



600 MHz – Proposed TV Transition Objectives and Methodology

RABC 600 MHz Working
Group Meeting

September 30, 2016



Agenda

- Introduction
- Overarching Objectives and Approach
- Proposed Transition Plan
 - Dependencies and Daisy Chains
 - Assigning Stations to Phases
 - Rules and Objectives
 - Phases and Schedule
- Comments and Next steps

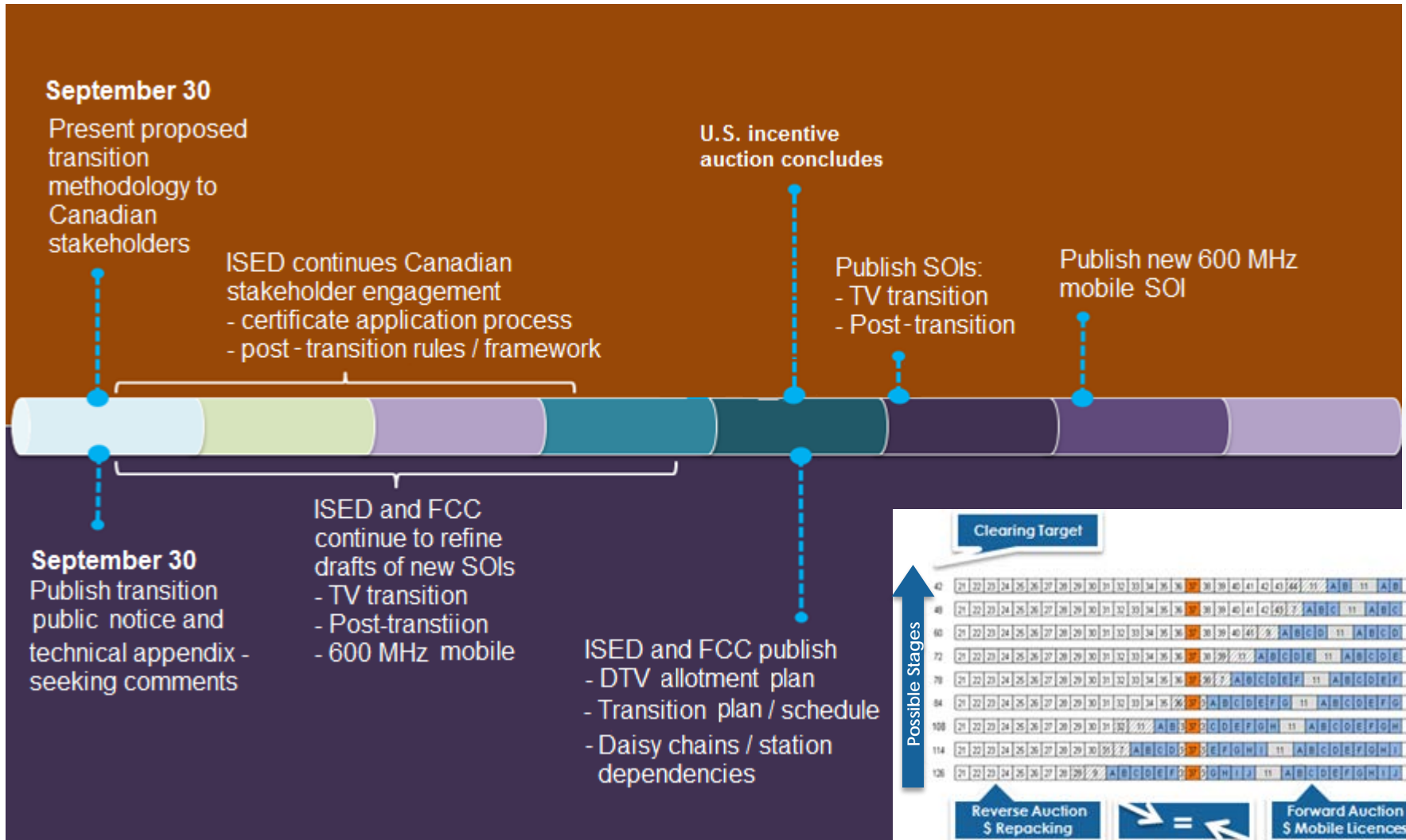
Introduction

- Canada and the U.S. are jointly repurposing the 600 MHz band, repacking existing OTA TV stations more tightly in lower frequencies. The upper portion will be repurposed for commercial mobile service.
- All regular power and virtually all low power existing Canadian TV stations will have a channel following the repacking.
- A new joint allotment plan will identify the new channel assignments for all Canadian and U.S. stations while a joint transition plan will address the scheduling of station moves.

