Innovation, Science and Economic Development Canada
Innovation, Sciences et Développement économique Canada

DGEPS-002-17
January 2017

Spectrum Management and Telecommunications

Objectives and Methodology for the Over-the-air Television Transition

Aussi disponible en français – DGGPN-002-017

Canada

Contents

1. Intent

1. This paper outlines the objectives and methodology that will be used by Innovation, Science and Economic Development Canada (ISED) in establishing the transition plan and schedule for over-the-air (OTA) TV stations as part of the repurposing of the 600 MHz frequency band in Canada.

2. Background

2. In December 2014, ISED released the *Consultation on Repurposing the 600 MHz Band* from broadcast to mobile services. The associated decision to proceed with a joint repurposing with the United States (U.S.) was released in August 2015. The joint repurposing will reconfigure the 600 MHz band by repacking OTA TV stations more tightly in lower frequencies, making the upper portion of the band available for commercial mobile broadband.

3. To this end, ISED and the Federal Communications Commission (FCC) are developing a joint new digital TV (DTV) allotment plan identifying the channels and associated parameters for OTA TV stations. In Canada, all OTA regular power and low power TV stations are expected to be assigned a channel. In the U.S., the FCC is conducting an incentive auction to determine which U.S. OTA TV stations will be assigned channels. As a result, the full list of stations having a channel in the new joint allotment plan cannot be determined until the conclusion of the U.S. incentive auction.

4. The transition involves the reassignment of some OTA TV stations to new channels and/or digital operations identified in the new DTV allotment plan, as well as the schedule for those changes. To complete their transition, broadcasters will need to test their infrastructure to ensure that their TV stations are operating in accordance with their approved parameters and that the required protection is being afforded to other broadcasting undertakings. While both the current and new allotment plans are designed to manage the interference environment, they are not necessarily compatible concurrently.

5. Station dependencies form when one station cannot transition until another station has completed its transition, without causing interference. During the transition, there is the potential for temporary interference as stations test their facilities and begin operating on their new channels while others continue to operate on their original channels. The scheduling of station moves is paramount in order to limit the level of temporary interference. As the number of stations that need to transition increases, so does the complexity of coordinating the timing of all testing activities.

6. In its 2015 decision, ISED adopted two overarching transition priorities: i) minimizing the impact to TV viewers during the transition period, and ii) maximizing the amount of time and other resources available to broadcasters.

7. To facilitate the orderly execution of the transition in a manner that is in the best interest of Canadians, the transition will consist of a series of phases. Each transition phase will begin at the same time, but will have sequential end dates. Stations are to cease operating on their

original channel by this time.[1] Prior to the end of each phase, there will be a defined on-air testing period for broadcasters to test the operation of their facilities. While broadcasters may conduct the necessary transition activities (e.g. planning and construction) at any time throughout their phase, they can only test their new systems during the on-air testing period to minimize interference.

8. As the actual sequence of station channel changes will not be determined until the new channel assignments are known, the transition plan and schedule will be developed using a series of objectives and a methodology.

9. In April 2016, ISED engaged Canadian OTA TV broadcasters through participation in a series of discussions organized by the Radio Advisory Board of Canada (RABC) aimed at developing Canadian objectives and methodology to be used in creating the joint transition plan and schedule. These discussions focused on the analysis of technical factors and considerations pertaining to the transition of OTA TV stations.

10. ISED presented *600 MHz – Proposed TV Transition Objectives and Methodology,* at an RABC meeting held on September 30, 2016. These were designed to provide an orderly and manageable transition, taking into consideration the time required for broadcasters to transition, the potential impact on viewers and the efficient allocation of limited resources. The Department's proposals were also based on the technical concepts discussed during the RABC meetings and reflected the feedback received from broadcasters and other participants.

11. To ensure transparency and to provide additional opportunity for input regarding transition issues that will impact the OTA TV broadcasting community, ISED published its *Notice of Engagement Regarding the 600 MHz Transition Plan Objectives and Methodology* on October 31, 2016. Consistent with the joint repurposing of the 600 MHz band, ISED and the FCC are coordinating closely on transition planning.

12. All comments in response to the notice of engagement are available on ISED's *Spectrum Management and Telecommunications* website. Comments were received from the RABC and Bell Canada.

