2015 PMBA ANNUAL CONFERENCE
The Post-Spectrum-Auction World for Public TV

An Engineering and Legal Perspective on Planning Ahead for TV Repack and Post-Auction Operations

May 26-29, 2015
Washington, D.C.
Session Goals

• Understand the tight timing issues of implementing the TV repack and its impact on your station and budgets
• Understand some of the engineering and supply chain challenges associated with TV repack
• Understand the proposed reimbursement process
• Understand potential action items for stations (now and later)
Brief Analog & Digital TV History

1941  Black & white television broadcasting begins in the U.S.
      U.S. National Television Systems Committee (NTSC) formed.

1950’s  B&W television widely introduced throughout the world

1953  NTSC color television standard adopted in the U.S.

1954  Color television broadcasts commence in the U.S.

1970’s  Color television in world wide use

1980’s  Channels 70-83 to cellular and public safety
       Lobbying Battle begins between U.S. broadcasters and
       the mobile communications industry for more “unused TV channels”

1993  “Grand Alliance” formed for High Definition TV

1997  DTV approved by FCC
      Stations to “borrow” second channel
      Ch. 52-69 (700 MHz band) repurposed to carriers and Public Safety
Brief Analog & Digital TV History

Mar 1998  First DTV station goes on-air  (27 total in 1998)

DTV Construction Deadlines
May 1999  Top 10 Markets, 4 network affiliates
Nov 1999  Markets 11-30, 4 network affiliates
May 2002  All Commercial Stations
May 2003  All Noncommercial Stations

Many stations initially built reduced facilities and “maximized” later

July 2005  “Use it or Lose it” deadline – Commercial stations
July 2006  “Use it or Lose it” deadline – Noncommercial stations

2005-2006  Channel Elections for Post-Transition
           Election conflict resolution

2009       Analog operations terminate
           DTV operations on final channel
Broadcaster Auction Options

Auction participation is not mandatory. Participation is confidential.

Bid options for participating stations:
   1. License relinquishment
   2. Change bands (U to Hi-V, U to Lo-V, Hi-V to Lo-V)
   3. Share channel with another station

Post-Auction: Repacking
Non-participating stations may have to change to a new channel within the same band. Coverage areas and service population are protected.

Participating stations whose bids are not accepted may have to change channel within the same band

FCC to reimburse for “reasonable expenses” by involuntary channel changes
No reimbursement for stations changing bands (they get auction proceeds)
TV Incentive Auction

Participation of Over 200 Broadcasters is Needed

“...under the assumption of full participation, we learn that to clear 84 MHz of spectrum, a minimum of roughly 200 voluntary broadcaster exits are needed ignoring the domain constraints as identified by the FCC, and approximately 250 exits, if those constraints are considered”

AT&T Computational Study (June 18, 2014)

Greenhill’s FCC information package 10/01/2014

Station Shortfall for 120 MHz
(Full Power, Class A, Border Protection)

<table>
<thead>
<tr>
<th>DMA Rank (2010-2011)</th>
<th>Market</th>
<th>Number of Stations</th>
<th>Stations With No Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>New York</td>
<td>27</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>Los Angeles</td>
<td>29</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>Chicago</td>
<td>22</td>
<td>6</td>
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<tr>
<td>4</td>
<td>Philadelphia</td>
<td>24</td>
<td>14</td>
</tr>
<tr>
<td>5</td>
<td>Dallas-Ft. Worth</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>San Francisco-Oakland-San Jose</td>
<td>28</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>Boston</td>
<td>23</td>
<td>9</td>
</tr>
<tr>
<td>8</td>
<td>Atlanta</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Washington, DC</td>
<td>22</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>Houston</td>
<td>19</td>
<td>4</td>
</tr>
</tbody>
</table>

Areas Most Seriously Affected by Repacking

From SIEPR “Incentive Auction Design Conference” Feb 2013
Timelines and Milestones

“Auction Comment Public Notice” 3Q 2014  Adopted 12-11-2014
Initiates Pre-Auction process: to seek public input on auction design issues, opening prices, amount of market variation in band plan, initial clearing target, and the final television channel assignment process

Repack - Proposed Channel Reassignment “Optimization” Priority Factors:

1. Maximize “stays”: number of TV stations to stay on current channel no expenses, disruptions, terrain loss issues
2. Minimize number of stations to receive total new interference over 1%
3. Avoid reassignment of stations with high buildout costs

“Auction Procedures Public Notice” 1Q 2015
Resolves implementation issues from Comment PN; provide explanations and instructions; final procedures
Timelines and Milestones

