and (c) instead of requiring that all stations in a DMA be assigned to no more than two different transition phases, the restriction was tightened to assign all stations within a DMA to the same transition phase and, conversely, loosened to require that all stations in a DMA be assigned to no more than three different transition phases. The results of applying these alternative constraints are shown in the figures and tables below. We invite comment on whether any of these alternative constraints should be adopted.

**a. Temporary Channel Assignments**

26. Figure 6 below shows the impact of allowing 50 temporary channel assignments on the phase size distribution. Table 2 shows how allowing a small number of temporary channel moves can reduce the size of linked-station sets. The results in this table indicate that allowing up to 50 temporary channel assignments is likely to significantly reduce the size of the largest linked-station set, reduce the number of U.S. stations remaining in the 600 MHz Band in Phase 9, and reduce the number of DMAs requiring more than one rescan.



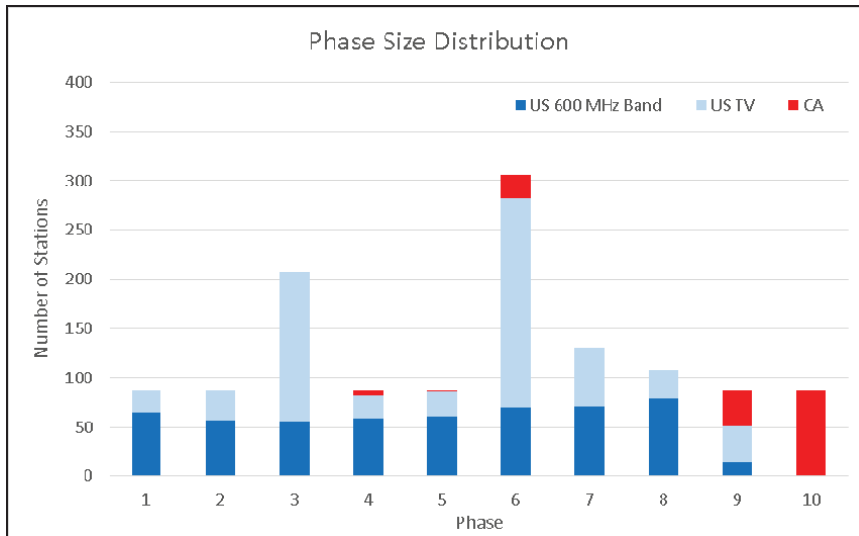
**Figure 6:** 84 MHz scenario with 50 temporary channels

# of temporary channel moves	# of stations that must move to new channels	# of linked-stations	Size of the largest linked-station set	Median linked-station set size	# of linked-station sets	# of stations in largest phase	% of U.S. DMAs with more than one rescan
0	1,274	710	105	3	85	134	42%
50	1,274	677	83	3	79	134	36%

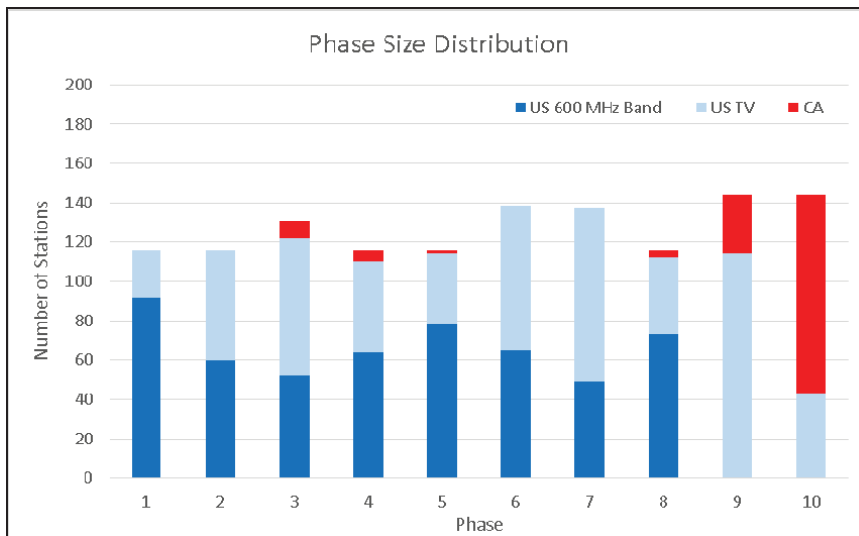
**Table 2:** Comparison between different numbers of temporary channel moves at 84 MHz

**b. Pairwise Interference**

27. Figures 7 and 8 and Table 3 below show the results if (a) only 0.5 pairwise interference increases are allowed on a temporary basis during the transition and (b) pairwise interference increases up to 5 percent are allowed.<sup>20</sup> Figures 7 and 8 and Table 3 reflect that, as the amount of temporary pairwise interference allowed is increased, more U.S. TV-Band and Canadian stations transition in the final two phases, and fewer DMAs require more than one rescan. As compared to the 0.5 percent results, the higher interference levels substantially reduced the maximum number of linked-station sets.



**Figure 7:** 84 MHz scenario at 0.5% pairwise temporary increased interference limit



**Figure 8:** 84 MHz scenario 5.0% pairwise temporary increased interference limit

<sup>20</sup> The new pairwise interference is calculated relative to pre-auction interference-free service population. This is consistent with how stations were protected during the auction itself. See *IA R&O*, 29 FCC Rcd at 6649-51, paras. 172-82.

Pairwise interference	# of stations that must move to new channels	# of linked-stations	Size of largest linked-station set	Median linked-station set size	# of linked-station sets	# of stations in largest phase	% of U.S. DMAs with more than one rescan
0.5%	1,274	811	305	3	52	306	44%
2.0%	1,274	710	105	3	85	134	42%
5.0%	1,274	717	107	3	111	144	38%

**Table 3:** Comparison between different levels of pairwise interference at 84 MHz

28. Staff analysis also indicates that, when pairwise temporary interference is allowed to increase, aggregate interference levels (calculated consistent with the methodology presented in the Aggregate Interference PN)<sup>21</sup> do not exceed the pairwise limits except for a few cases. In those few cases, the aggregate interference for any one station is never more than double the pairwise limit. Table 4 shows the results of the staff's analysis.

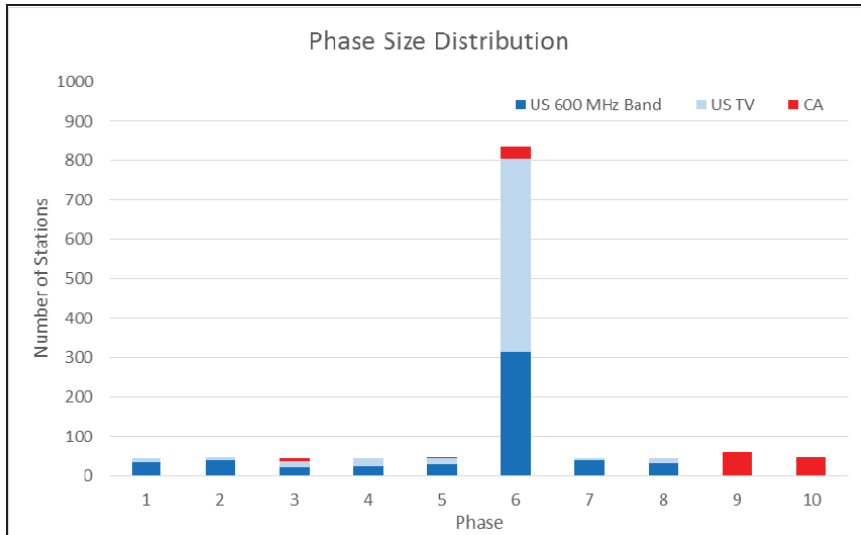
Pairwise temporary interference limit	Max aggregate interference	Number of stations with aggregate interference greater than 2%
0.5%	1.39%	0
2.0%	2.96%	14
5.0%	9.71%	103 (11 Stations above 5%)

**Table 4:** 84 MHz scenario showing impact on aggregate interference when a given level of pairwise interference is allowed.