3. Overall proposals and comments

13. In the *notice of engagement*, ISED proposed and sought comments on the objectives and methodology to be used to develop the transition plan and schedule. Specifically, objectives and rules were proposed to address the assignment of stations to phases, as well as the tasks and process parameters to be used for scheduling, including extending the overall transition through supplementary phases.

14. Overall, the RABC supported ISED's proposals, as outlined in the consultation and provided some suggestions and enhancements. On technical issues, Bell Canada fully supported and endorsed the comments provided by the RABC, but also supplied additional comments regarding the amount

[1] TV stations operating within the 600 MHz band will be permitted to continue using their current channels and modes of operation (i.e. analog or digital) until the spectrum is needed for mobile broadband services (i.e. TV stations located in urban areas will be afforded a minimum one-year notification period while TV stations located in all other areas will be afforded a two-year minimum notification period). TV stations operating outside the 600 MHz band will be permitted to operate on a secondary basis (i.e. on a no-interference, no-protection basis) relative to other TV stations.

of time afforded to Canadian broadcasters. Both the RABC and Bell Canada provided additional comments beyond the scope of the notice of engagement, which are not addressed in this document.

4. Transition objectives

15. In a complex transition such as this, cooperation is needed to achieve a plan that is realistic and implementable, satisfying the goals of each Administration. Stations on both sides of the border are to be treated fairly and equally, with a goal to complete the transition in an orderly and coordinated fashion, while making it practical and timely.

16. ISED notes that while similar, Canada has slightly different transition objectives from those of the U.S. (i.e. Canada's priority is to allow additional time for Canadian stations to transition, whereas the U.S.' priority is to clear stations in the 600 MHz band). The joint Canada-U.S. transition plan and schedule must be developed to account for and balance the transition needs and priorities of both countries.

17. The RABC supported all of the Canadian objectives, however raised concerns with the U.S.'s primary objective of clearing the 600 MHz band as quickly as possible. The RABC suggested that this objective not be applied near the Canada/U.S. border, as it would increase the duration of temporary interference to Canadian stations, impacting viewers and television ratings.

18. The phased-transition plan and schedule will be based on a series of objectives[2] reflecting the needs of Canadian broadcasters, TV viewers, and mobile service providers, while providing for an orderly and structured transition.

19. Having considered stakeholder feedback on the proposals, ISED will be applying the following objectives:[3]

Objective 1: Maximize the amount of time for broadcasters to transition their stations, while still ensuring a timely transition.

Objective 2: Minimize the impact of the transition on viewers.

Objective 3: Minimize the complexity of the transition.

Objective 4: Maximize the efficient use of resources.

5. Methodology for assigning stations to phases

20. Each transitioning station will be assigned to a specific phase based on the following rules and then optimized to further promote the objectives. These transition rules reduce impact to broadcasters and viewership by limiting undue interference, the number of rescans required and the number of station dependencies.

5.1 Limiting temporary interference to 2%

21. The transition will involve dependencies between stations, increasing its overall complexity. During the transition, there is the potential for temporary additional interference as stations conduct

[2] Given the joint nature of the repurposing, the assignment of stations to phases will account for and balance the priorities and needs of both Canada and the U.S.

[3] The FCC has similar but not identical transition objectives, for specific details please refer to their domestic process.

on-air testing and begin to operate on their newly assigned channels while others still continue operating on their original channels.

22. Allowing a temporary 2% pairwise additional interference[4] during the transition was proposed to strike a balance between Objective 3 by reducing the complexity of the overall transition (i.e. reducing the number of station dependencies) and Objective 2 by having minimal effect on the signal quality received by viewers regardless of whether operating in digital or analogue mode. Additionally, to minimize the duration of interference, broadcasters will only be able to test their new facilities during their phase's specified on-air testing periods. Furthermore, stations assigned to transition within the same phase that have dependencies causing more than 2% temporary pairwise interference will need to closely coordinate with each other prior to testing their new facilities.

23. The RABC acknowledged that temporary technical rules and temporary interference are unavoidable during the transition and did not object to the proposed 2% temporary pairwise interference level. They also emphasized that the duration of interference is as important a consideration as the level of interference and suggested that ISED limit the duration of temporary interference to further reduce the impact on viewership.

