Public Safety Wireless Network

PSWN

Achieving Interoperability through Cooperation and Coordination

Spectrum Issues and Analysis Report

Fairfax, VA
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EXECUTIVE SUMMARY

IMPROVEMENTS AND ADVANCEMENTS ON SIX IDENTIFIED SPECTRUM ISSUES ARE ESSENTIAL FOR THE PUBLIC SAFETY COMMUNITY TO ESTABLISH EFFECTIVE, INTEROPERABLE COMMUNICATIONS

- The PSWN program identified six spectrum issues that are an impediment to effective, interoperable communications—
  - The aggregate amount of spectrum allocated for public safety is insufficient to meet current and future voice and data communications needs
  - Public safety spectrum allocations are fragmented into 13 discrete portions of radio spectrum in seven separate groups throughout the VHF and UHF bands
  - To date, insufficient spectrum has been dedicated to meet interoperability requirements
  - Affordable multi-band technology is not readily available to the public safety community
  - The regulations and procedures used by the FCC and the NTIA to manage spectrum are not always well understood and have not necessarily been designed to encourage and enable interoperability
  - As public safety spectrum issues are resolved and additional spectrum is made available, the public safety community must take care to migrate its operations to a limited number of bands in a well-planned manner

- To achieve interoperable communications, improvements need to be made, including—
  - The aggregate amount of spectrum allocated for public safety use should be increased to support current and future communications requirements
  - Public safety spectrum should be located across a minimum number of frequency bands and these bands should be appropriate for supporting public safety communication requirements
  - Each public safety frequency band should have spectrum designated specifically to support interoperability requirements
  - Affordable technology to support multi-band communications should be more readily available to the public safety community
  - Spectrum management processes should be better understood and should evolve to encourage interoperability and the efficient use of spectrum
  - A strategy to smartly migrate the public safety community to newly allocated public safety bands should be developed

IMPROVEMENTS AND ADVANCEMENTS ON MAJOR SPECTRUM ISSUES ARE ESSENTIAL FOR THE PUBLIC SAFETY COMMUNITY TO ESTABLISH EFFECTIVE, INTEROPERABLE COMMUNICATIONS TO MEET CURRENT AND FUTURE COMMUNICATIONS REQUIREMENTS

- Based on recent developments taking place at the FCC, NTIA, Congress, and the ITU, the PSWN program developed the following recommendations to achieve the desired improvements—
  - The FCC and NTIA should formulate policies and regulations that protect existing public safety allocations and grant additional spectrum for public safety use
  - The PSWN program and FLEWUG should participate in the development of United States positions on international allocations. Monitor DTV implementation, and continue to make comments in the 96–86 proceeding
  - The PSWN program should outline specific steps to determine the appropriate spectrum for public safety, increase the priority of public safety allocations among decision makers, and obtain the necessary allocations
  - The FCC and NTIA should ensure that all public safety agencies, at all levels of government, are afforded the opportunity to use interoperability spectrum in each public safety band on a co-equal basis
  - The PSWN program and the FLEWUG should continue to actively participate in FCC activities impacting interoperability spectrum and conduct analytical studies to advance progress on interoperability issues
  - The PSWN program should support public safety's efforts to understand multi-band technologies, define its specific needs, and develop a competitive market for equipment among prospective vendors
  - The FCC and NTIA should develop more efficient and user-friendly spectrum management processes that are accessible to all types of public safety entities
  - The PSWN program and FLEWUG should continue to participate in public safety proceedings and meetings at regulatory bodies that examine spectrum management processes
  - The FCC and NTIA should jointly develop processes that lead to coordinated national planning in order to achieve a sound migration of public safety communications to new bands

I. SUMMARY REPORT

- Introduction
- Purpose
- Methodology
- Public Safety Spectrum Issues
- Recent Developments
- Recommendations and Actions

THE PUBLIC SAFETY WIRELESS NETWORK (PSWN) PROGRAM DEVELOPED THIS REPORT TO TRACK RECENT DEVELOPMENTS AND THEIR IMPACT ON THE RESOLUTION OF KEY PUBLIC SAFETY SPECTRUM ISSUES

- Radio spectrum is recognized as an essential resource for providing and improving radio communications capabilities of public safety agencies
  - The National Partnership for Reinventing Government (NPRG) has identified spectrum as one of five priority issues in action item A06 of its report *Access America*
  - The Public Safety Wireless Advisory Committee (PSWAC) developed a series of recommendations regarding spectrum requirements of the public safety community through the year 2010
  - The Federal Communications Commission (FCC) and the National Telecommunications and Information Administration (NTIA) manage spectrum resources for local/state and federal agencies, respectively; these agencies are active in identifying spectrum issues of concern to the public safety community

- The PSWN program has undertaken discrete activities to help foster a broader understanding of spectrum issues. In particular, the program has—
  - Developed "how-to" guides for both local/state and federal spectrum management processes
  - Developed a comparison report of the local/state and federal spectrum management processes
  - Assisted the Federal Law Enforcement Wireless Users Group (FLEWUG) with the development of comments, reply comments, ex parte presentations, and petitions in regards to FCC proceedings affecting public safety
  - Filed its own comments to the most recent public safety Notice of Proposed Rulemaking (NPRM)
  - Created the *Public Safety and Radio Spectrum Guide* to raise awareness of public safety spectrum issues; the guide was endorsed by the Attorney General and the National League of Cities and distributed to senior-level government officials