### c. DMA Restrictions

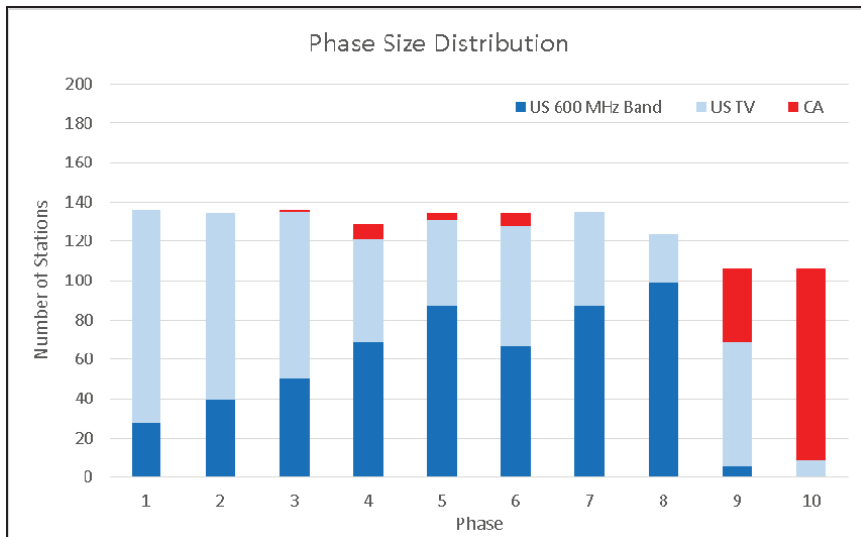
29. Requiring that all stations within a DMA be assigned to the same transition phase resulted in approximately two thirds of all stations being assigned to the same phase. Figure 9 illustrates this result under an 84 MHz scenario.

<sup>21</sup> See *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, GN Docket No. 12-268, ET Docket No. 13-26, ET Docket No. 14-14, Second Report and Order and Further Notice of Proposed Rulemaking, 29 FCC Rcd 13071, 13074-78, paras. 5-12 (2014).



**Figure 9:** 84 MHz scenario where all stations within a DMA assigned to same phase

30. On the other hand, as shown in Figure 10 and Table 5 below, when stations in the same DMA are allowed to transition in up to three different phases, the number of DMAs requiring more than one rescan actually decreases compared to the baseline run. This is because allowing a few DMAs to be subject to three rescans gives the optimization software more flexibility to improve the percentage of DMAs that only require one rescan. Loosening this constraint also results in more stations moving out of the 600 MHz Band sooner.



**Figure 10:** 84 MHz scenario where stations within a DMA assigned to no more than three phases



# of phases for stations within same DMA	# of stations that must move	# of linked-stations	Size of largest linked-station set	Median linked-station set size	# of linked-station sets	# of stations in largest phase	% of U.S. DMAs with more than one rescan
1	1,274	850	640	2	50	835	0%
2	1,274	710	105	3	85	134	42%
3	1,274	747	106	3	87	136	33%

*Table 5: Comparison between the number of phases for stations within the same DMA at 84 MHz*

#### IV. THE PHASE SCHEDULING TOOL

##### A. Overview

31. After stations are assigned to phases by applying the Phase Assignment Tool described above, we propose to use the Phase Scheduling Tool to help determine the phase completion date for each phase.<sup>22</sup> The Phase Scheduling Tool estimates the total time necessary for stations within a phase to perform the tasks required to complete the transition process. In this section, we discuss the Phase Scheduling Tool and the proposed inputs which include the specific tasks required for stations to transition and the estimated time required to complete each task.

32. The Phase Scheduling Tool models the various processes involved in a station transitioning to its post-auction channel. It divides these processes into two sequential stages: the “Pre-Construction Stage” and the “Construction Stage.” While separate processes within a stage may occur concurrently, such as equipment procurement and zoning applications, all processes within the Pre-Construction Stage must be complete before the station is ready to move to the Construction Stage. For example, in the model, the process of installing a new primary antenna cannot occur until after the new antenna is manufactured and delivered. A transition phase cannot end until all stations in the model assigned to that phase have completed both stages and are ready to operate on their post-auction channels.

33. Some processes require specialized resources that may be in limited supply. The Phase Scheduling Tool models these limited resources by constraining the amount available at any given time. If a station needs a constrained resource to complete a process, and the resource is unavailable because other stations are using it, the station is placed in a queue until the required resource is available. As described in more detail below, the processes within each phase are not designed to be a comprehensive listing of every task; we have instead separated those processes which need resources that are most limited in supply and therefore likely will have the biggest impact on scheduling.

34. In each Stage, the Phase Scheduling Tool uses two inputs: (1) the time it would take for a station to complete the tasks of that stage if all resources are available when needed; and (2) the estimated availability of constrained resources. The Phase Scheduling Tool uses these inputs to calculate how long it will take each station within a transition phase to complete all work associated with both Stages. The output of the Tool is the estimated number of weeks from the start of the transition required for all stations assigned to a phase to complete all of the necessary transition tasks, test equipment on their post-auction channels, and be ready to operate on their post-auction channels.

35. Since it is not possible to know the exact order stations will begin each process, the Phase Scheduling Tool uses discrete event simulation to model this uncertainty. The Phase Scheduling Tool does assume, however, that a station assigned to an earlier phase will begin its Pre-Construction Stage processes requiring a constrained resource (e.g., ordering an antenna) before a station assigned to a later phase. By assigning the station order within a transition phase randomly, called the “simulation order,” and simulating the transition processes, the Phase Scheduling Tool provides a single estimate of the time

<sup>22</sup> The phase completion date for each phase will also be the construction permit deadline assigned to each station within a given phase. Unless otherwise authorized by the Commission, it is by this date that each station within a phase will be required to cease operating on its pre-auction channel.

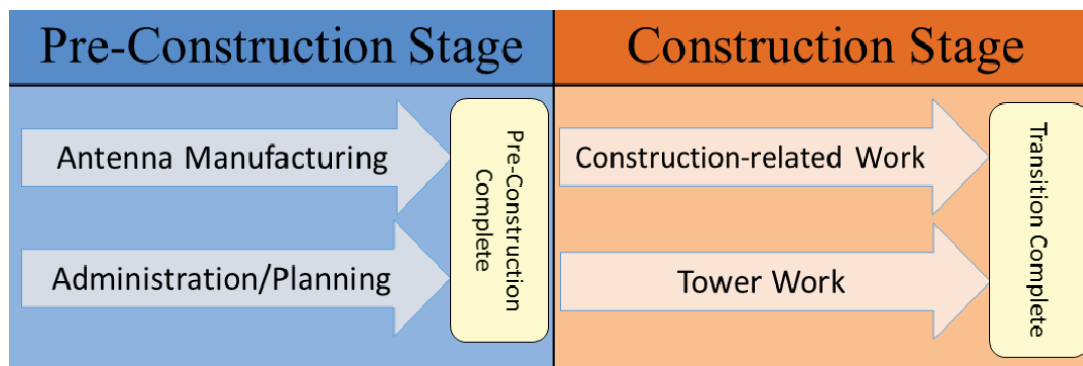
to complete each transition phase. By repeating this simulation multiple times with stations in the same phase entering the system in a new random simulation order, the Phase Scheduling Tool produces a range of completion times for each phase. The Bureau intends to use this range in determining appropriate phase deadlines given the composition of the individual stations in each phase.

36. The Phase Scheduling Tool also enables the staff to analyze the sensitivity of transition phase time estimates based on changes in input data. During the transition, as new information becomes available, the Tool can be rerun to assess the potential impact of unforeseen developments on the overall schedule.

37. The following subsections detail the specific processes or tasks that we propose to model for each stage, as well as the estimated time and resource availability for each process. The proposed estimates are based on data contained in the Widelity Report,<sup>23</sup> submissions from stakeholders, and informational discussions with tower crew companies, other antenna and transmitter manufacturers, and broadcasters.<sup>24</sup> We believe that the proposed estimates are conservative and that they reasonably capture each aspect of the transition. We invite comment on these proposed inputs. The final subsection shows sample outputs of the Phase Scheduling Tool for the two baseline Phase Assignment Tool runs set forth in the prior section.

**B. Modeling the Transition Stages**

38. As stated earlier, the individual tasks required for a station to complete its transition have been grouped into two stages: the Pre-Construction Stage and the Construction Stage. In the Pre-Construction Stage, a station completes two tasks: ordering and delivery of the main and auxiliary antennas; and administration and planning work, which includes zoning, administration, legal, possible structural tower improvements, equipment modifications, and other activities. In the Construction Stage, a station completes two additional tasks: construction-related work and tower crew work. This process is shown in Figure 11 below.