Where are we in the overall process?

- ✓ ISED decision on 600 MHz repurposing: August 2015
- ✓ Joint ISED/FCC framework guiding repurposing process: August 2015
- ✓ Start of the incentive auction: March 29, 2016
- ✓ Launch of the RABC 600 MHz working group: April 2016
 - ✓ Information gathering related to the Canadian transition
 - ✓ **Draft framework to govern the transition: September 30, 2016**
 - Draft certificate application process
 - Draft post-transition rules and framework
- End of incentive auction (2016 or 2017?)
- New joint DTV allotment plan, transition plan and schedule
- Beginning of transition

Timelines



Overarching Objectives

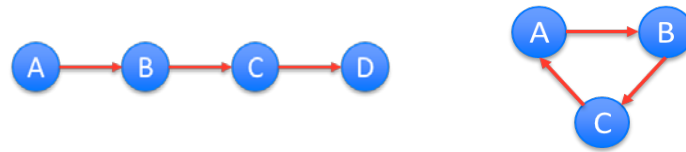
- Orderly and manageable transition
 - Continue broadcasting throughout without undue interference
 - Maximize time for Canadian broadcasters to transition while ensuring a timely transition
 - Efficiently manage limited resources (e.g. tower crews, manufacturing and equipment delivery)
- Minimizing impact to viewers
 - Limited number of rescans required
- Flexibility to take into account unforeseen issues that may arise during the transition

Proposed Transition Approach

- Phase-based
- Regional/market-based
- Station priority: Which move first?
 1. Canadian stations impeding U.S. station transition
 2. Canadian stations operating in the “TV band” with dependencies
 3. Canadian stations operating in the “mobile” band
 4. Canadian stations with no dependencies
- Temporary technical rules during the transition
- Restrict use of temporary channels, unless necessary
- Timely application process

Station Dependencies & Daisy Chains

- During the transition there is potential for interference
 - Stations operating on their original channels and stations on-air testing or operating on their new channels
- Multiple station dependencies form a daisy chain



- Daisy chains can also be quite complex
 - Can consist of 100s of stations, spanning Canada into U.S.
 - For the transition, need to break daisy chains:
 - ✓ Assign stations to transition during different time periods
 - ✗ Assign stations to operate on temporary channels
 - ✓ Allow temporary increases in interference
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Transition Plan: Phases

Assigning each station to a phase

- Optimization techniques based on rules and objectives
 - All assignments must satisfy each rule, then best fit applied to objectives
 - Minimizes dependencies created by interference issues, ensures broadcasters time to transition and groups stations within a market into the same phase to manage limited resources and minimize impact on viewers

Scheduling of phases

- Estimates total time for stations within a phase to complete their transition by modelling transition activities and accounting for limited resources
- Phases will have sequential on-air testing periods and end dates

Number of Phases

Limiting the number of transition phases

- Allows for stations within the same region to transition at the same time
- Limits the need for multiple channel rescans by viewers
- Facilitates monitoring of the transition process
- FCC proposing 10 phases, completed within 39 months
- ISED proposing to extend transition beyond 39 months
 - Canadian stations not impeding the transition of U.S. stations to be scheduled in later phases

Assignment of Stations to Phases

No Canadian stations will be assigned to transition before Phase 3

- Canadian TV stations not scheduled to transition earlier than 18 months
- Canadian stations not impacting the transition of U.S. stations scheduled for later phases
 - Stations with Canadian only or no dependencies
 - Stations without dependencies can continue to operate on their current channel/parameters provided no interference is caused to other stations during or after the transition