- As another component of the program's spectrum analysis efforts, this report is designed to monitor and analyze the key spectrum issues, assess the current state of each issue, and identify the actions that should be taken to make progress toward resolving the issues

THE PSWN PROGRAM DEVELOPED THIS REPORT TO TRACK RECENT DEVELOPMENTS AND THEIR IMPACT ON THE RESOLUTION OF KEY PUBLIC SAFETY SPECTRUM ISSUES

- The body of the report is divided into the following six sections: aggregate amount of spectrum, number and appropriateness of frequency bands, interoperability spectrum, affordable multi-band technology, spectrum management processes, and migration strategy
  - These sections (II–VII) provide an overview of the public safety spectrum issues identified by the PSWN program and include an analysis of the impact of recent developments on these issues and recommendations for future actions

- In the body of the report, each section is developed and analyzed using the following framework:
  - *Problem Statement* — An assessment of the current status of a specific spectrum issue and why the current status does not meet public safety communications needs
  - *Desired End State* — Descriptions of the issue's importance to the public safety community and of the desired end state for the issue as articulated in the *PSWN Program Long-Term Plan*
  - *Achievements* — A discussion of positive progress in meeting the desired end state
  - *Challenges* — A discussion of the impediments in meeting the desired end state
  - *Recommendations and Actions* — A description of opportunities that can be pursued to advance public safety spectrum goals

- The appendixes of this report provide supporting information about ongoing activities that impact public safety spectrum issues
  - *Appendix A: Acronyms* — A definition of the acronyms used in this report
  - *Appendix B: Recent Developments* — A description of recent spectrum-related developments occurring at the FCC, the NTIA, the United States Congress, and the International Telecommunication Union (ITU) are analyzed in this report, and a synopsis of activities undertaken by the PSWN program and the FLEWUG that impact public safety spectrum issues is provided

THE PURPOSE OF THIS REPORT IS TO PROVIDE A DETAILED ANALYSIS OF THE ISSUES AFFECTING PUBLIC SAFETY RADIO SPECTRUM

- This report is intended to—
  - Clarify the issues affecting public safety radio spectrum
  - Inform the public safety community about the environment, actions, and processes impacting spectrum availability and use
  - Educate the public safety community on spectrum-related developments
  - Analyze recent spectrum-related developments to determine their impact on public safety spectrum management and use
  - Assess the progress that has been made in reaching the desired end state regarding public safety spectrum issues
  - Identify potential opportunities and options to advance public safety spectrum goals

A THREE STEP RESEARCH AND ANALYSIS APPROACH WAS USED TO DEVELOP THE *SPECTRUM ISSUES AND ANALYSIS REPORT*

- A variety of data sources were used to monitor spectrum developments, including—
  - FCC, NTIA, and Congressional documents
  - Federal Government and Congressional staff
  - News articles
  - Press releases
  - Web sites

- Recent developments were collected and tracked in a database the "Spectrum Action Tracker" to maintain an up-to-date resource of spectrum related articles and web links

- An analytical framework was used to categorize and assess the impact of developments on spectrum issues
  - An analysis of recent developments was conducted to determine their impact on the ability of the public safety community to address identified spectrum issues
  - Impacts were categorized into achievements, challenges, and opportunities

- Potential recommendations and actions that can be taken by decision makers (FCC, NTIA) and the public safety community to favorably influence the outcome of recent developments were developed

- Research, monitoring, and analysis of impact and recommendations related to spectrum issues are an ongoing activity for the PSWN program

USING THE PSWAC RECOMMENDATIONS, THE PSWN PROGRAM IDENTIFIED SIX ISSUES ESSENTIAL TO MEETING CURRENT AND FUTURE SPECTRUM NEEDS OF THE PUBLIC SAFETY COMMUNITY. . .

Issue	Problem Statement / *Desired End State*
1. Aggregate Amount of Spectrum	• The aggregate amount of spectrum allocated for public safety is insufficient to meet current and future voice and data communications needs • *The aggregate amount of spectrum allocated for public safety use should be increased to support current and future communications requirements*
2. Number and Appropriateness of Frequency Bands	• Public safety spectrum allocations are fragmented into 13 discrete portions of radio spectrum in seven separate groups throughout the Very High Frequency (VHF) and Ultra High Frequency (UHF) bands • *Public safety spectrum should be located across a minimum number of frequency bands and these bands should be appropriate for supporting public safety communication requirements*
3. Interoperability Spectrum	• To date, insufficient spectrum has been dedicated to meet interoperability requirements • *Each public safety frequency band should have spectrum designated specifically to support interoperability requirements*

. . .REACHING THE DESIRED END STATE FOR EACH ISSUE WILL INCREASE THE PUBLIC SAFETY COMMUNITY'S ABILITY TO ADDRESS SPECTRUM ISSUES

USING THE PSWAC RECOMMENDATIONS, THE PSWN PROGRAM IDENTIFIED SIX ISSUES ESSENTIAL TO MEETING CURRENT AND FUTURE SPECTRUM NEEDS OF THE PUBLIC SAFETY COMMUNITY. . .