**Figure 11:** Overview of the transition stages

<sup>23</sup> See *Media Bureau Seeks Comment on Widelity Report and Catalog Costs of Potential Expenses and Estimated Costs*, GN Docket No.12-268, Public Notice, 29 FCC Rcd 2989 (MB 2014) (*Widelity Report*).

<sup>24</sup> See, e.g., Letter from Digital Tech Consulting, Attach., *Broadcast Spectrum Repacking Timeline, Resource and Cost Analysis Study*, 24 (filed Nov. 6, 2015) (*DTC Study*); Letter from Digital Tech Consulting, Attach., *Response to T-Mobile and CCA Reports on the Broadcast Spectrum Repacking Timeline, Resource and Cost Study* (filed Mar. 17, 2016) (*DTC Responsive Study*); Letter from T-Mobile USA, Inc., Attach., *On Time and On Budget: Completing the 600 MHz Incentive Auction Repacking Process within the FCC's 39-Month Relocation Deadline and the Budget Established by Congress* (Feb. 17, 2016) (*T-Mobile Study*); Letter from T-Mobile USA, Inc., Attach., *On Time and On Budget: A Response to Digital Tech Consulting, Inc.'s March 2016 Presentation on the State of Broadcaster Relocation Resources* (filed May 11, 2016) (*T-Mobile Responsive Study*).

39. The Phase Scheduling Tool groups together all tasks within a stage that can be done regardless of how many other stations are performing similar tasks. However, since there are two constrained resources that are dependent on the actions of others (antenna deliveries and tower crew availability), these tasks are separated out and the model considers how resource availability impacts the total completion time for any station in either stage. We note that there are many other resources that are not specifically identified but are essential to completion of the transition process. Based on the staff's analysis and the record developed to date, resources such as auxiliary antenna manufacturing, transmitter manufacturing, transmission line manufacturing and RF component installers will not affect the time required for a station to complete its transition. The availability and manufacturing capacity of these resources have been identified as being sufficient to fulfill the expected demand during the transition (i.e., these resources have been designated as being "unconstrained") and therefore are not broken out separately in the Phase Scheduling Tool. Instead, as illustrated in Figure 11, the tasks related to these unconstrained resources have been grouped into the general tasks of Administration/Planning, which is within the Pre-Construction Stage, and Construction-related Work, which is within the Construction Stage.<sup>25</sup> The Phase Scheduling Tool uses conservative estimates for the time requirements in order to safely over-estimate the individual needs of each station.

### C. Pre-Construction Stage Inputs

40. There are two components to the Pre-Construction Stage: (1) the time required for antenna equipment to be ordered, manufactured and delivered (a significant constraint); and (2) the time required for all other planning and administration activities necessary to prepare for construction (called "Administration/Planning"). The Administration/Planning component includes zoning, administration, legal work, and pre-construction alterations to tower and transmitter equipment. Since administration and planning activities take place in parallel and the activities of one station are unlikely to impact the ability of others to perform the same activities, the model simply estimates the *total time* needed to complete all of these activities.

41. The proposed Phase Scheduling Tool categorizes stations based on the difficulty of completing these activities. The Commission used a similar "bucketing" approach for categorizing stations as was used when determining the Final Channel Assignment.<sup>26</sup> Proposed time estimates were derived by taking estimates from Widelity and, where appropriate, adding "slack" time so that the overall estimate of the time required would be a conservative one.<sup>27</sup> The proposed time estimates are shown in Table 6 below.

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<sup>25</sup> Other required resources such as RF consultants and structural engineers will need to complete their work by the end of the initial 3-month filing window for construction permits, and therefore, are also not considered a constrained resource for purposes of the Phase Scheduling Tool.

<sup>26</sup> *Application Procedures for Broadcast Incentive Auction Scheduled to Begin on March 29, 2016*, GN Docket No. 12-268, Public Notice, 30 FCC Rcd 11034, 11176 (Appendix E) (2015) (*Application Procedures PN*).

<sup>27</sup> The Widelity Report estimates that Administration/Planning could take up to 72 weeks for "complicated" stations (primarily due to zoning), up to 20 weeks for the average DTV station and up to 12 weeks for the average Class A or other lower power station. To be conservative, we added another 12 weeks to the Administration/Planning estimates for the non-complicated stations since these timelines were more aggressive. However, we expect this work will start during the 3-month filing window for construction permits (if not earlier, when each station receives their confidential letter with their final channel assignment). *Widelity Report*, 29 FCC Rcd at 3037-46 (Widelity Case Studies).

Station Classification	Administration/ Planning	Based on Widely Case Study <sup>28</sup>
“Complicated” <sup>29</sup>	72 Weeks	Case 4
DTV	32 Weeks	Case 1
Class A	24 Weeks	Case 3

**Table 6:** Proposed estimates for Administrative/Planning work

42. The Administration/Planning time estimate sets the *minimum* amount of time required for a station to complete the Pre-Construction Stage. While Administration/Planning work is occurring, stations likely will place orders for their main antennas. The proposed time estimates for this component of the Pre-Construction Stage include manufacturing time once the antenna manufacturers receives orders from stations, as well as delivery time. If no station had to wait for its main antenna to be manufactured and delivered, then the maximum amount of time it would take any station to complete the Pre-Construction Stage would be the 72 weeks allotted for the complicated stations to complete their planning activities. However, the ability of manufactures to produce enough antennas may impact the overall schedule. Therefore, the Phase Scheduling Tool includes antenna manufacturing and delivery as a specific resource constraint. Each station within a Transition Phase must receive its antenna delivery in order for it to complete the Pre-Construction Stage.

43. Stations are divided into two categories, based on the assumption that manufacture and delivery of directional antennas for full power stations will require more time than for non-directional and Class A antennas (of either type). The time estimates shown in Table 7 are based on the assumption that the antenna manufacturers will begin manufacturing antennas as soon as the orders are received unless they are manufacturing at their current capacity.<sup>30</sup>

Station Classifications	Time to deliver requested antenna
Directional DTV Antennas	24 Weeks
Non Directional and Class A Antennas	12 Weeks

**Table 7:** Standard estimates for satisfying antenna requests

44. We also propose to include in the Phase Scheduling Tool a specific number of antennas that can be manufactured and delivered at any given time. Based on those numbers, some stations may be able to receive their antenna without waiting for any additional time, but other stations may have to wait for their antennas to be delivered. The Phase Scheduling Tool will place such stations in a queue until the antenna can be delivered, based on the station’s assigned number in a simulation order.<sup>31</sup> In addition, the

<sup>28</sup> Details on each of these case studies can be found in the Widely Report. *Id.*

<sup>29</sup> The definition of a “complicated” station is consistent with that used in determining the Final Television Channel Assignment Plan. See *Broadcast Incentive Auction Scheduled to Begin March 29, 2016; Procedures for Competitive Bidding in Auction 1000, Including Initial Clearing Target Determination, Qualifying to Bid, and Bidding in Auctions 1001 (Reverse) and 1002 (Forward)*, GN Docket No. 12-268, Public Notice, 30 FCC Rcd at 8975, 9104, paras. 279-80 (2015) (*Auction 1000 Bidding Procedures PN*); *Application Procedures PN*, 30 FCC Rcd at 11176 (Appendix E).

<sup>30</sup> The time estimates for antenna delivery are generally consistent, if not more conservative, than those cited in the Widely Report, which was generally 3 months except for deliveries to complicated stations. Widely Report, 29 FCC Rcd at 3037-46.

<sup>31</sup> For example, assume that five stations (A, B, C, D, and E) with simulation order 1, 2, 3, 4, and 5 respectively, need to have an antenna delivered to complete the Pre-Construction Stage, there are currently only three antennas available, but additional antennas are being manufactured over time. Stations A, B, and C will each be able to have  
(continued....)

Phase Scheduling Tool will assume that manufacturers have an inventory of 20 antennas at the start of the 39-month transition period, and that capacity will increase over the course of the transition period. These proposed assumptions are listed in Table 8 below.<sup>32</sup>

Category	Capacity		
	Year 1	Year 2	Year 3
Antenna Manufacturing Capacity	80/Month	84/Month	88/Month

**Table 8: Antenna Manufacturing Capacity Estimates**

45. The completion of the Pre-Construction Stage for a given station is the maximum completion time for these two activities – either the time required for Administration/Planning activities or the time required for the manufacture and delivery of the antennas. For stations in early phases, the Pre-Construction Stage is usually the time required for Administration/Planning. For a station assigned to a later phase, the station will likely have completed the Administration/Planning activities before the delivery of its antenna, and therefore, its Pre-construction Stage will be completed when the antenna is delivered.