Assignment of Stations to Phases

All stations within a region will be assigned to no more than two phases

- Allows for stations within the same region to transition at the same time; clusters stations based on geographic area
- Limits the need for multiple channel rescans by viewers
- Manages limited resources; tower crews can concentrate their work on specific area

Assignment of Stations to Phases

Difference between the number of stations transitioning in each phase is limited to 30

- Balances and assigns stations evenly among phases
- Manages limited resources; spreads resources evenly among the phases

No phase to exceed 125 station dependencies / dependency difference limited between phases

- Limits the amount of coordination required during on-air testing, making for a more manageable on-air testing process for broadcasters
- Minimizes maximum size of daisy chains within phase

Temporary Transition Rules

Station cannot cause more than 2% additional interference to another station

- Allows flexibility for stations to conduct on-air testing while limiting interference during the transition
 - Coordination may not always be practical for complex daisy chains
- Reduces number and complexity of station dependencies
 - Higher interference levels would reduce further, but 2% balances limiting dependencies and causing greater interference
- Reduces number of channel rescans

Minimizing the Amount of Work

No use of temporary channels, unless necessary

- Use of temporary channels means more moves: first move to the temporary channel and then to the final channel
- May create confusion for viewers and additional rescans
- May require additional equipment, further limiting resources
- May be considered on ad-hoc basis

Station Assignment Objectives

Maximize time for Canadian broadcasters to transition their stations

- Limit Canadian and U.S. stations competing for limited resources throughout the transition
- Canadian TV stations will be afforded at least 18 months to transition

Assign U.S. stations in “mobile” band to earlier phases; clear U.S. “mobile” band first

- Mobile auction completed

Station Assignment Objectives

Minimize number of rescans per market/region

Minimize total number of linked stations (daisy chains)

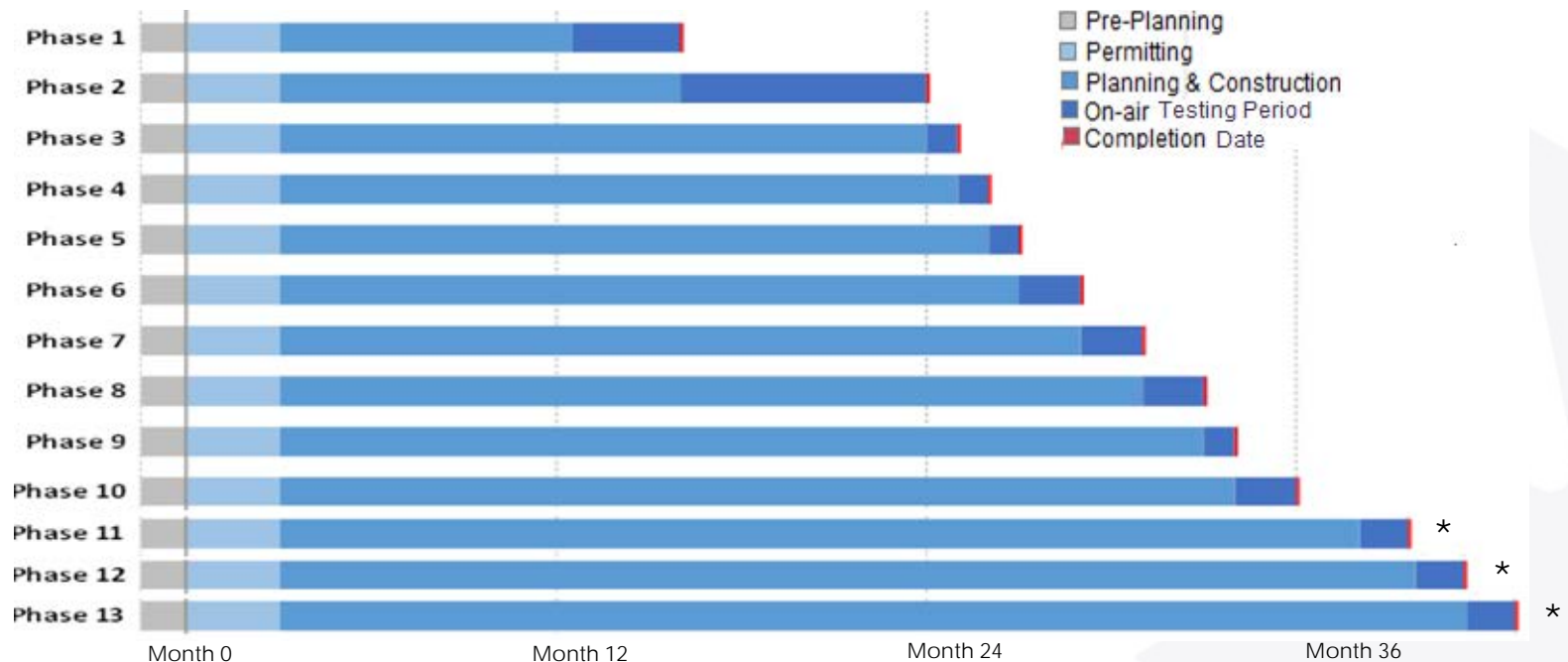
- Throughout all phases of the transition
- Provide as many stations as possible with the ability to conduct on-air tests while broadcasting on their original channel without the need to coordinate