1. Multi-Band Technology	• Affordable multi-band technology is not readily available to the public safety community • *Affordable technology to support multi-band communications should be more readily available to the public safety community*
2. Spectrum Management Processes	• The regulations and procedures used by the FCC and the NTIA to manage spectrum are not always well understood and have not necessarily been designed to encourage and enable interoperability • *Spectrum management processes should be better understood and should evolve to encourage interoperability and the efficient use of spectrum*
3. Migration Strategy	• As public safety spectrum issues are resolved and additional spectrum is made available, the public safety community must take care to migrate its operations to a limited number of bands in a coordinated, deliberate manner • *A strategy to smartly migrate the public safety community to newly allocated public safety bands should be developed*

. . .REACHING THE DESIRED END STATE FOR EACH ISSUE WILL INCREASE THE PUBLIC SAFETY COMMUNITY'S ABILITY TO ADDRESS SPECTRUM ISSUES (Continued)

RECENT POLICY AND REGULATORY DEVELOPMENTS HAVE HAD AN IMPACT ON PUBLIC SAFETY SPECTRUM ISSUES

- The PSWN program tracks developments directly concerning or potentially relating to public safety spectrum issues occurring at the following federal entities responsible for the management and use of public safety spectrum: the FCC, the NTIA, and the U.S. Congress
  - Additionally, the program follows technical developments in industry, legislative developments in state and local governments, and spectrum-related activities of public safety agencies located throughout the country

- The above facer contains a matrix of recent developments and public safety spectrum issues contained in this report. Appendix B contains a detailed description of the recent developments analyzed in this report

- **FCC**
  - *First Report and Order (R&O) for WT Docket 96-86* ¾ The First R&O establishes the service rules and licensing procedures for the 24 MHz of spectrum allocated to public safety in the 764–806 MHz band
  - *Third NPRM for WT Docket 96-86* ¾ The Third NPRM requests comment on rules for the reserve spectrum in the 764–806 MHz band, interoperability spectrum below 512 MHz, potential land mobile radio (LMR) interference with Global Navigational Satellite Systems (GNSS), and public safety's preparedness for potential Year 2000 problems
  - *Universal Licensing System (ULS)* and *Electronic Comment Filing System (ECFS)* ¾ These automated systems were implemented to enable members of the public community to participate in FCC activities through the Internet
  - *Commercial spectrum auctions* ¾ On-going commercial auctions generate revenue for the Federal Government while reducing the amount of available spectrum available to potentially satisfy current and future public safety spectrum needs
  - *Reallocation of 220 MHz spectrum* ¾ The FCC recently designated fifteen channel pairs in the 220 MHz band for public safety use
- *Spectrum management en banc hearing*
  - A hearing was held on April 6, 1999
  - Additional hearings have been suggested as part of the FCC's desire to educate itself regarding spectrum issues; these may provide an opportunity for the public safety community to communicate directly to FCC Commissioners and staff

RECENT POLICY AND REGULATORY DEVELOPMENTS HAVE AN IMPACT ON PUBLIC SAFETY SPECTRUM ISSUES

- **NTIA**
  - *Ad Hoc 214* — The NTIA established Ad Hoc 214, among other things, to examine how to reduce regulatory barriers so that interoperability between federal agencies and their state and local counterparts would be easier to realize
  - Ad Hoc 214 was involved in establishing a Memorandum of Agreement (MOA) between the State of Wisconsin and the Department of Defense (DOD) to build a shared system on frequencies licensed to DoD
  - The NTIA has identified interoperability channels in the UHF and VHF bands, and is currently considering proposals regarding the management and use of these channels

- **Congress**
  - *Omnibus Budget Reconciliation Act (OBRA) of 1993 and the Balanced Budget Act (BBA) of 1997* — with these actions, Congress mandated that 200 MHz and 20 MHz, respectively be reallocated. The NTIA identified 235 MHz with OBRA 93 and 12 MHz with BBA 97 (originally 20 MHz, subsequently reduced by 8 MHz), thereby recommending that a total of 247 MHz of Federal Government spectrum be reallocated for commercial use

- **ITU**
  - *Mobile Satellite System (MSS) allocations in existing public safety bands* — During the 2000 World Radio Conference (WRC), the ITU will be considering spectrum allocations for MSS use in existing public safety bands

THERE ARE SEVERAL ACTIONS THAT THOSE INVOLVED IN PUBLIC SAFETY SPECTRUM DEBATES CAN TAKE TO IMPACT SPECTRUM ISSUES AND MOVE THE ISSUES CLOSER TO THEIR DESIRED END STATE