#### **D. Construction Stage Inputs**

46. The approach to modeling the Construction Stage is similar to that of the Pre-Construction Phase and consists of two activities: (1) the time to complete all general facets of construction (called “Construction-Related Work”); and (2) the time required by tower crews to complete installation of equipment on the tower. As with Pre-Construction Stage activities, these activities can occur in parallel but the estimated completion time for the Stage is the time required to complete both these activities. In addition, like the Administration/Planning category in the Pre-Construction Stage, the Construction-Related Work category is a catch-all category of work for the Construction Stage. The estimated time for this activity includes estimates of the time to complete all construction work and associated management and coordination activities. More specifically, Construction-Related Work includes estimates for the time associated with installing the transmitter components, combiners, RF mask filters and the transmission line to the tower base. Construction-Related Work also allows time for any possible installation of liquid cooling systems, AC power, and connection to remote control equipment and input signal connections if required. Finally, Construction-Related Work includes time required for performing any tower modifications and any final testing of the system. Table 9 proposes estimates of the time to complete all work included in the “Construction-Related Work” category.<sup>33</sup>

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 their order fulfilled for their antenna without having to wait. Stations D and E will need to wait for their order for an antenna to be fulfilled. When manufacturing capacity becomes available, station D will receive it, and when capacity for a second antenna becomes available station E will receive it.

<sup>32</sup> These estimates are based on public statements by manufacturers regarding their planned ramp up in anticipation of the transition and the assumption that these manufacturers plan on maintaining market share. *See, e.g.*, Wireless Estimator, ERI to accelerate completion of TV channel repack post FCC’s Broadcast Incentive Auction, (April 19, 2016), <http://wirelessestimator.com/articles/2016/eri-and-t-mobile-deal-for-crews-and-facilities-puts-39-month-repack-deadline-closer-to-being-met/>. We also assumed a conservative 5 percent growth rate.

<sup>33</sup> Based on Widelity time estimates for the various work streams that fall under Construction-Related Work. *See Widelity Report*, 29 FCC Rcd at 3037-46.

Station Classifications	Construction-Related Work	Based on Widelity Case Study #
“Complicated”	32 Weeks	Case 4
DTV	24 Weeks	Case 1
Class A	12 Weeks	Case 3

**Table 9:** Minimum Estimated Time for Construction-Related Work

47. The Construction-Related Work estimates the minimum amount of time required for a station to complete the Construction Stage. The other process in the Construction Stage work is tower work. The time required for tower work is both tower and antenna specific. Table 10 lists the different characteristics that determine the amount of time required to perform tower work.<sup>34</sup>

Tower Height	Base Time (in Days)	Change from Base Time							
		Location		Type		Transmission Line		Licensed Auxiliary Antenna	
		Side	Other	Panel	Other	Flexible	Rigid	Yes	No
0-499 Feet	10	0	0	5	0	-5	0	4	0
500-999	15	0	0	3	0	0	0	5	0
1000-1999	25	-5	0	0	0	0	0	3	0
2000 or over	40	-5	0	0	0	0	0	3	0

**Table 10:** Tower Crew Time Estimates

48. If a station did not need to wait for an antenna crew to become available in order to complete its tower work, then the amount of time the station would take to complete the Construction Stage would be the larger of the time estimated for construction-related work and the time estimated for the station to complete work on its tower. However, not every station will be able to have a tower crew as soon as needed. The Phase Scheduling Tool will place any station that is waiting for a tower crew to become available in a queue until a crew becomes available, based on the station’s assigned number in a simulation order.<sup>35</sup> Stations will be removed from the queue according to their simulation order.<sup>36</sup>

49. We propose to include in the Phase Scheduling Tool specific estimates regarding the number of available tower crews. The record developed to date reflects different estimates as to the number and types of tower crews that will be available.<sup>37</sup> In light of the variance in these estimates, we

<sup>34</sup> These times were based on feedback from industry. *See, e.g.*, T-Mobile Responsive Study at 39-40. This table does not reflect the time to install an auxiliary antenna. *See infra* para. 51 (describing how auxiliary antennas are handled in the Tool).

<sup>35</sup> For example, if five stations are ready to construct their facilities in the model at the same time, but there are only two available tower crews, some of the stations will have to wait for the tower crews to complete work for other stations before they are able to begin construction on their facilities. Once a crew becomes available the station with the lowest simulation order will begin its tower work.

<sup>36</sup> *See infra* para. 50 (discussing the three possible queues for tower crews in which stations can be placed). *See also* Table 11 (providing estimates for the size of each of these pools).

<sup>37</sup> *Widelity Report*, 29 FCC Rcd 2989, 3011-12 (estimating no more than 14 qualified tower crews to work on complex sites and 30 to 40 other crews that can handle simpler jobs. It may be possible to supplement with crews from Canada and members of international tower crews); DTC Responsive Study at 17-21 (estimating 21 qualified tower crews for complex sites and four additional regional crews for simpler projects); Letter from T-Mobile USA, Inc., Attach., *On Time and On Budget: Completing the 600 MHz Incentive Auction Repacking Process within the FCC’s 39-Month Relocation Deadline and the Budget Established by Congress*, 37-40 (Feb. 17, 2016) (T-Mobile (continued....))



propose to place tower crews into three buckets: one for U.S. crews capable of servicing towers that are particularly difficult to work on due to height or location; one for U.S. crews that are capable of servicing easier towers; and one for Canadian crews. U.S. stations on towers that are above 300 feet in height and that are top-mounted or located on a candelabra can only draw from the pool of U.S. crews that can handle such difficult sites. Other U.S. stations can only draw from the other pool of U.S. crews, on the assumption that these difficult site crews will be fully occupied. Canadian stations can only draw from the pool of Canadian crews. It is likely that crews will travel between countries, but separating the crews in this way provides a more conservative estimate of the number of crews available in each country. We expect that the number of crews will increase as the transition proceeds.<sup>38</sup> The specific estimates we propose are set forth below in Table 11.<sup>39</sup>

Country	Number of Crews		
	Year 1	Year 2	Year 3
USA – Difficult Sites	25	26	27
USA – Other Sites	26	28	30
Canada	22	22	22

**Table 11: Number of Tower Crews**

50. Other assumptions incorporated into the proposed Phase Scheduling Tool are:

- (1) The estimated time required to complete work on a tower is reduced or discounted if more than one station on the tower is transitioning in the same phase. The Phase Scheduling Tool assumes that antenna installations will be performed by a single tower crew at the same time for all stations located on a given tower that are assigned to the same phase. The total estimated time for work on the tower will be the time required for the most difficult station plus 10 percent for the second station and five percent for each additional station up to an additional 30 percent. Based on informal discussions with industry and the record developed to date, we believe that these proposed discounts are appropriately conservative.
- (2) The Phase Scheduling Tool assumes that 75 percent of all stations (including those with a licensed auxiliary antenna) will need to install an auxiliary antenna. For each station requiring an auxiliary antenna, one additional week of tower crew time is added to the tower crew time, which is the maximum time required for an auxiliary in Table 10.
- (3) Where the estimated time required to complete an entire transition phase is less than four weeks because much of the work (other than transmission testing on the new channel) has already occurred prior to the start date for the testing period of that transition phase, the testing period window is scaled up to allow four weeks for testing.

**E. Sample Output**

51. This section provides sample results of the Phase Scheduling Tool using the baseline Phase Assignment Tool results presented in section III.B.1 above and the proposed constraints and objectives in section III.A for simulated auction outcomes involving 114 MHz and 84 MHz clearing scenarios. Although Tables 12 and 13 below show the average number of weeks from the start of the phase to phase

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Study) (estimating 41 tower crews and an additional 27 crews that firms expect to hire in the future); T-Mobile Responsive Study at 36 (identifying 51 qualified tower crews).