24. ISED recognizes broadcasters concerns in minimizing the duration of temporary interference. ISED notes that the duration of the interference, although temporary, will be further reduced as stations within the same market/region transition during the same phase.[5]

25. Moreover, to further limit the temporary interference experienced by stations, ISED will adjust the transition schedule to reduce the aggregate temporary interference to below 5%, where possible.

Rule 1: Temporary pairwise additional interference of up to 2 % will be permitted during the transition. Broadcasters with stations, assigned to transition in the same phase, which cause more than 2 percent pairwise interference, will be required to coordinate with each other prior to testing their new systems.

5.2 Assignment of Canadian stations to early phases

26. In the Department's *Decision on Repurposing the 600 MHz Band,* ISED concluded that all regular power TV undertakings currently operating below the to-be-repurposed 600 MHz band that need to relocate to a new channel assignment and/or convert to digital, would be provided with a minimum of 18 months to transition, after the plan is finalized. Additionally, as ISED has adopted a phase-based transition, those stations scheduled in later phases will benefit from transition periods longer than 18 months.

27. Based on initial simulations and transition scenarios, it is expected that phase 3 will be the first phase scheduled for completion more than 18 months after the release of the transition plan. To further the primary objective of maximizing the amount of time for broadcasters to transition their stations, the Department proposed that no Canadian regular power station would be assigned earlier

[4] This additional interference is calculated with respect to the baseline interference-free population of a station based on its original parameters. The baseline interference-free population is defined as the population within the noise-limiting boundary contour predicted to receive service.

[5] Theoretically, temporary interference could last from the on-air testing period of phase 1 until the final phase.

than phase 3. However, depending on the new DTV allotment plan, the actual phase that provides the minimum 18 months to transition might change.

28. The RABC supports the Department's proposal noting that based on initial simulations Canadian regular power TV stations may be provided an even longer minimum transition period.

Rule 2: No Canadian station will be assigned to a transition phase shorter than 18 months.

5.3 Extending the length of the transition

29. The FCC intends to transition U.S. stations in 10 phases within 39 months as it prepares to open the 600 MHz band to commercial broadband mobile applications and services.

30. Although similar, Canada and the U.S. have slightly different transition objectives. To further support Objective 1, ISED proposed to extend the transition beyond 39 months, with the addition of supplemental phases. Extending the transition period provides broadcasters more time, but also further relieves pressure on potentially limited resources and increases the opportunity for suppliers from the U.S. to work with Canadian stations on their transition, consistent with Objective 4.

31. The RABC and Bell Canada supported the Department's proposal to extend the transition beyond 39 months for Canadian stations by adding extra phases, while urging that no station should be forced to go off-air for reasons beyond its control. Taking into account complexities, scope of work and uniquely Canadian factors, they emphasized that Canadian stations should be given the maximum amount of time possible to transition, while noting that broadcasters would not be able to initiate planning activities until they are notified of their newly assigned channels.

32. In developing the final joint transition plan, ISED will place priority on scheduling Canadian stations in later transition phases, effectively providing them more time to implement the transition while attentive to priorities established by the FCC.[6] While Canadian stations that impede the U.S.' ability to repurpose the band will be assigned to transition within the first 39 months; the Department will strive to schedule these stations in later phases of this period.

33. It is premature to define the number of additional phases and extended transition period, as the new DTV allotment is not yet known. Once the number of stations required to transition and/or convert from analogue to digital operation is known, a practical number of phases will be added, extending the transition period.

Rule 3: The transition of Canadian stations will be extended beyond 39 months. The number of additional phases to be added will be determined once the number of Canadian stations that could be scheduled in the additional phases is known.

[6]ISED and the Federal Communications Commission are coordinating closely on transition timing, consistent with our intent to jointly repack OTA 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*, August 11, 2015.

5.4 Determining the number of phases for a market

34. A market-based transition approach groups stations by service area scheduling them to transition at the same time. Some regions may include numerous transitioning stations. Assigning stations within a "service area grouping" to a minimum number of phases will limit the impact on viewers, Objective 2, by reducing the number of TV channel rescans required and the duration of temporary interference between stations.