Issue	Recommendations and Actions
1. Aggregate Amount of Spectrum	• The FCC and the NTIA should formulate policies and regulations that protect existing public safety allocations and grant public safety additional spectrum • The PSWN program and the FLEWUG should participate in the development of United States positions on international allocations, monitor the implementation of digital television (DTV), and continue to make comments to the 96–86 proceeding
2. Number and Appropriateness of Frequency Bands	• The PSWN program should outline specific steps to determine the appropriate spectrum for public safety, increase the priority of public safety allocations among decision makers, and obtain the necessary allocations
3. Interoperability Spectrum	• The FCC and NTIA should ensure that all public safety agencies, at all levels of government, are afforded the opportunity to use interoperability spectrum in each public safety band on a co-equal basis • The PSWN program and the FLEWUG should continue to actively participate in FCC activities impacting interoperability spectrum and conduct analytical studies to advance progress on interoperability issues
4. Multi-Band Technology	• The PSWN program should support public safety's efforts to understand multi-band technologies, define its specific needs, and develop a competitive market for equipment among prospective vendors
5. Spectrum Management Processes	• The FCC and NTIA are developing more efficient and user-friendly spectrum management processes and ensure broader participation by the public safety community • The PSWN program and FLEWUG should participate in public proceedings and attend meetings at regulatory bodies that examine spectrum management processes
6. Migration Strategy	• The FCC and NTIA should develop processes that lead to coordinated national planning in order to achieve a sound migration of public safety communications to new bands

A MORE DETAILED ANALYSIS OF THE CURRENT PROBLEMS, DESIRED END STATES, AND OPPORTUNITIES FOR ACTION PROVIDED ABOVE, ALONG WITH FURTHER ANALYSIS OF THE ACHIEVEMENTS AND CHALLENGES IN SPECTRUM ISSUES, ARE PROVIDED IN THE FOLLOWING SECTIONS

- Section II—Aggregate Amount of Spectrum
- Section III—Number and Appropriateness of Frequency Bands
- Section IV—Interoperability Spectrum
- Section V— Affordable Multi-Band Technology
- Section VI—Spectrum Management Processes
- Section VII—Migration Strategy
- Appendix A—Acronyms
- Appendix B—Recent Developments

II. AGGREGATE AMOUNT OF SPECTRUM

- Problem Statement
- Desired End State
- Achievements
- Challenges
- Recommendations and Actions

THE AGGREGATE AMOUNT OF SPECTRUM ALLOCATED FOR PUBLIC SAFETY USE IS INSUFFICIENT TO MEET CURRENT AND FUTURE VOICE AND DATA COMMUNICATIONS NEEDS

- The current aggregate amount of radio spectrum allocated for public safety entities cannot satisfy existing day-to-day communications requirements or support interoperability requirements
  - Additional spectrum is needed to address these shortfalls and to support the deployment of advanced technologies

- Most public safety agencies use spectrum to support voice communications, but spectrum is increasingly being used to support more advanced technologies, such as data, imagery, and video transmissions
  - Data applications include text messaging, fingerprint identification, and geographic location data
  - Imagery applications include snapshots of accidents, crime scenes, mug shots, and fingerprints
  - Video applications include surveillance, monitoring, and robotics control for bomb disposal and fire fighting
  - More than 90% of law enforcement agencies use voice-only channels on their radio systems
  - About 27% currently use data-only channels, and this number is expected to increase 70% in the future[1]
  - Further, 30% of the fire and emergency medical service (EMS) agencies that responded to the *PSWN Program Analysis of Fire and EMS Communications Interoperability* reported that they currently use mobile computing equipment; and the number is predicted to double by 1999[2]

- The need for additional spectrum also stems from enhanced mission requirements due to numerous sociological changes, including—
  - Population growth and demographic changes
  - Domestic terrorism incidents, such as the Oklahoma City and World Trade Center bombings, pose unique interoperability challenges due to the mass number of responding public safety entities and the limited time constraints

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[1] National Institute of Justice. *State and Local Law Enforcement Wireless Communications and Interoperability: A Quantitative Analysis,* p. 28.
[2] PSWN Program. *PSWN Program Analysis of Fire and EMS Communications Interoperability, p. 31.*

THE AGGREGATE AMOUNT OF SPECTRUM ALLOCATED FOR PUBLIC SAFETY USE SHOULD BE INCREASED TO SUPPORT CURRENT AND FUTURE COMMUNICATIONS REQUIREMENTS

- The public safety community currently has a total of 71.55 Megahertz (MHz) of spectrum allocated specifically for public safety use, to include 47.55 of existing spectrum and 24 MHz designated for reallocation pursuant to the Balanced Budget Act of 1997
  - State and local public safety agencies are allocated 47.2 MHz of the 71.55 MHz;
  - Federal entities with public safety responsibilities are allocated 24.45 MHz
  - This amount represents 49% of PSWAC's recommendation for 145.05 MHz of spectrum needed to meet current and future requirements, which would require an additional allocation of 73.5 MHz

- Based on PSWAC recommendations, an additional 73.5 MHz of spectrum is needed by the year 2010 to meet public safety spectrum requirements—
  - To meet current shortfalls for voice and data operations, 1 MHz of spectrum is needed
  - For interoperability, 2.5 MHz of spectrum below 512 MHz should be designated
  - Another 70 MHz of general use spectrum is required for voice, data, image, and video requirements
  - This would give the public safety community a total of 145.05 MHz of radio spectrum
  - Specific spectrum bands identified by PSWAC for additional public safety allocations are discussed in Section III