<sup>38</sup> See, e.g., Letter from T-Mobile USA, Inc., 2 (filed Apr. 12, 2016) (representatives for RIO Steel & Tower and Grundy Telecom Integration have expressed their plans to hire additional “experienced climbers”); *Widelity Report*, 29 FCC Rcd at 3012 (stating that additional crews could come from the cellular industry and from other countries).

<sup>39</sup> Tower crew estimates were based on feedback from industry and from ISED Canada. We assume a conservative growth rate in U.S. tower crews of 5%, but no growth in Canadian crews (which is very conservative).

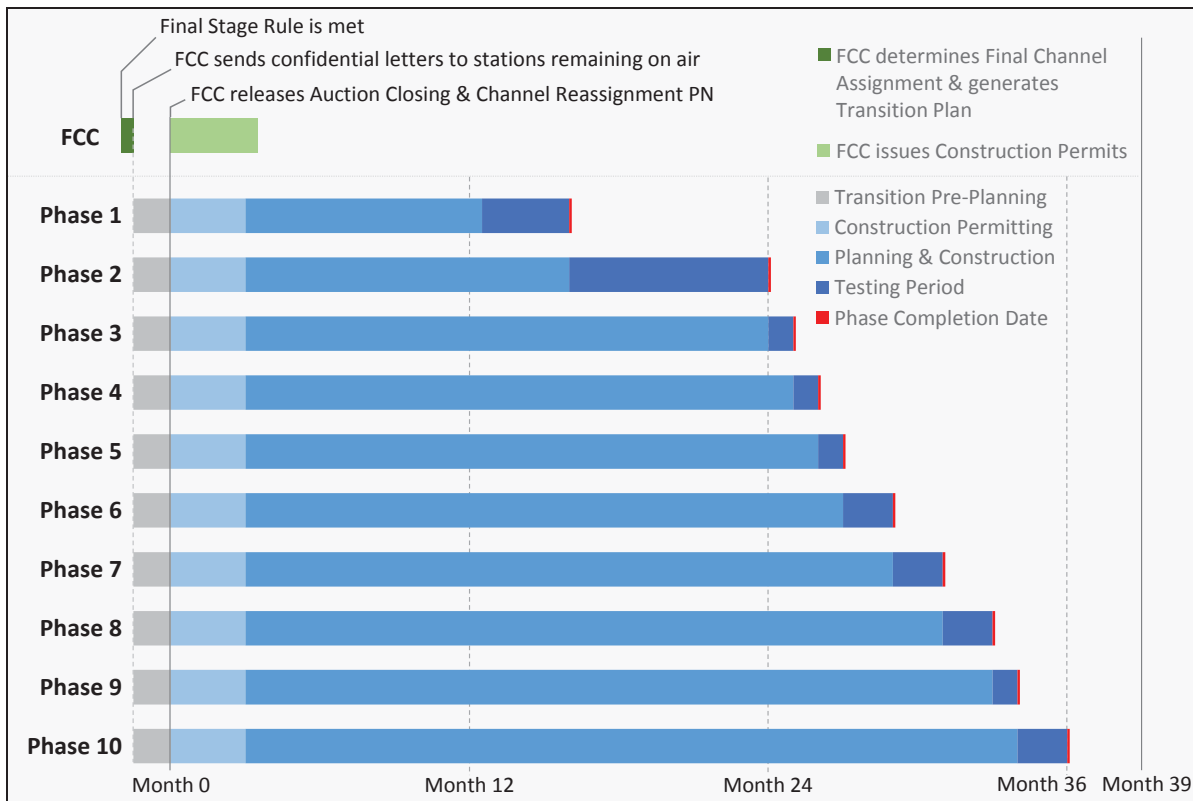


completion date, each phase completion date will be listed as a specific date when the final transition plan is released.<sup>40</sup> This outputs of each clearing scenario are represented graphically below in Figures 12 and 13, respectively. As both Figures show, stations within each phase cannot start testing until the prior phase is complete, and all stations within a phase must cease operating on their pre-auction channels by the phase completion date.

**114 MHz Baseline**

	Phase Number									
	1	2	3	4	5	6	7	8	9	10
Average number of weeks from Phase Start to Phase Completion Date	70	104	108	112	116	123	131	138	143	149

*Table 12: Number of weeks from the start of a phase to the phase completion date at 114 MHz*



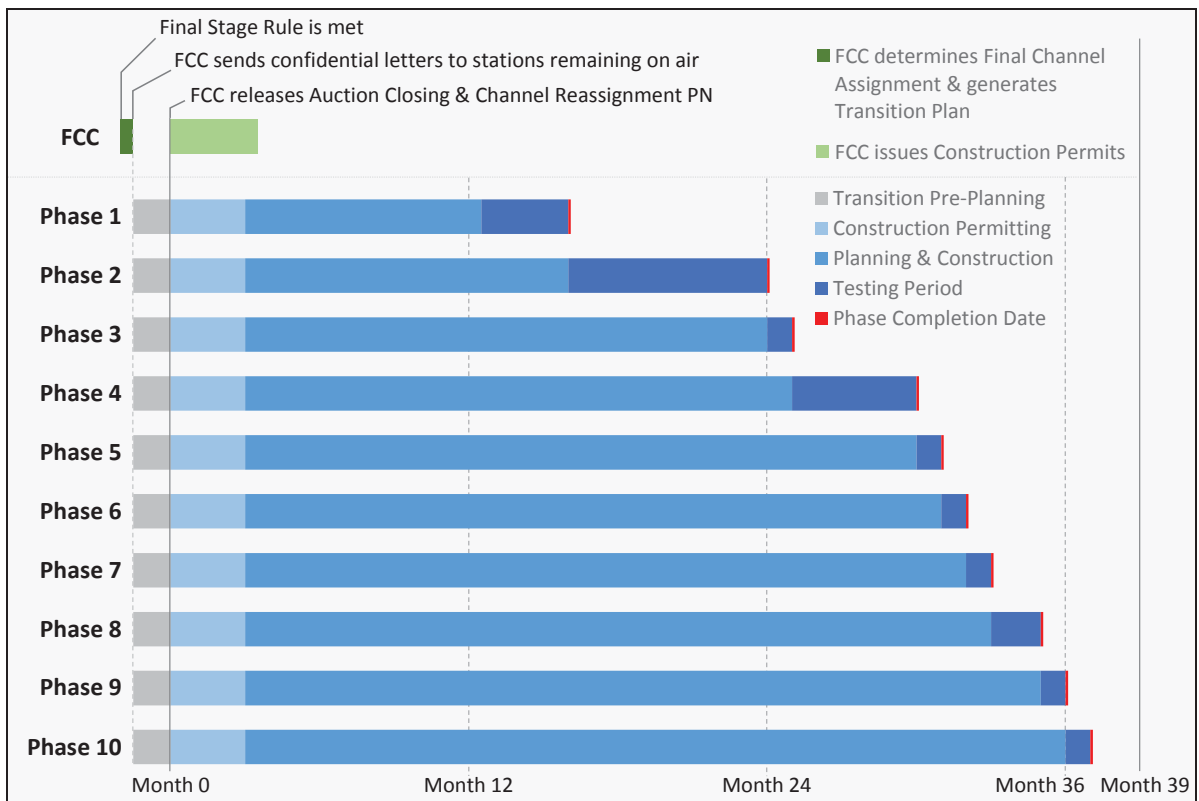
*Figure 12: Phase Timelines at 114 MHz*

<sup>40</sup> The relatively longer test period for stations in phase 2 is a result of the fact that this is the first phase in which “complicated” stations can be assigned. Thus, it is likely that there will always be a longer test period for stations in phase 2.

**84 MHz Baseline**

	Phase Number									
	1	2	3	4	5	6	7	8	9	10
Average number of weeks from Phase Start to Phase Completion Date	69	104	108	129	133	137	143	151	156	160

**Table 13:** Number of weeks from the start of a phase to the phase completion date at 84 MHz



**Figure 13:** Phase timelines at 84 MHz

## APPENDIX B

### Initial Regulatory Flexibility Act Analysis

1. As required by the Regulatory Flexibility Act of 1980, as amended (“RFA”)<sup>1</sup> the Commission has prepared this Initial Regulatory Flexibility Analysis (“IRFA”) concerning the possible significant economic impact on small entities of the policies and rules proposed in the this PN (*Transition Schedule PN*). Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments provided on the first page of the *Transition Schedule PN*. The Commission will send a copy of the *Transition Schedule PN*, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (“SBA”).<sup>2</sup> In addition, the *Transition Schedule PN* and IRFA (or summaries thereof) will be published in the Federal Register.<sup>3</sup>

2. The Regulatory Flexibility Act of 1980, as amended (“RFA”),<sup>4</sup> requires that a regulatory flexibility analysis be prepared for notice and comment rule making proceedings, unless the agency certifies that “the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities.” The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”<sup>5</sup> In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.<sup>6</sup> A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).