“PN Announcing Pre-Auction Licensing Deadline” 1Q 2015
90-day notice of date by which existing CP’s, channel substitutions, Class A digital conversions completed by this date will be protected
***Deadline is May 29, 2015***

OET Releases Updated Baseline Data 1H 2015
List of specific facilities to be preserved, technical parameters, and coverage areas/population served

Summer 2015
Stations must review baseline data to certify accuracy of facility information or provide corrections. Form 2100 Schedule 381 - survey

Final Catalog of Costs released 1H 2015
Outreach to broadcasters regarding reimbursement procedures, post-auction transition to new channels, and consumer education
Timelines and Milestones

Incentive Auction  Mid-2015  2016
Participating stations must submit application
Conduct Mock auction, conduct Reverse and Forward Auctions
Auction closes when “Final Stage Rule” is satisfied

ASAP After Auction Concludes
Forward auction licenses are granted, disbursement of auction proceeds
are made to broadcasters that are relinquishing spectrum

Relinquishing and channel sharing stations must vacate pre-auction
channels within 3 months

***Channel Reassignment Public Notice***
Final TV channel assignments and parameters announced
Post-Auction period begins
\( t = 0 \)  Ready  Set  GO!
Timelines and Milestones

Deadline at “t + 3” Months
Repacked stations must file Construction Permit applications and estimated channel relocation costs

Crunch time – to plan new facility and transition

After “t + 3” Months, 36 month “Broadcast Construction Period” begins
CP’s are issued ASAP

FCC establishes construction deadlines for new channel implementation

**Deadlines to vary** by region, complexity, and other factors
Some stations will have less than the full 36 month period

FCC reviews cost estimates and issues initial allocation of funds
Timelines and Milestones

Meeting Construction Deadline
- At “t + 39” months, all operations on pre-auction channels must cease
- 6-month extension of **construction deadline** upon suitable request
- Subsequent extensions via much stricter criteria
- Must go dark if not ready at “t + 39”
- 12 months silent = automatic license expiration
  - FCC can reinstate with waiver – if involuntarily dark and if “equity and fairness” apply

Interim operations will be necessary for many stations
- Existing or new auxiliary transmitter/antenna
- Temporary installation OK
- On pre-auction and/or post-auction channel
- Reduced facilities
- Alternate site OK
- Temporary channel OK
Facility Planning

Limited opportunity for pre-planning until repack results are available

By $t = 3$ months must apply for Construction Permit

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Initial planning steps for new channel
Prior to filing for CP - Develop Antenna & Transmission Line Specs

Consulting RF Engineer

- Develop Prospective Antenna and Transmission Line Configuration
- FCC Compliance/Adjust ERP and Antenna Pattern
- Coverage Goals
- Practicality for Actual Antenna Pattern

In consultation with Station Engineer

Antenna Manufacturer

- Practical Antenna Design
  - "Catalog" or Custom Pattern
  - Usually no Charge: Prospective/Quotation

Structural Engineer

- Tower Loading Study
- If Overload Condition Found:
  1. Strengthen Tower
  2. Revise Antenna/Line, or
  3. Alternate Site or New Tower Site

1 A few TV Groups handle most/all internally.
Facility Planning

1. Pre-planning  \((t = 0)\)
2. RF Engineering
3. Structural Engineering
4. Negotiate with tower owners
5. Permitting
6. Estimated Costs to FCC for Reimbursement (negotiation?)

------  \(t = 3\) months ------

7. Acquire equipment/manufacturing
8. Tower Work
9. Field Engineering
Transmitters

New channel - transmitter modification or replacement?
Tube (IOT) or Solid State
Banding issues

Manufacturer support availability
Parts availability for older technology
Antennas

Most stations use a single-channel antenna, must replace UHF slotted cylinder dominant

Shared “broadband” antennas also common may work on new channel
UHF Panels typically OK over only part of UHF band
Hi-VHF Panels typically OK over Ch’s 7-13
Combiner modifications necessary