- Advanced applications, such as data, imagery, and video, will require more bandwidth than is currently necessary for voice technology, which will strain already limited spectrum resources
  - For public safety frequencies below 512 MHz, voice is generally transmitted on 25 kilohertz (kHz) channels, although there have been recent initiatives to "narrowband" voice channels to 6.25 kHz for local and state use, and 12.5 kHz for federal use
  - The 700 MHz band channel bandwidths are 6.25 kHz for narrowband technologies (which can be aggregated to form 25 kHz channels) and 50 kHz for wideband technologies (which can be aggregated to form 150 kHz channels)

THE AGGREGATE AMOUNT OF SPECTRUM ALLOCATED FOR PUBLIC SAFETY USE SHOULD BE INCREASED TO SUPPORT CURRENT AND FUTURE COMMUNICATIONS REQUIREMENTS (Continued)

- Low-speed data systems can also function on the narrowband voice channels (4.8 kilobytes per second [kbps] on 6.25 kHz channels and 9.6 kbps on 12.5 kHz channels)
- Higher speed data transmissions and slow-speed video transmissions (384 kbps) require channels of at least 100 kHz
- Broadband high speed data and video applications could require channels as wide as 600 kHz

RECENT FCC ACTIONS HAVE RESULTED IN MORE SPECTRUM FOR THE PUBLIC SAFETY COMMUNITY

- As directed in the BBA of 1997, the FCC released a public notice in January 1998 to reallocate 24 MHz of spectrum in the 746–806 MHz band from television broadcasters to public safety[3]

- The FCC is holding a public proceeding regarding the management and use of the reallocated 24 MHz
  In September 1998, the FCC released the First R&O,[4] which established the rules for governing the planning, management, and use of the general use spectrum. The First R&O provided public safety agencies with 2.6 MHz of interoperability spectrum, 12.6 MHz of general use spectrum and 8.8 MHz of reserve spectrum. In the Third NPRM, the FCC seeks comment on the following two frequency designations from the R&O—
    - Using and licensing of the 2.6 MHz of interoperability spectrum
    - Use and licensing of the 8.8 MHz of reserve spectrum

- In a separate proceeding in February 1998, the FCC designated spectrum in the 220 MHz band for public safety use[5]
  - This spectrum was designated to facilitate public safety communications and is available to local, state, and federal public safety entities
  - Fifteen channel pairs (30 frequencies) measuring 5 kHz wide, resulting in an additional 150 kHz of spectrum, are available for use by public safety entities
  - Ten channels are available to all public safety for base/mobile operations; the remaining five channels are available for licensing for emergency medical use only

[3] FCC. *FCC Reallocates Television Channels 60–69 (746–806 MHz) to Other Services*, ET Docket No. 97–157, January 6, 1998.
[4] FCC. FCC WT Docket No. 96-86. *The Development of Operational, Technical and Spectrum Requirements For Meeting Federal, State and Local Public Safety Agency Communication Requirements Through the Year 2010*, August 6, 1998.
[5] FCC. *Filing Freeze To Be Lifted For Applications Under Part 90 For the Fifteen Public Safety Channel Pairs in the 220–222 MHz Band.* DA 97–2296, February 13, 1998.

RECENT FCC ACTIONS HAVE RESULTED IN MORE SPECTRUM (Continued)

- As a result of these new allocations, 49% of the PSWAC recommendation for the amount of spectrum needed to meet current and future communications requirements has been met

THE NTIA AND FCC HAVE TAKEN STEPS TO INCREASE CAPACITY OF EXISTING SPECTRUM ALLOCATIONS BY MANDATING SMALLER CHANNEL BANDWIDTHS, PERMITTING MORE EFFICIENT USE OF EXISTING SPECTRUM

- The NTIA has mandated that Federal Government radio users in high-band VHF and low-band UHF reduce the bandwidth of their radio channels from 25 kHz to 12.5 kHz prior to 2008
  - The narrowbanding deadline for the 162–174 MHz band is January 1, 2005
  - The narrowbanding deadline for the 406–420 MHz band is January 1, 2008

- The FCC has developed a refarming policy as part of an overall strategy to improve the efficiency of spectrum use in private land mobile radio (PLMR) allocations (which include public safety) to help meet future communications requirements[6]
  - Equipment received for type acceptance after February 14, 1997, must meet a spectrum efficiency standard of one voice channel per 12.5 kHz of channel bandwidth
  - Equipment received for type acceptance on or after January 1, 2005, except for hand-held transmitters with an output power of two watts or less, must meet a spectrum efficiency standard of one voice channel per 6.25 kHz of channel bandwidth
  - Users have the option of transitioning to 12.5 kHz channels before going to 6.25 kHz channels
  - The FCC amended its rules to allow licensees to implement trunked radio systems in bands below 512 MHz

- The narrowband plan for the 24 MHz reallocation of spectrum in the 700 MHz band will be compatible with the proposed refarming band plans in lower frequency bands
  - Narrowband channels will be 6.25 kHz wide but can be aggregated to 12.5 kHz and 25 kHz channel bandwidths
  - Channels that are wider than 25 kHz will not be authorized for the narrowband plan, but can be accommodated in the wideband segment

[6] FCC. *In the Matter of Replacement of Part 90 by Part 88 to Revise the Private Land Mobile Radio Services and Modify the Policies Governing Them and Examination of Exclusivity and Frequency Assignments Policies of the Private Land Mobile* Services*,* PR Docket No. 92-235, March 12, 1997.