#### A. Need for, and Objectives of, the Proposed Rule Changes

3. The Federal Communications Commission (Commission) delegated authority to the Media Bureau (Bureau) to establish construction deadlines within the 39-month post-incentive auction transition period for television stations that are assigned to new channels in the incentive auction repacking process. Pursuant to the Commission’s direction, the Bureau, in consultation with the Wireless Telecommunications Bureau (WTB), the Office of Engineering and Technology (OET) and the Incentive Auction Task Force (IATF), is developing a plan for a “phased transition schedule.” The purpose of the *Transition Schedule PN* is to invite comment on the plan.

4. The Bureau proposes to use a Phase Assignment Tool that will use mathematical optimization techniques to assign stations to one of 10 “transition phases.” The phases will have sequential testing periods and deadlines or “phase completion dates.” The phase completion date is the last day that a station in its assigned phase may operate on its pre-auction channel. The specific constraints and objectives the Bureau proposed are set forth in Appendix A to the *Transition Schedule PN*.

5. The Bureau proposes to use a Phase Scheduling Tool to estimate the time required for stations in each phase to complete the tasks required to transition to their pre-auction channels in light of resource availability. The Bureau will use the Phase Scheduling Tool to guide it in establishing phase completion dates for each phase. This is the date by which stations within that phase must cease operations on their pre-auction channels. Appendix A details the specific tasks or processes that the

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<sup>1</sup> See 5 U.S.C. § 603. The RFA, see 5 U.S.C. §§ 601-612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (“SBREFA”), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

<sup>2</sup> See 5 U.S.C. § 603(a).

<sup>3</sup> See *id.*

<sup>4</sup> See 5 U.S.C. § 603.

<sup>5</sup> See 5 U.S.C. § 601(6).

<sup>6</sup> See 5 U.S.C. § 601(3).

Bureau proposes to model in the Phase Scheduling Tool for each stage of the transition process, as well as the estimated time and resource availability for each task.

6. Under the proposed plan, the transition phases will begin at the same time, but will have sequential phase completion dates. Each phase will have a defined “testing period,” ending with the phase completion date. For each phase after the first one, the testing period will begin on the day after the phase completion date for the prior phase. The need for a station to coordinate with other stations during the testing period will depend on whether it is part of a “linked-station set,” that is, a set of two or more stations assigned to the same phase with interference relationships or “dependencies.” Stations that are not part of a linked-station set may test on their post-auction channels during the testing period without the need for coordination. Stations that are part of a linked-station set must coordinate testing with stations in the set so as not avoid undue interference. Such stations must transition to their post-auction channels simultaneously.

7. As part of the proposed plan, the Bureau is seeking comment on whether to allow increased temporary interference between stations that are still operating on their pre-auction channels and stations testing or operating on their post-auction channels in order to facilitate the transition. The staff’s analysis indicates that allowing temporary pairwise (station-to-station) interference above the 0.5 percent authorized by the rules governing increased permanent interference is likely to significantly reduce inter-dependencies between stations and facilitate coordination. The Bureau proposes to allow temporary pairwise interference increases of up to two percent, which it believes will produce substantial benefits without undue disruption to television service during the transition.

8. The Bureau is also considering whether to assign some stations to temporary channels during the transition as another means of reducing the size or number of linked-station sets and facilitate the transition. The Bureau proposes to limit such assignments, however, to stations in complex “cycles” of inter-dependency. The Bureau also proposes to limit such assignments to channels that are close to stations’ ultimate channel assignments, and to relatively low power stations, in order to limit the associated burdens and costs. Temporary channel assignments would replicate pre-auction coverage area and population served. Because the Bureau anticipates that stations would need to commence operations on temporary facilities early in the transition, it proposes to require that stations assigned to temporary channels apply for special temporary authority (STA) within ninety days of the *Closing and Reassignment PN*’s release.

9. If the Bureau decides to use temporary channel assignments, it tentatively concludes that stations will have must-carry rights on their temporary channels. It also proposes that any temporary channel assignments in the 600 MHz Band would be subject to the inter-service interference (ISIX) protections adopted in the *ISIX Third Report and Order*. In addition, a full power or Class A station operating on a temporary channel could displace a low power television (LPTV) station. An operating LPTV station displaced by a temporary channel assignment could file for a new channel during the post-auction LPTV displacement window. Alternatively, the displaced LPTV station could go silent or seek temporary authorization to operate its facility at variance from its authorized parameters in order to prevent interference.

10. Because the Commission anticipated the possibility of using temporary channels to facilitate the transition and stated that the reasonably incurred costs of equipment needed to move to temporary channels are eligible for reimbursement, the Bureau notes that such costs would be eligible for reimbursement in the same manner as costs related to construction of permanent post-auction channel facilities. Multichannel Video Programming Distributors (MVPDs) likewise should be eligible for reimbursement of all eligible costs in order to continue to carry a reassigned station operating on a temporary channel.

## **B. Legal Basis**

11. The proposed action is authorized pursuant to Sections 1, 4, 301, 303, 307, 308, 309, 310, 316, 319, 338, 403, 614, and 615 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 154, 301, 303, 307, 308, 309, 310, 316, 319, 338, 403, 534 and 535.

## **C. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply**

12. The RFA directs agencies to provide a description of, and where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.<sup>7</sup> The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”<sup>8</sup> In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.<sup>9</sup> A small business concern is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.<sup>10</sup> Below, we provide a description of such small entities, as well as an estimate of the number of such small entities, where feasible.

13. *Television Broadcasting.* This economic census category “comprises establishments primarily engaged in broadcasting images together with sound.”<sup>11</sup> The SBA has created the following small business size standard for such businesses: those having \$38.5 million or less in annual receipts.<sup>12</sup> The 2007 U.S. Census indicates that 808 firms in this category operated in that year. Of that number, 709 had annual receipts of \$25,000,000 or less, and 99 had annual receipts of more than \$25,000,000.<sup>13</sup> Because the Census has no additional classifications that could serve as a basis for determining the number of stations whose receipts exceeded \$38.5 million in that year, we conclude that the majority of television broadcast stations were small under the applicable SBA size standard.

14. Apart from the U.S. Census, the Commission has estimated the number of licensed commercial television stations to be 1,385 stations.<sup>14</sup> Of this total, 1,221 stations (or about 88 percent)

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<sup>7</sup> 5 U.S.C. § 603(b)(3).

<sup>8</sup> 5 U.S.C. § 601(6).

<sup>9</sup> 5 U.S.C. § 601(3) (incorporating by reference the definition of “small-business concern” in 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.” 5 U.S.C. § 601(3).

<sup>10</sup> 15 U.S.C. § 632.

<sup>11</sup> U.S. Census Bureau, 2012 NAICS Definitions, “515120 Television Broadcasting,” at <http://www.census.gov/cgi-bin/sssd/naics/naicsrch>. This category description continues, “These establishments operate television broadcasting studios and facilities for the programming and transmission of programs to the public. These establishments also produce or transmit visual programming to affiliated broadcast television stations, which in turn broadcast the programs to the public on a predetermined schedule. Programming may originate in their own studios, from an affiliated network, or from external sources.”

<sup>12</sup> 13 C.F.R. § 121.201; 2012 NAICS code 515120.

<sup>13</sup> U.S. Census Bureau, Table No. EC0751SSSZ4, *Information: Subject Series – Establishment and Firm Size: Receipts Size of Firms for the United States: 2007* (515120), [http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN\\_2007\\_US\\_51SSSZ4&prodType=table](http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2007_US_51SSSZ4&prodType=table).