Minimize difference between number of stations in the largest and smallest phases

- Balancing the number of stations in each phase will more efficiently manage limited resources
 - Spread out evenly across phases

Length of Phases

- Time for all stations within a phase to complete the work
- Modelling of limited resources based on availability, capacity
- Extended transition period for Canadian stations not impeding U.S. station ability to transition



Station Transition Activities

- Phase duration takes into account the complexity and scope of work:

Construction Pre-construction

1. Planning
2. Engineering design
3. Structural tower analysis
4. Permits (e.g. lease, zoning, land-use authority)
5. Equipment acquisition ★
6. Coordination of broadcasters within same market
7. Tower modifications and antenna installation ★
8. Calibration of equipment and testing

- Some activities may occur in parallel, others not

Pre-construction

- Manufacturing and equipment delivery★
 - Some stations may be able to receive antennas without waiting, others wait in queue (simulations)
 - Directional antennas: 24 weeks for delivery
 - Omni-directional antennas: 12 weeks for delivery
 - Capacity: 80–88/month
- All other activities (planning)
 - Complicated stations: 72 weeks
 - DTV stations: 32 weeks
 - LPTV stations: 24 weeks
- Maximum completion time for pre-construction is the greater of “manufacturing and equipment delivery” or “all other activities”

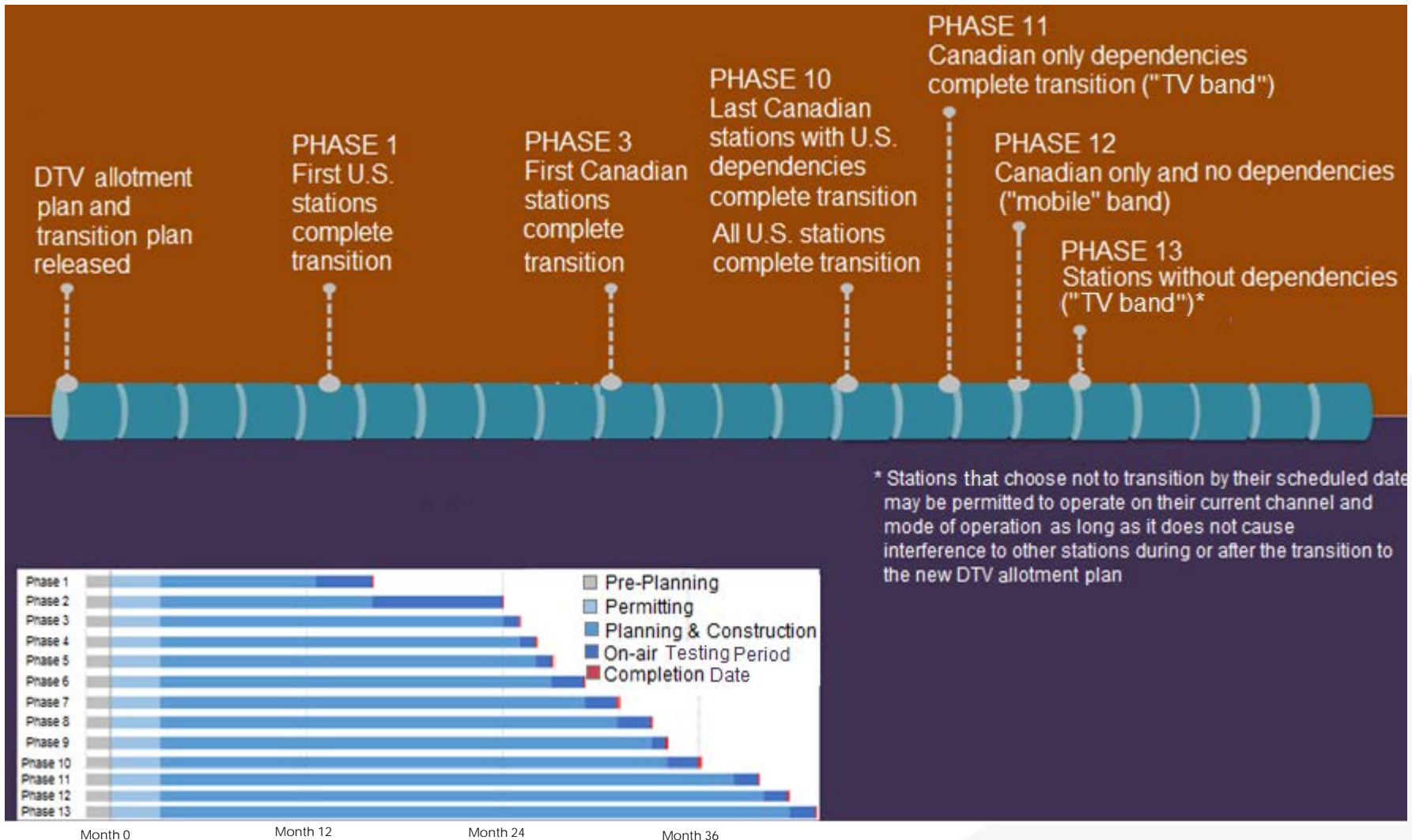
Construction

- Tower work: Number and availability of tower crews (equipment installation on the tower)★
 - Some may schedule tower crews to work on their stations without waiting, others wait in queue (simulations)
 - Tower height (10–40 days): base time
 - Antenna related (adjustment on base time)
 - Canadian tower crews: 22; U.S. tower crews: 51–57
- All other construction work (combiners, on-air tests)
 - Complicated stations: 32 weeks
 - DTV stations: 24 weeks
 - LPTV stations: 12 weeks
- Maximum completion time for construction is the greater of “tower work” or “all other construction work”

Other Proposed Considerations

- Account for stations occupying same tower (in phase)
 - Total “tower work” time can be reduced
 - Stations can take advantage of using the same tower crew at the same time for antenna installations
 - Time for most difficult station + 10% for 2nd station + 5% for each additional station up to 30%
- Auxiliary antenna use
 - Additional week added to tower crew work for stations needing auxiliary antenna
- Minimum on-air testing period of 4 weeks
 - Sequential testing periods; stations in a phase cannot start testing prior to completion of previous phase