- Wideband channels are 50 kHz and can be aggregated to 100 kHz and 150 kHz channel bandwidths

Aggregate Amount of Spectrum…Achievements…

THE NTIA AND FCC HAVE TAKEN STEPS TO INCREASE CAPACITY OF EXISTING SPECTRUM ALLOCATIONS BY MANDATING SMALLER CHANNEL BANDWIDTHS, PERMITTING MORE EFFICIENT USE OF EXISTING SPECTRUM (Continued)

- Narrowbanding efforts by the NTIA and refarming efforts by the FCC will drastically increase the number of channels available to public safety without increasing the aggregate amount of spectrum
  - Channels assigned to federal agencies will double
  - Channels licensed to state and local entities in bands below 512 MHz will quadruple

THERE ARE SEVERAL ISSUES RELATED TO DTV THAT HAVE THE POTENTIAL TO BLOCK PUBLIC SAFETY ACCESS TO THE 700 MHz BAND IN THE SHORT AND LONG TERMS

- In some areas of the country, TV broadcasters are using the public safety 700 MHz band, as shown in the facing table (TV channels 63, 64, 68, and 69)
  - As part of the transition to DTV, broadcasters have until December 31, 2006 to vacate these channels
  - The broadcasters identified above are supposed to start DTV broadcasts on their newly allocated channels in 2002
  - The BBA Act of 1997 permits the FCC to extend the deadline to vacate the spectrum beyond 2006 if DTV penetration is below 85% as specified in the BBA of 1997 or if digital-to-analog converter technology is not available in the market
  - This may delay the availability of the 700 MHz band to public safety in the cities listed in the facing table

- In the following cities, the complete 24 MHz allocation may never be available because stations in these cities have been assigned a DTV channel in the public safety band[7]:
  - Concord, CA—Channel 63
  - Riverside, CA—Channel 68
  - Philadelphia, PA—Channel 64
  - Aguadilla, PR—Channel 69
  - Mayaguez, PR–Channel 63

- Because the FCC requires base/mobile channel pairing in the 700 MHz band, if one channel is unavailable, the other channel that was supposed to be the other half of the pair will be unavailable for public safety use, rendering a total of 12 MHz that will be unavailable

- In some cities, public safety may never have access to the 700 MHz band due to interference resulting from an inadequate separation distance between the city center and the TV transmitter

[7] Each TV channel has 6 MHz bandwidth.

THE PUBLIC SAFETY COMMUNITY MAY FACE CHALLENGES IN OBTAINING AN ADDITIONAL 73.5 MHz OF SPECTRUM TO MEET LONG-TERM COMMUNICATIONS REQUIREMENTS DUE TO COMPETITION WITH COMMERCIAL INTERESTS

- Since 1994, approximately 2,825 MHz of spectrum has been auctioned by the FCC
  - The Federal Government has had 255 MHz of spectrum reallocated or slated to be reallocated for auction to commercial wireless communications services
  - Auctions have raised $23.5 billion in revenue for the government so far[8]
  - The BBA of 1997 has extended authority to the FCC to auction mutually exclusive applications for any service except for public safety and DTV[9]

- Since the FCC started auctioning commercial spectrum in 1993, public safety has received only 24 MHz of spectrum
  - In 1996, the PSWAC Report identified a need for 97.5 MHz of spectrum to meet short and long-term public safety mission requirements
  - Some of the bands identified by PSWAC as potential spectrum have been reallocated for auction while others have been reallocated for commercial purposes
    - 6% of the identified spectrum will be auctioned to General Wireless Communication Services (GWCS)
    - 21% of the identified spectrum was allocated to DTV for commercial purposes
    - 19% of the spectrum was allocated to Intelligent Transportation Systems as recommended in the PSWAC Report; although this is not specifically designated for public safety, agencies can be subscribers
    - Public safety spectrum below the 512 MHz bands have been refarmed and will increase the number of available channels in these bands

- The demand for commercial spectrum must be balanced with the needs of public safety users. While recent FCC proceedings have suggested that public safety agencies should be allowed to participate in the auctions process, obstacles such as limited monetary resources and administrative capabilities impede the realization of full public safety participation

[8] FCC estimate, *http://www.fcc.gov/wtb/auctions*.
[9] Balanced Budget Act of 1997, Sec. 3002.