<sup>14</sup> See *Broadcast Station Totals as of June 30, 2016*, Press Release (MB rel. July 8, 2016) (*Broadcast Station Totals*) at [https://apps.fcc.gov/edocs\\_public/attachmatch/DOC-340211A1.docx](https://apps.fcc.gov/edocs_public/attachmatch/DOC-340211A1.docx)

had revenues of \$38.5 million or less, according to Commission staff review of the BIA Kelsey Inc. Media Access Pro Television Database (BIA) on July 2, 2014. In addition, the Commission has estimated the number of licensed noncommercial educational (NCE) television stations to be 395.<sup>15</sup> NCE stations are non-profit, and therefore considered to be small entities.<sup>16</sup> Therefore, we estimate that the majority of television broadcast stations are small entities.

15. We note, however, that in assessing whether a business concern qualifies as small under the above definition, business (control) affiliations<sup>17</sup> must be included. Our estimate, therefore, likely overstates the number of small entities that might be affected by our action because the revenue figure on which it is based does not include or aggregate revenues from affiliated companies. In addition, an element of the definition of “small business” is that the entity not be dominant in its field of operation. We are unable at this time to define or quantify the criteria that would establish whether a specific television station is dominant in its field of operation. Accordingly, the estimate of small businesses to which rules may apply does not exclude any television station from the definition of a small business on this basis and is therefore possibly over-inclusive to that extent.

16. *Class A TV and LPTV Stations.* The same SBA definition that applies to television broadcast stations would apply to licensees of Class A television stations. As noted above, the SBA has created the following small business size standard for this category: those having \$38.5 million or less in annual receipts.<sup>18</sup> The Commission has estimated the number of licensed Class A television stations to be 418.<sup>19</sup> Given the nature of these services, we will presume that these licensees qualify as small entities under the SBA definition.

17. There are also 2,090 LPTV stations and 3658 TV translator stations.<sup>20</sup> Given the nature of these services, we will presume that all of these entities qualify as small entities under the above SBA small business size standard.

18. *Wireless Telecommunications Carriers (except satellite).* The appropriate size standard under SBA rules is for the category Wireless Telecommunications Carriers. Under that size standard, such a business is small if it has 1,500 or fewer employees.<sup>21</sup> Census Bureau data for 2012, show that there were 967 firms in this category that operated for the entire year. Of this total, 955 had employment of 999 or fewer, and 12 firms had employment of 1,000 employees or more. Thus under this category and the associated small business size standard, the Commission estimates that the majority of wireless telecommunications carriers (except satellite) are small entities that may be affected by our action.<sup>22</sup>

19. *Wired Telecommunications Carriers.* The North American Industry Classification System (“NAICS”) defines “Wired Telecommunications Carriers” as follows: “This industry comprises establishments primarily engaged in operating and/or providing access to transmission facilities and infrastructure that they own and/or lease for the transmission of voice, data, text, sound, and video using wired telecommunications networks. Transmission facilities may be based on a single technology or a

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<sup>15</sup> See *Broadcast Station Totals, supra*.

<sup>16</sup> See generally 5 U.S.C. §§ 601(4), (6).

<sup>17</sup> “[Business concerns] are affiliates of each other when one concern controls or has the power to control the other or a third party or parties controls or has to power to control both.” 13 C.F.R. § 21.103(a)(1).

<sup>18</sup> 13 C.F.R. § 121.201; NAICS code 515120.

<sup>19</sup> See *Broadcast Station Totals, supra*.

<sup>20</sup> See *id.*

<sup>21</sup> 13 CFR § 121.201, NAICS code 517210.

<sup>22</sup> See

[http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN\\_2012\\_US\\_51SSSZ5&prodType=table](http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2012_US_51SSSZ5&prodType=table).



combination of technologies. Establishments in this industry use the wired telecommunications network facilities that they operate to provide a variety of services, such as wired telephony services, including VoIP services; wired (cable) audio and video programming distribution; and wired broadband Internet services. By exception, establishments providing satellite television distribution services using facilities and infrastructure that they operate are included in this industry.<sup>23</sup> The SBA has developed a small business size standard for wireline firms for the broad economic census category of “Wired Telecommunications Carriers.” Under this category, a wireline business is small if it has 1,500 or fewer employees.<sup>24</sup> Census data for 2007 shows that there were 3,188 firms that operated for the entire year.<sup>25</sup> Of this total, 3,144 firms had fewer than 1,000 employees, and 44 firms had 1,000 or more employees.<sup>26</sup> Therefore, under this size standard, we estimate that the majority of businesses can be considered small entities.

20. *Cable Television Distribution Services.* Since 2007, these services have been defined within the broad economic census category of Wired Telecommunications Carriers, which category is defined above.<sup>27</sup> The SBA has developed a small business size standard for this category, which is: All such businesses having 1,500 or fewer employees.<sup>28</sup> Census data for 2007 shows that there were 3,188 firms that operated for the entire year.<sup>29</sup> Of this total, 3,144 firms had fewer than 1,000 employees, and 44 firms had 1,000 or more employees.<sup>30</sup> Therefore, under this size standard, we estimate that the majority of businesses can be considered small entities.

21. *Cable Companies and Systems.* The Commission has developed its own small business size standards for the purpose of cable rate regulation. Under the Commission’s rules, a “small cable company” is one serving 400,000 or fewer subscribers nationwide.<sup>31</sup> Industry data shows that there are

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<sup>23</sup> U.S. Census Bureau, 2012 NAICS Definitions, “517110 Wired Telecommunications Carriers” at <http://www.census.gov/cgi-bin/sssd/naics/naicsrch>. Examples of this category are: broadband Internet service providers (e.g., cable, DSL); local telephone carriers (wired); cable television distribution services; long-distance telephone carriers (wired); closed circuit television (“CCTV”) services; VoIP service providers, using own operated wired telecommunications infrastructure; direct-to-home satellite system (“DTH”) services; telecommunications carriers (wired); satellite television distribution systems; and multichannel multipoint distribution services (“MMDS”).

<sup>24</sup> 13 C.F.R. § 121.201; NAICS code 517110.

<sup>25</sup> U.S. Census Bureau, 2007 Economic Census. See U.S. Census Bureau, American FactFinder, “Information: Subject Series – Estab and Firm Size: Employment Size of Establishments for the United States: 2007 – 2007 Economic Census,” NAICS code 517110, Table EC0751SSSZ5; available at <http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>.

<sup>26</sup> *Id.* With respect to the latter 44 firms, there is no data available that shows how many operated with more than 1,500 employees.

<sup>27</sup> See also U.S. Census Bureau, 2012 NAICS Definitions, “517110 Wired Telecommunications Carriers” at <http://www.census.gov/cgi-bin/sssd/naics/naicsrch>.

<sup>28</sup> 13 C.F.R. § 121.201; NAICS code 517110.

<sup>29</sup> U.S. Census Bureau, 2007 Economic Census. See U.S. Census Bureau, American FactFinder, “Information: Subject Series – Estab and Firm Size: Employment Size of Establishments for the United States: 2007 – 2007 Economic Census,” NAICS code 517110, Table EC0751SSSZ5; available at <http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>.

<sup>30</sup> *Id.* With respect to the latter 44 firms, there is no data available that shows how many operated with more than 1,500 employees.

<sup>31</sup> 47 C.F.R. § 76.901(e). The Commission determined that this size standard equates approximately to a size standard of \$100 million or less in annual revenues. *Implementation of Sections of the Cable Television Consumer Protection And Competition Act of 1992: Rate Regulation*, MM Docket No. 92-266, MM Docket No. 93-215, Sixth Report and Order and Eleventh Order on Reconsideration, 10 FCC Rcd 7393, 7408, para. 28 (1995).

currently 660 cable operators.<sup>32</sup> Of this total, all but ten cable operators nationwide are small under this size standard.<sup>33</sup> In addition, under the Commission's rate regulation rules, a "small system" is a cable system serving 15,000 or fewer subscribers.<sup>34</sup> Current Commission records show 4,629 cable systems nationwide.<sup>35</sup> Of this total, 4,057 cable systems have less than 20,000 subscribers, and 572 systems have 20,000 or more subscribers, based on the same records. Thus, under this standard, we estimate that most cable systems are small entities.