Last 10 years, addition of vertically polarized component has been common

Stacked antennas prevalent during transition
Transmission Line

Coaxial line – usually rigid

- 20 ft, 19.75 ft, and 19.5 ft sections for single-channel antennas

- Fixed length sections may not be compatible on new channel

<table>
<thead>
<tr>
<th>Engineering Review Needed to Determine Suitability on New Channel</th>
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<tbody>
<tr>
<td>Prohibited Channels per Line Length</td>
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<tr>
<td>20' Sections</td>
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<tr>
<td>4, 10, 16, 17, 20, 21, 25, 26, 29, 30</td>
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<tr>
<td>33, 34, 37, 38, 41, 42, 45, 46, 49, 50</td>
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<tr>
<td>53, 54, 57, 58, 61, 62, 65, 66, 69</td>
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<tr>
<td>19 3/4' Sections</td>
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<td>10, 11, 14, 17, 18, 22, 23, 26, 27, 30</td>
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<td>31, 34, 35, 38, 39, 42, 43, 46, 47, 50</td>
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<tr>
<td>51, 55, 56, 59, 60, 63, 64, 66, 68</td>
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<tr>
<td>19 1/2' Sections</td>
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<td>5, 7, 14, 15, 18, 19, 23, 24, 27, 28, 31</td>
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<tr>
<td>32, 35, 36, 39, 40, 44, 45, 48, 49,</td>
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<tr>
<td>52, 53, 56, 57, 60, 61, 65, 66, 69</td>
</tr>
</tbody>
</table>

Broadband systems have minor, non-repeating changes to section lengths; engineering review needed to determine suitability on new channel

- Lower power stations may use flexible line, continuous run; OK on new channel

- Some waveguide installations exist, likely to require replacement for new channel
Towers

Tower Structural Analysis
EIA/TIA RS-222-G (2005) now in effect most jurisdictions
Rev-F (1996) in effect during country's greatest build out of towers

Availability of as-built documentation

Limited number of structural engineers
Vendor and Service Provider Capacity

Depressed marketplace for equipment, industry has contracted
Threat of repacking, FCC freezes, general economy

Severe impact on high-power TV antenna manufacturers and tower crews capable of working on tall and complicated towers

Antenna Manufacturers
Principally: Dielectric, ERI both anxious and ready to ramp up
Others: Jampro, SWR, RFS, Kathrein

Tower crews:
“No more” than 14, current estimate is 5 to 10, for complex sites
30-40 “regional” crews
Vendor and Service Provider Capacity

Transmitter Manufacturers, high power
  GatesAir (Harris)
  Rohde & Schwarz
  Comark

Service & support only
  Acrodyne
  Axcera
  Larcan (via Maple Leaf RF Systems & Service LLC)
Vendor and Service Provider Capacity

Engineering Resources – Limited Capacity

Structural Engineers
  All firms at peak can do total of 40 structural analyses per month

Field Engineering – Transmitter installation & modification
  through 2009 – est. >100
  now, est. 30
  more available to do RF sweeps of antenna/line

RF Consulting Engineers
  Some TV groups handle internally, most stations will need help
  Est. 35, half of which positioned to handle more than 5-10 stations
  Reduced number of practitioners
Impact to LPTV, Television Translator, DRT

Not protected through repack
Many expected to be displaced by spectrum reallocation or repacked station
No reimbursement for channel change

FCC Mitigation
Special filing window for displaced operating facilities
 opens after t = 3 months and DTV expansion/alternate channel filing
 MX apps – settlement window, DRT priority, then auction

Facilities in 600 MHz band may continue to operate until notified by new licensee (120 day notice); if on guard band must cease at t = 39 months
“Perfect Storm” of challenges and shortages

- Stations involuntarily repacked
- Winning full power bidders for band changes
- Site consolidation / expansion opportunity for others
- LPTV and translator station displacement and digital buildout

All will draw from the same manufacturer and service provider resources
Collateral Damage

MVPD’s receiving OTA signals must be ready
Advance notice required from TV stations of changes
  30 days – ceasing operation
  30 days – sharing channel
  90 days – changing channel – coordination required for cutover

MVPD’s reasonable expenses are reimbursed
  without regard to must-carry or retransmission consent
  reimbursement is via station for must-carry signal delivery to headend

Other users of UHF TV Spectrum

Wireless Microphones

Whitespace Devices

BAS – Part 74 microwave operations in TV band
Reimbursement for Eligible Expenses

Reimbursement goes to station involuntarily repacked

Impact at shared sites

TV stations not changing channel

FM stations, other tower users

Does contract specify obligations?
Reimbursement Process -- Overview

• TV Broadcaster Relocation Fund
  – $1.75 Billion established by Congress
  – Reimburse broadcasters for channel relocation expenses
  – Funds available for non-auction participants and unsuccessful auction participants, but only those who are required to change channels (i.e. “relocate”)
  – Successful auction participants are not eligible for reimbursement (neither are TV translator/LPTV stations)
Reimbursement Process -- Overview