THE PUBLIC SAFETY COMMUNITY MAY FACE CHALLENGES RETAINING FULL USE OF EXISTING ALLOCATIONS DUE TO COMPETITION WITH COMMERCIAL INTERESTS

- If accepted, the ITU proposal for sharing the allocation in the 450–470 MHz public safety band between LMR and mobile satellite services (MSS) may cause harmful interference to existing public safety LMR systems operating in the band[10]
  - This proposal is currently under study by working groups of the FCC preparing for the World Radio Conference
  - If the proposal to share the allocation is approved by the ITU and harmful interference from MSS does occur, existing public safety communications in the 450–470 MHz band may become less reliable

[10] NTIA, *United States Preliminary Views On WRC-2000* (As of September 11, 1998).

THE FCC AND NTIA SHOULD FORMULATE POLICIES AND REGULATIONS THAT PROTECT EXISTING PUBLIC SAFETY ALLOCATIONS AND GRANT PUBLIC SAFETY ADDITIONAL SPECTRUM

- The FCC should enforce the DTV transition schedule to ensure that the public safety community receives the 700 MHz band on a nationwide basis by 2006
  - The FCC needs to ensure that individual broadcasters are meeting construction deadlines
  - If individual broadcasters miss construction deadlines, the FCC should determine the reasons why
  - Entities like the FCC's DTV Tower Strike Force can help broadcasters overcome hurdles in meeting construction deadlines
  - The FCC needs to provide incentives for broadcasters to comply with all DTV implementation deadlines, such as levying usage charges or fines to broadcasters who miss deadlines
  - The FCC should strictly interpret the provision in the BBA of 1997 that allows the FCC to continue to permit TV broadcasts on the public safety 700 MHz band allocation if "one or more stations…has exercised due diligence and satisfies the conditions for an extension of the Commission's applicable construction deadlines for digital television service in that market"[11] to prevent broadcasters from stalling the return of their TV channels

[11] Balanced Budget Act of 1997, Section 3003 (14)(b)(i).

THE FCC AND NTIA SHOULD FORMULATE POLICIES AND REGULATIONS THAT PROTECT EXISTING PUBLIC SAFETY ALLOCATIONS AND GRANT PUBLIC SAFETY ADDITIONAL SPECTRUM (Continued)

- The FCC should grant the public safety community additional spectrum below 512 MHz to meet long-term public safety communications needs as recommended by PSWAC
  - The FCC should grant public safety interoperability channels below 512 MHz, per the Third NPRM
  - The FCC should initiate another proceeding to identify and allocate additional spectrum for public safety below 512 MHz
  - The FCC and the NTIA Public Safety Joint Working Group should coordinate viewpoints developed by the FCC and NTIA to identify spectrum available for public safety use

THE PSWN PROGRAM AND THE FLEWUG SHOULD MONITOR IMPLEMENTATION OF DTV AND CONTINUE TO MAKE COMMENTS IN THE 96-86 PROCEEDING

- The PSWN program, the FLEWUG, and interested members of the public safety community should continue to support the designation of more public safety spectrum below 512 MHz by actively participating in ex parte presentations regarding WT Docket 96–86

- The PSWN program should continue to monitor broadcasters' conversion to DTV to flag potential problems in particular geographic areas, such as—
  - Tracking the number and location of TV stations that have met construction deadlines and have converted from analog to digital transmissions
  - Monitoring the FCC biennial review of the DTV implementation strategy
  - Monitoring actions of the FCC DTV Tower Strike Force
  - Monitoring technological and market developments in the DTV industry to gauge the probability of the 700 MHz band being open to public safety by 2006

III. NUMBER AND APPROPRIATENESS OF FREQUENCY BANDS

- Problem Statement
- Desired End State
- Achievements
- Challenges
- Recommendations and Actions

PUBLIC SAFETY SPECTRUM ALLOCATIONS ARE FRAGMENTED INTO 13 DISCRETE PORTIONS OF RADIO SPECTRUM IN NINE SEPARATE GROUPS THROUGHOUT THE VHF AND UHF BANDS

- Local, state, and federal public safety operations are spread across the following frequency bands—

State and Local Bands	Federal Bands
- 25–50 MHz - 72–76 MHz - 150–174 MHz - 220–222 MHz* - 450–470 MHz - 470–512 MHz - 764–776 and 794–806 MHz* - 806–821 and 851–866 MHz - 821–824 and 866–869 MHz	- 30–50 MHz - 138–150.8 MHz - 162–174 MHz - 406.1–420 MHz

*Recently allocated public safety band for state and local entities

- The current distribution of channels for both federal and local/state public safety agencies in the nine spectrum bands is shown in the figure above.[12]
  - Almost half of the channels available for use by public safety entities are located in the high-band UHF range, with the second most available channels in the high-band VHF range

[12] This distribution of channels includes the 24 MHz recently allocated in the 700 MHz band; without these channels, the distribution would be as follows: low-band VHF (25–50 MHz): 15.83%, low-band UHF (72–76 MHz): 0.34%; high-band VHF (150–174 MHz): 33.44%; high-band VHF (220–222 MHz): 1.02%; low-band UHF (406.1–420 MHz): 18.49%; low-band UHF (450–512 MHz): 20.64%; high-band UHF (806–869 MHz): 10.24%

PUBLIC SAFETY SPECTRUM ALLOCATIONS ARE FRAGMENTED INTO 13 DISCRETE PORTIONS (Continued)