35. Minimizing the number of phases per "service area grouping" also supports Objective 4 by facilitating the efficient allocation and use of resources by broadcasters. By clustering stations within a general service area in the same phase, broadcast tower crews will have the opportunity to concentrate on these stations without dividing their time travelling to other markets, reducing the overall timing of the projects. As such, ISED proposed to minimize the number of phases per "service area grouping" to no more than two.

36. The RABC supported a market-based approach and limiting the number of phases per general service area to no more than two. They further recommended that efforts be made to ensure that the scheduled phases for a "service area grouping" be adjacent or near-adjacent phases to reduce the duration of temporary interference.

37. After further review, the Department notes that restricting the number of phases per "service area grouping" to no more than two may force some stations into earlier phases, which would artificially reduce the amount of transition time afforded to these broadcasters. The same would hold true if "service area groupings" were forced into sequential phases. In order to balance the many competing criteria, including the number of phases per "service area grouping" and maximizing the amount of time given for stations to transition, limiting the number of phases to no more than two per "service area grouping" or assigning them in sequential phases may not be practical.

Rule 4: The number of phases per "service area grouping" will be minimized.

5.5 Balancing the number of stations among phases

38. Depending on the number of stations transitioning and their particular location, there is the potential that some transition phases may contain a much larger number of stations than others. Balancing the distribution of stations across all phases supports Objective 4. It facilitates the management and allocation of resources, especially as there may be limited availability of particular resources such as broadcast tower crews for antenna installation.

39. ISED sought comments on balancing the number of stations transitioning in each phase by limiting the difference in the number of stations within each phase to 30. After further review, given that the number of stations and their dependencies is not yet known, and as ISED intends to provide Canadian stations with the maximum amount of time to transition, it may not be practical to establish a pre-determined limit.

40. There were no comments regarding overall station balancing. As a result, the Department will balance the number of stations transitioning in each phase taking into account the final number of stations that are required to transition and/or convert and the decision on the total number of phases.

41. However, the RABC did suggest that broadcasters with more than four stations scheduled to transition within the same phase be granted additional phases or time, at their discretion, to complete the transition. The transition is a complex process involving the coordination of a large amount of stations, many of which have national and international dependencies. Providing each broadcaster with the ability to determine when to transition would undermine the ability of Canada and the U.S. to transition stations in an orderly manner that reduces interference.

42. Furthermore, consistent with the phased-transition, all phases are scheduled to start at the same time, providing stations scheduled in later phases with additional time to complete the transition. This will allow broadcasters some flexibility to manage and plan their overall transition. Redistributing stations to other phases may result in longer periods of temporary interference for others, while potentially placing additional strain on the overall availability of resources and impact to viewers. For example, certain broadcasters may be required to transition many stations. Limiting the number of stations per broadcaster per phase to four may therefore not support a timely transition.

Rule 5: The number of stations per phase will be balanced to the extent practical.

5.6 Station dependencies and daisy-chains

43. This transition will involve sequential dependencies between stations called daisy-chains, which can be quite lengthy, spanning vast areas of both countries. Depending on the number of stations required to transition, some daisy-chains may consist of hundreds of stations linked together by dependencies.

44. Limiting the number of linked stations within the same transition phase further supports Objective 3. It greatly simplifies the complexities associated with the overall transition. Reducing the number of station dependencies within a single daisy-chain and number of linked stations also facilitates the on-air testing process by easing coordination between broadcasters. As such, ISED proposed to limit the number of linked stations per phase to 125 stations.

45. There were no comments on ISED's proposal. ISED estimates that the proposed limit would result in a manageable number of linked stations. However, as the new DTV allotment plan and associated dependencies have yet to be determined, it is premature for ISED to define a maximum number of linked stations per phase

Rule 6: The number of linked stations per phase will be minimized to the extent practical.

5.7 Assignment of temporary channels

46. The use of temporary channels is an effective way of de-linking stations from daisy-chains, reducing the extent of inter-station coordination between broadcasters and the overall complexity of the transition. However, assigning a temporary channel to a station would effectively make it transition twice: first to the temporary channel, and later to its final channel. This increases the amount of work required, potentially placing a further strain on limited resources as well as likely necessitating additional equipment. The use of temporary channels will also create the need for an additional rescan by viewers.