Overall Transition Plan Timing



Comments and Timing

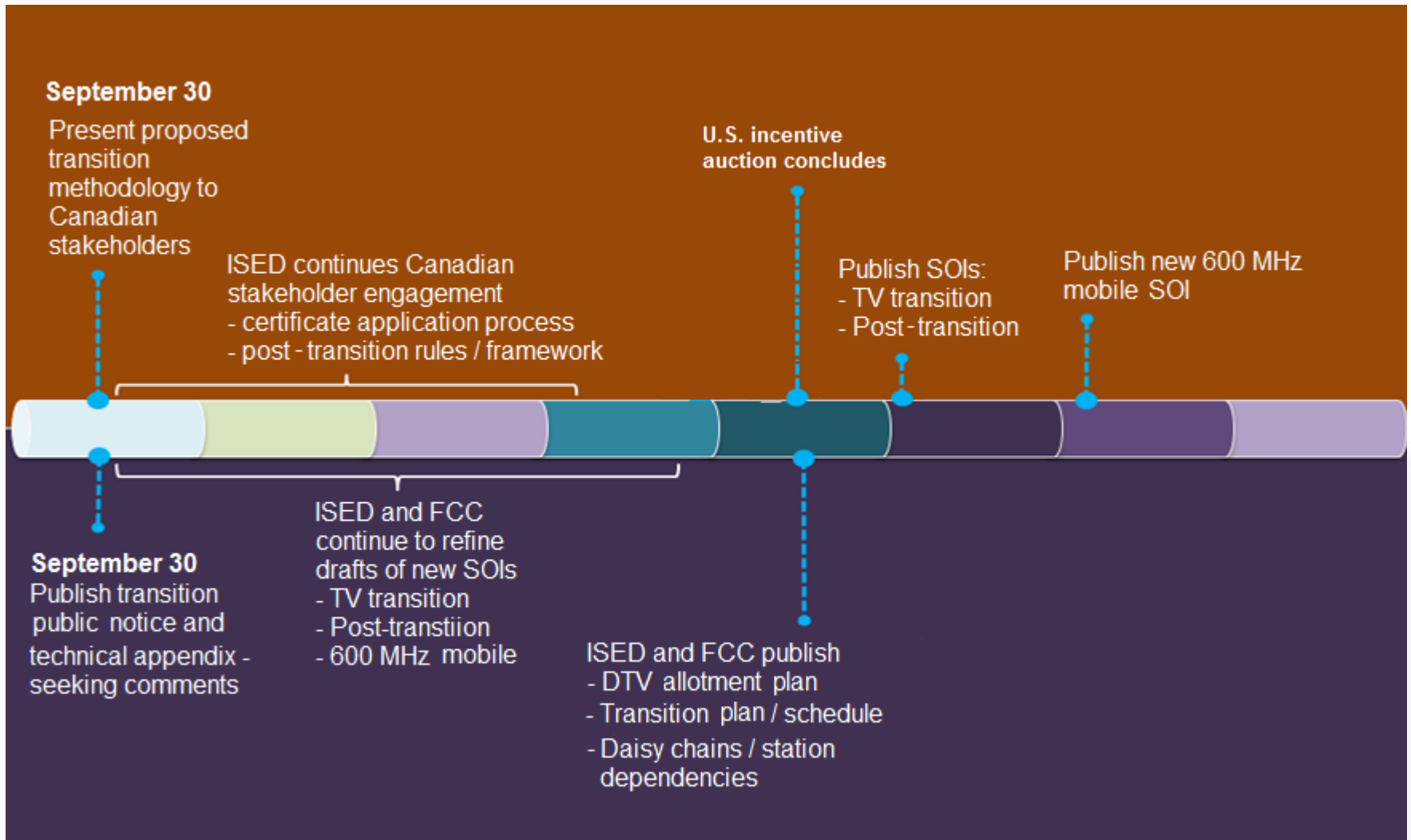
- ISED invites comments on the proposed transition plan
 - Comments on the methodology for assigning stations to phases, including proposed rules and objectives
 - Comments on the methodology for establishing a transition schedule and the proposed inputs (pre-construction and construction)
- Comments kindly requested by November 11, 2016



Next Steps

- Continue RABC 600 MHz working group meetings:
 - Written input and comments on the proposed transition plan, methodology and inputs
 - ISED application and certificate authorization processes
- ISED and FCC collaborating on joint transition plan
- Following incentive auction completion
 - New DTV allotment plan
 - Transition plan and schedule
 - Transition will begin
- Cross-border coordination for DTV, mobile operations
 - Transition and post-transition

Timelines



Canada 