• Initial allocation of funds
  – Public TV stations receive up to 90% of costs allocated in advance (commercial gets up to 80%) [Note the importance of good cost estimates]

• Cost estimates due w/in 3 months after Channel Reassignment Public Notice
  – Estimate of costs on FCC Form, using Catalog of Eligible Expenses
  – Only costs “reasonable to provide facilities comparable to those that a b-caster... had prior to the auction”
  – Hard and soft expenses (more on that later)
Reimbursement Process – FCC Expectations

• Lowest cost equipment that most closely replaces existing equipment
• No reimbursement for new features
• Reuse own equipment to extent possible; if seek new equipment, must justify (technically)
• FCC encourages b-casters to seek out used equipment
Preparing Cost Estimates

• Stations may select applicable cost estimates pre-determined in the Catalog, or provide and justify and document own individualized estimate

• Stations must certify belief, in good faith,
  – Reasonably incur all these costs
  – Will use money only for eligible expenses
  – Comply with all draw down procedures, maintain detailed records, file all required documentation
Initial Allocation

• Initial allocation - based on FCC review of cost forms
• Issued to stations in designated individual accounts in US Treasury
• For PTV, initial allocation “up to” 90% of estimated costs
• Funds available for draw down as expenses incurred and as documentation is submitted and approved
True-up

• Before the end of 3 year reimbursement period
• Stations provide actual and remaining estimated costs
• Additional funds allocated as necessary
• Prioritization scheme if there is a shortfall in the fund
• If $$ left over in Station’s account, reverts to US Treasury
TV Broadcaster Relocation Fund Reimbursement Form

• This Form is your friend – it is used to submit:
  – Info to establish account with Dept. of Treasury for payment purposes
  – Estimate of Eligible Relocation Costs
  – Actual cost documentation, as expenses incurred, so that reimbursements can be made
  – Total expenses occurred
Learn to Love the Form

APPENDIX A – COST CHART

<table>
<thead>
<tr>
<th>(A) Description</th>
<th>(B) Predetermined Cost Estimate (if available)</th>
<th>(C) Revised Cost</th>
<th>(D) Estimated Cost</th>
<th>(E) Component Description</th>
<th>(F) Component Amount</th>
<th>Actual Cost Information</th>
<th>Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Pre-fill from above]</td>
<td>[Provide amount]</td>
<td>[If necessary]</td>
<td>[Describe]</td>
<td>[Provide Amount]</td>
<td>[Name of payment recipient]</td>
<td>[Date]</td>
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</tr>
</tbody>
</table>
Learn to Love the Form

• Documentation is key
• Payments disbursed on rolling basis
• Stations update the actual cost section of the Reimbursement Form each time they submit cost documentation for payment
• Multiple cost submissions
• FCC presently seeking contractor to administer reimbursement
Eligible Costs for Reimbursement

• Hard Costs
  – Equipment replacement and installation
  – Equipment modification
  – Tower work

• Soft Costs
  – Engineering fees (RF and structural consultants)
  – Health care facility notifications
  – Legal fees
Reimbursement – Timing Review

• \( t = 3 \) months
  – Submit first Reimbursement Form (used for initial allocation of 90%)

• \( t = \) during construction on new channel
  – Submit Reimbursement Forms (and invoices, etc.) for approval and draw down of reimbursement payments

• \( t = 30 \) months
  – Submit Reimbursement Form for final accounting and true up

• \( t = 36 \) months
  – Reimbursement period ends
Reimbursement - Key Takeaways

• Timing matters
• First Reimbursement Form is key – initial allocation (90% of estimated costs) based on this
• Actual reimbursements based on actual expenses incurred, documented and approved
• Keep very good records and documentation
• Budget for and consider how to handle cost-overruns (reimbursable AND non-reimbursable)
Planning – For Right Now

• Review Form and obtain info requested in FCC Form 2100, Schedule 381 (Due Summer 2015)
  – Last tower structural study; survey
  – Information on current transmission equipment
• Confirm/engage RF engineering consultant; you need someone on board and ready for t=0 time
• Consider a Project Manager for repack
  – PM is a reimbursable cost – staff time not reimbursable
• Begin educating your procurement/purchasing chain about timing and process to come
Planning – For Later

• Prepare for a busy time ahead
  – At this point, best guess is busy time to kick off Summer to Fall 2016 (?)

• Be ready to jump to (if needed) at t=0
  – Everything keyed to Channel Reassignment Public Notice

• Budget planning needs to account for possible repack, reimbursement program, cost overruns and delays
Comments, Questions?

Thank You!

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