47. Based on these limitations, ISED proposed to consider the assignment of temporary channels during the transition on a case-by-case basis at the specific request of broadcasters. In assessing these requests, the Department would endeavor to balance the needs of the broadcaster with the implications on resource availability, the potential for additional temporary interference to other stations as well as the overall transition plan.

48. The RABC agreed with the Department's proposal, noting that the use of temporary channels could increase the associated costs, resources and time necessary to complete the transition. However, they indicated that there may be special cases where the use of a temporary channel may allow for the continuity of a station's operations or provide greater efficiency in the completion of the transition.

49. The Department recognizes that in specific instances the use of a temporary channel may benefit the transition by allowing a station to continue broadcasting, albeit on a different channel. ISED will consider the assignment of temporary channels on a case-by-case basis at the specific request of broadcasters. In making such requests, broadcasters should indicate how their proposal benefits the transition plan and addresses interference to other stations.

Rule 7: Temporary channels will not be assigned to stations unless specifically requested by a broadcaster. Requests to operate on a temporary channel will be assessed by the Department on the basis of their impact to the transition plan.

5.8 Ordering of Canadian stations

50. ISED's first objective is to maximize the amount of time for broadcasters to relocate to new DTV assignments, taking into consideration the associated planning and construction activities, while ensuring a timely transition. Although similar, the U.S. has a slightly different priority in that, while providing sufficient time for U.S. broadcasters to transition, it will prioritize the relocation of stations in the 600 MHz commercial mobile band.

51. Recognizing the U.S.' priorities while at the same time facilitating the Canadian transition, a specific order for the assignment of Canadian stations to transition phases was proposed. As such, ISED sought comments on assigning Canadian stations to transition phases in the following order:

1. stations impeding the transition of U.S. stations;
2. stations operating in the "TV band" with dependencies;
3. stations operating in the 600 MHz to be repurposed band ("mobile band"); and
4. stations with no dependencies.

52. The RABC noted that the station ordering proposed by ISED is different than in the U.S. where stations operating in the 600 MHz band will be scheduled to earlier phases. The RABC was concerned that this may result in a longer than necessary period of temporary interference to Canadian stations along the border. The RABC encouraged the Department to ensure that the station order and scheduling are complementary between the two countries so that the duration of temporary interference is taken into account.

53. The Department notes that there continues to be a need to facilitate the joint transition by scheduling stations with U.S. dependencies before other stations. At the same time, Canada's objective of providing the maximum amount of time for stations to transition would be achieved

by scheduling these stations to later phases, as much as possible.

54. However, after further review, the Department finds it overly restrictive to establish a specific order based on categories and instead, will assign stations to phases based on overall objectives and the considerations noted in the discussion in Section 5.

Rule 8: Stations with U.S. dependencies will be scheduled within phases 3 to 10.

6. Phase scheduling

55. ISED will determine, in collaboration with the FCC, the overall transition schedule and the duration of each phase taking into account resource availability as well as other considerations like weather and rating periods, where possible.

6.1 Transition activities and planning parameters

56. ISED consulted on the planning parameters and values to determine the length of time necessary for stations to complete the transition. The Department recognizes that the activities associated with a station's transition to a new channel and/or converting from analogue to digital operation can vary greatly among broadcasters and OTA TV stations. While some activities may be done concurrently, others must be done sequentially.

57. The RABC stressed the importance of accounting for complexities when establishing the duration of each phase and suggested additional activities be included within the list of transition activities, such as the application process and tower modification/relocation.

58. A list of activities associated with transitioning stations can be found in Annex A. While not exhaustive, the list has been updated to include the additional activities provided by the RABC.

59. Only one comment was received regarding the specific planning parameter values. The RABC questioned the extent of the derived benefits from broadcast tower crews working on shared tower sites. While acknowledging that the total time necessary for tower crews to install antennas can be reduced, they contended that the use by other services should also be considered when determining the necessary time for stations on a shared site to transition. They indicated that this could result in additional work for other users should the TV stations need to relocate or change out their antennas.

60. ISED notes that the total time necessary for the installation of antennas can be reduced drawing on efficiencies as broadcast tower crews take advantage of the need to only travel and rig the site with installation equipment once. While still appreciating the time-saving opportunities, the Department recognizes there may be other factors including coordination with other services to consider. As such, ISED has adjusted the time savings associated with stations operating on a shared tower (i.e. the time required to transition the most difficult station plus 50% of the time associated with each additional station).