22. *Cable System Operators (Telecom Act Standard)*. The Communications Act of 1934, as amended, also contains a size standard for small cable system operators, which is "a cable operator that, directly or through an affiliate, serves in the aggregate fewer than 1 percent of all subscribers in the United States and is not affiliated with any entity or entities whose gross annual revenues in the aggregate exceed \$250,000,000."<sup>36</sup> There are approximately 54 million cable video subscribers in the United States today.<sup>37</sup> Accordingly, an operator serving fewer than 540,000 subscribers shall be deemed a small operator if its annual revenues, when combined with the total annual revenues of all its affiliates, do not exceed \$250 million in the aggregate.<sup>38</sup> Based on available data, we find that all but ten incumbent cable operators are small entities under this size standard.<sup>39</sup> We note that the Commission neither requests nor collects information on whether cable system operators are affiliated with entities whose gross annual revenues exceed \$250 million.<sup>40</sup> Although it seems certain that some of these cable system operators are affiliated with entities whose gross annual revenues exceed \$250,000,000, we are unable at this time to estimate with greater precision the number of cable system operators that would qualify as small cable operators under the definition in the Communications Act.

23. *Direct Broadcast Satellite (DBS) Service*. DBS service is a nationally distributed subscription service that delivers video and audio programming via satellite to a small parabolic "dish" antenna at the subscriber's location. DBS, by exception, is now included in the SBA's broad economic census category, Wired Telecommunications Carriers,<sup>41</sup> which was developed for small wireline

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<sup>32</sup> NCTA, Industry Data, Number of Cable Operators and Systems, <http://www.ncta.com/Statistics.aspx> (visited October 13, 2014). Depending upon the number of homes and the size of the geographic area served, cable operators use one or more cable systems to provide video service. See *Annual Assessment of the Status of Competition in the Market for Delivery of Video Programming*, MB Docket No. 12-203, Fifteenth Report, 28 FCC Rcd 10496, 10505-6, para. 24 (2013) ("15<sup>th</sup> Annual Competition Report").

<sup>33</sup> See SNL Kagan, "Top Cable MSOs – 12/12 Q" available at [http://www.snl.com/InteractiveX/TopCableMSOs.aspx?period=2012Q4&sortcol=subscribersbasic&sortorder=desc\(subscription\)](http://www.snl.com/InteractiveX/TopCableMSOs.aspx?period=2012Q4&sortcol=subscribersbasic&sortorder=desc(subscription)).

<sup>34</sup> 47 C.F.R. § 76.901(c).

<sup>35</sup> The number of active, registered cable systems comes from the Commission's Cable Operations and Licensing System (COALS) database on October 10, 2014. A cable system is a physical system integrated to a principal headend.

<sup>36</sup> 47 U.S.C. § 543(m)(2); see 47 C.F.R. § 76.901(f) & nn. 1-3.

<sup>37</sup> See NCTA, Industry Data, Cable's Customer Base, <http://www.ncta.com/industry-data> (visited October 13, 2014).

<sup>38</sup> 47 C.F.R. § 76.901(f); see *FCC Announces New Subscriber Count for the Definition of Small Cable Operator*, Public Notice, 16 FCC Rcd 2225 (Cable Services Bureau 2001).

<sup>39</sup> See NCTA, Industry Data, Top 25 Multichannel Video Service Customers (2012), <http://www.ncta.com/industry-data> (visited Aug. 30, 2013).

<sup>40</sup> The Commission does receive such information on a case-by-case basis if a cable operator appeals a local franchise authority's finding that the operator does not qualify as a small cable operator pursuant to § 76.901(f) of the Commission's rules. See 47 C.F.R. § 76.901(f).

<sup>41</sup> See 13 C.F.R. § 121.201, 2012 NAICS code 517110. This category of Wired Telecommunications Carriers is defined as follows: "This industry comprises establishments primarily engaged in operating and/or providing access to transmission facilities and infrastructure that they own and/or lease for the transmission of voice, data, text, (continued....)

businesses. Under this category, the SBA deems a wireline business to be small if it has 1,500 or fewer employees.<sup>42</sup> Census data for 2007 shows that there were 3,188 firms that operated for that entire year.<sup>43</sup> Of this total, 2,940 firms had fewer than 100 employees, and 248 firms had 100 or more employees.<sup>44</sup> Therefore, under this size standard, the majority of such businesses can be considered small entities. However, the data we have available as a basis for estimating the number of such small entities were gathered under a superseded SBA small business size standard formerly titled “Cable and Other Program Distribution.” As of 2002, the SBA defined a small Cable and Other Program Distribution provider as one with \$12.5 million or less in annual receipts.<sup>45</sup> Currently, only two entities provide DBS service, which requires a great investment of capital for operation: DIRECTV and DISH Network.<sup>46</sup> Each currently offers subscription services. DIRECTV and DISH Network each report annual revenues that are in excess of the threshold for a small business. Because DBS service requires significant capital, we believe it is unlikely that a small entity as defined under the superseded SBA size standard would have the financial wherewithal to become a DBS service provider.

#### **D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements**

24. If the Bureau decides to use temporary channels, it proposes to require that stations assigned to temporary channels apply for special temporary authority (STA) within ninety days of the *Closing and Reassignment PN*'s release. It also proposes that any temporary channel assignments in the 600 MHz Band would be subject to the inter-service interference (ISIX) protections adopted in the ISIX Third Report and Order, which requires, among other things, that wireless carriers prepare and retain a study demonstrating that no interference will be caused to full-power or Class A broadcast television stations. We believe the proposals in the *Transition Schedule PN* will not have a significant effect on the reporting, recordkeeping, or other compliance requirements of regulatees. To the extent that commenters believe that any of the proposals would impose any additional reporting, recordkeeping, or compliance requirement on small entities, we ask that they describe the nature of that burden.

#### **E. Steps Taken to Minimize Significant Impact on Small Entities and Significant Alternatives Considered**

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sound, and video using wired telecommunications networks. Transmission facilities may be based on a single technology or a combination of technologies. Establishments in this industry use the wired telecommunications network facilities that they operate to provide a variety of services, such as wired telephony services, including VoIP services; wired (cable) audio and video programming distribution; and wired broadband Internet services. By exception, establishments providing satellite television distribution services using facilities and infrastructure that they operate are included in this industry.” (Emphasis added to text relevant to satellite services.) U.S. Census Bureau, 2012 NAICS Definitions, “517110 Wired Telecommunications Carriers,” at <http://www.census.gov/cgi-bin/sssd/naics/naicsrch>.

<sup>42</sup> 13 C.F.R. § 121.201; 2012 NAICS code 517110.

<sup>43</sup> U.S. Census Bureau, 2007 Economic Census. See U.S. Census Bureau, American FactFinder, “Information: Subject Series – Estab and Firm Size: Employment Size of Establishments for the United States: 2007 – 2007 Economic Census,” NAICS code 517110, Table EC0751SSSZ5; available at [http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN\\_2007\\_US\\_51SSSZ5&prodType=table](http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2007_US_51SSSZ5&prodType=table).

<sup>44</sup> *Id.*

<sup>45</sup> See 13 C.F.R. § 121.201, NAICS code 517510 (2002).

<sup>46</sup> See *15<sup>th</sup> Annual Competition Report*, 28 FCC Rcd at 10507, para. 27. As of June 2012, DIRECTV is the largest DBS operator and the second largest MVPD in the United States, serving approximately 19.9 million subscribers. DISH Network is the second largest DBS operator and the third largest MVPD, serving approximately 14.1 million subscribers. *Id.* at 10507, 10546, paras. 27, 110-11.

25. The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standard; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.<sup>47</sup>

26. In general, alternatives to proposed rules or policies are discussed only when those rules pose a significant adverse economic impact on small entities. In this context, however, the proposed transition plan set forth in the *Transition Schedule PN* generally confers benefits. In particular, the intent of the plan is to ensure that all stations are able to complete a timely transition to their final post-auction channel facilities without delay and without incurring unnecessary costs. Although certain proposals, such as the use of temporary channels and increased interference, may impose additional burdens on stations and MVPDs, the benefits of such proposals (such as further facilitating the successful post-incentive auction transition) outweigh any burdens associated with compliance. Further, eligible stations and MVPDs that incur additional costs associated with these proposals may seek reimbursement. In addition, if a full power or Class A station operating on a temporary channel displaces an operating LPTV station, such LPTV station could file for a new channel during the post-auction LPTV displacement window. Alternatively, the displaced LPTV station could go silent or seek temporary authorization to operate its facility at variance from its authorized parameters in order to prevent interference.

**F. Federal Rules that May Duplicate, Overlap, or Conflict with the Proposed Rule**

27. None.

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<sup>47</sup> 5 U.S.C. § 603(c).