61. As Canadian broadcasters will be provided a minimum of 18 months to complete the transition and are being purposely scheduled in later transition phases, they will have more time to complete their transition than the listed planning parameter values. Furthermore, Canadian stations are purposely being scheduled in later phases, giving the majority even more time to complete their stations' transition.

6.2 Transition resources

62. Some transition activities require specialized resources, such as broadcast tower crews, as well as antennas, transmitters and combiners, which given the scope of the transition, may be in limited supply. As such, the Department recognizes that some broadcasters may not be able to immediately access these limited resources and may have to wait until the installations at other sites are completed and for manufacturers to deliver equipment. The Department proposed to build these considerations into the transition schedule, recognizing that stations assigned to later phases will have additional time to transition.

63. The RABC and Bell Canada raised concerns about the limited availability of particular resources and their potential to impact the transition. They stressed that not only will there be increased demand for qualified and experienced broadcast tower crews (with the necessary specialized equipment) from Canadian and American broadcasters but also from other radio and telecommunication services. They also emphasized that increased demand could affect equipment manufacturing, resulting in delivery delays. They expressed concern that their ability to access resources may be diminished due to preexisting contractual agreements or preferred customer arrangements.

64. ISED engaged tower crew companies and antenna manufacturers to discuss their availability and capacity to facilitate the transition. Their feedback indicated that should the demand from broadcasters exceed their current capacities, they have the ability to ramp-up their services and production. Some tower crew companies expressed their ability to increase the number of concurrent crews and to acquire supplemental specialized equipment.

65. In light of the above considerations, ISED confirms that the values listed in Annex B will be used to derive the joint transition plan.

7. Additional comments and discussion

66. The RABC provided additional technical comments in response to the consultation related to the adjustments and flexibility within the transition plan, use of future technologies, broadcast distribution undertakings and coverage parameters.

7.1 Adjustments and flexibility of the transition plan and schedule

67. The RABC raised concerns with the development of a transition plan and schedule prior to broadcasters' completing their analysis of the work required to transition their stations. The RABC recommended first publishing a preliminary schedule, which could be adjusted to reflect particular stations' complexities. They stressed the importance of being able to explore inter-broadcaster solutions (e.g. sharing of antenna systems) and the potential for extensive delays associated with relocating towers as reasons for not finalizing the transition plan immediately.

68. They also recommended that the overall transition plan and schedule be flexible to account for unforeseen delays or incorrect assumptions during the course of the transition, noting that maximum flexibility should be afforded to stations to account for delays in implementing the transition to new channels.

69. While it is understood that there may be some uncertainty whether a particular station will change its channel, broadcasters can perform many upfront planning activities, including conducting an inventory of their equipment's specifications and capabilities. Further to Objective 1, ISED intends to maximize the time for broadcasters to transition while ensuring a timely transition. Waiting until broadcasters complete their analysis prior to establishing the transition plan could delay the transition significantly.

70. However, the Department recognizes that unforeseen situations may arise beyond broadcasters' control during the transition. In exceptional circumstances, ISED may consider requests for the redistribution of stations to different transition phases on a case-by-case basis. However, in making such requests, broadcasters should advise the Department as soon as possible and indicate how their proposal benefits the overall transition plan, addresses interference to others and minimizes impact on viewership. Additionally, if an entire area is uniquely affected the Department may explore adjusting the transition plan and schedule by reducing the duration of on-air testing periods, if needed. While ISED will endeavor to provide flexibility, this may be limited given the complexities of the overall transition.

7.2 Future technologies

71. The RABC requested that the transition plan allow for the use of future transmission standards, such as ATSC 3.0. They would like the option to continue broadcasting using the current digital TV standard (ATSC 1.0) or utilize other new standards, like ATSC 3.0.

72. ATSC 3.0, also known as Next Generation TV, is the latest standard being developed by the Advanced Television Systems Committee, in a response to the evolution of consumer needs and as a reaction to technological advancements.

73. The Department recognizes that consumers are adapting their viewing habits and seek the ability to watch everything, on any device, wherever they are.

74. The Department strives to remain technology neutral in its development of policies, procedures and rules, and encourages the use of new technologies. ISED will consider all available technologies in order to maximize spectrum efficiency. It is expected that the transition process will support the use of new technologies in the future provided all existing broadcasting rules and regulations are followed. ISED will update and/or develop rules and regulations for the use of future technologies in Canada, as needed.

7.3 Broadcasting distribution undertakings

75. While a subset of the Canadian population receives their TV signals over-the-air, most Canadians receive their local television stations' signals from broadcasting distribution undertakings (BDU), including cable and satellite service providers.

76. The RABC indicated that during the transition, the distribution of OTA TV stations by BDUs must remain unchanged and based on the existing station's coverage and contour.

77. The Department notes that while the repacking process strives to preserve a station's coverage area and total area within its noise-limited bounding contour (NLBC), there may be some small differences in the geographic location of the station's new NLBC. As BDUs' transmission of TV stations are based on the stations' coverage and contour, ISED acknowledges that there may be variances as a result of the repacking. The Department also understands that the

Canadian Radio-television and Telecommunications Commission (CRTC) is aware of the possible impacts and has taken steps to address them.[7]

7.4 Coverage parameters

78. To calculate the population service values, the RABC proposed that ISED recommend the use of a standard terrain-sensitive propagation model (i.e. Longley-Rice) to reduce the possibility of calculation differences, noting that it would also facilitate Canada-U.S. coordination, if the same model was used by the FCC. Along with the model, the RABC noted that a standard set of parameters to be used during the analyses should also be specified.

79. ISED will continue to use, for the transition process, the technical parameters and assumptions contained within the Department's repurposing decision[8] and the joint Canada –U.S. reconfiguration framework.[9]

8. Next steps

80. ISED will develop a joint transition plan and schedule based on the described objectives and methodology to implement the joint DTV allotment plan as part of the 600 MHz repurposing. Additionally, the transition plan and schedule will take into account the cumulative impacts of all changes to broadcasters, domestically and internationally.

81. The Department will oversee and monitor the transition's progress, keeping in communication with broadcasters throughout the process.

[7] *Renewal of television licences held by large English- and French-language ownership groups. Broadcasting Notice of Consultation CRTC* 2016-225-3, 2016-225-4 and 2016-225-5.
[8] *Decision on Repurposing the 600 MHz Band*, August 14, 2015.
[9] *Statement of Intent Between the Federal Communications Commission of the United States of America and the Department of Industry of Canada Related to the Reconfiguration of Spectrum Use in the UHF Band for Over-The-Air Television Broadcasting and Mobile Broadband Services*, August 11, 2015. Appendix 1.

Annex A — Activities Related to Transitioning OTA TV stations[10]

The following is a list of transition associated activities. This is not an exhaustive list and will vary depending on each broadcaster's specific transition needs. The Department appreciates that not all broadcasters will conduct each listed activity, given the differences between stations and their unique transition requirements.

Pre-construction

- Planning
- Structural tower analysis
- Engineering design
- Application process
- Application evaluation
- Permitting (e.g. lease, zoning, land-use authority)
- Equipment acquisition

Construction

- Tower modifications and/or replacement
- Facility upgrades (e.g. AC power, cooling and ventilation systems)
- Antenna installation
- Installation and/or retuning of transmitters, combiners, and radiofrequency mask filters
- Calibration of equipment and testing
- Final system testing and coordination of stations between broadcasters during on air-testing

[10] These activities are listed in no particular order, noting that while some may be done in parallel others will be performed sequentially.

Annex B — Input and Planning Parameters

Planning parameters	Value
Antenna Delivery: Directional antenna Omnidirectional antenna	 24 weeks 12 weeks
Antenna manufacturing capacity	80– 88/month
Pre-construction stage activities: Complicated stations DTV stations LPTV stations Construction-related activities Complicated stations DTV stations LPTV stations	 72 weeks 32 weeks 24 weeks 32 weeks 24 weeks 12 weeks
Antenna installation base time	10–40 days (+/- 5 days)
Antenna installation on multi-TV station tower	Most difficult station + 50% of each additional station's time
Minimum on-air testing period	4 weeks[11]

[11] On-air testing periods may be adjusted or reduced during the transition to account for scheduling or unforeseen issues.