- Frequency band fragmentation causes interoperability problems among local, state, and federal public safety entities and can impede joint public safety operations
  - Users in different bands are unable to talk to each other, thus isolating different disciplines and jurisdictions
  - For instance, federal agencies operate LMR systems below 800 MHz and generally cannot communicate with local or state agencies operating in the 800 MHz band; this is becoming more prevalent as an increasing number of local and state agencies migrate to the 800 MHz band
  - Agencies implement methods to overcome the interoperability challenges caused by frequency band fragmentation, such as swapping radios, equipping personnel with multiple radios, and equipping personnel with expensive dual-band radios

- Little consideration is given to the appropriateness of spectrum allocated for public safety use
  - Propagation effects that determine whether a particular band will meet public safety mission requirements generally are not considered
  - Many agencies have specialized communications requirements based on their specific missions and operating environments that are better served by either higher or lower frequency bands
  - For example, as documented in the PSWN program 800 MHz study, lower frequency bands may be more appropriate for public safety communications when considering range and building penetration, whereas 800 MHz spectrum is more readily available for use

PUBLIC SAFETY SPECTRUM SHOULD BE LOCATED ACROSS A MINIMUM NUMBER OF FREQUENCY BANDS AND THESE BANDS SHOULD BE APPROPRIATE FOR SUPPORTING PUBLIC SAFETY COMMUNICATION REQUIREMENTS

- Migration to one optimal band may not be realistic because of the intense competition between commercial, private, and government users for available bands and the large amount of embedded infrastructure for systems operating in each existing public safety frequency band
  - However, reducing the number of bands to an appropriate few is essential for establishing a manageable complement by improving interoperability and simplifying spectrum management

- Public safety communications requirements need to be taken into consideration when spectrum allocations are being made
  - The needs of commercial spectrum interests must be balanced with the public safety community's need to have a sufficient amount of spectrum in appropriate bands
  - Decision makers need to consider requirements identified by the public safety community to allocate spectrum appropriate for public safety use

- Appropriate public safety spectrum needs to be tested, identified, and allocated
  - The technical characteristics of potential bands need to be evaluated to ensure suitability for future public safety use
  - The results of this evaluation should be used to identify appropriate spectrum for additional allocation
  - Legislative and regulatory authority should allocate bands that are adjacent to existing public safety allocations or otherwise appropriate based on the evaluation and identification of appropriate spectrum

- The PSWAC identified potential public safety spectrum allocations that would consolidate public safety voice communications and narrowband data communications in or near existing public safety bands
  - 174–216 MHz—Immediate sharing of this TV band (primarily outside of urban areas) for statewide systems
  - 380–399.9 MHz—Reallocation to public safety and immediate sharing with Department of Defense
  - 470–512 MHz—Immediate allocation for voice, data, and video transmissions

NEW PUBLIC SAFETY SPECTRUM IN THE 700 MHz BAND IS ADJACENT TO EXISTING 800 MHz SPECTRUM, RESULTING OF A CONCENTRATION OF PUBLIC SAFETY USERS IN THOSE BANDS

- The majority of state and local public safety entities also appear to be migrating to the UHF band and frequencies around 800 MHz
  - 51% of law enforcement and 43% of fire agencies would prefer their next system to be in the 800 MHz band
  - Another 65% of law enforcement and 31% of fire agencies would prefer their next system to be in high-band VHF[13,14,15]

- The newly allocated 700 MHz band is adjacent to current public safety allocations in the 800 MHz band
  - This allocation increases the number of public safety channels by 2160 channels
  - This allocation constitutes 42% of the total number of channels allocated to public safety

- With the 700 MHz band allocation, the 700 MHz and 800 MHz bands are emerging as the primary public safety bands for state and local public safety entities
  - High band UHF (764–869 MHz) contains 63% of state and local public safety channels
  - However, most federal public safety channels are located in high-band UHF (47% of total federal channels) and high band VHF (41% of total federal channels)
  - The effects of frequency band fragmentation between federal and state/local entities can be minimized if the FCC grants federal agencies co-equal access to the 700 MHz band

[13] National Institute of Justice. *State and Local Law Enforcement Wireless Communications and Interoperability: A Quantitative Analysis,* January 1998.
[14] PSWN. *PSWN Program Analysis of Fire and EMS Communications Interoperability*, December 1998.
[15] The *Fire/EMS Study* and *NIJ Study* surveys asked agencies to identify preferred bands for voice and data needs. Agencies were able to select more than one band, which results in total percentages that exceed 100%.

CURRENT SPECTRUM ALLOCATIONS ABOVE 700 MHz, AS WELL AS THOSE IDENTIFIED BY PSWAC, MAY NOT RESOLVE EXISTING FREQUENCY BAND FRAGMENTATION OR TECHNICAL OBSTACLES

- Although the new 700 MHz spectrum is adjacent to the 800 MHz spectrum, the benefits of contiguous bands will not be realized until certain issues are addressed—
  - There is no mobile, portable, or base station LMR equipment that operates in the 700 MHz band
  - There is no off-the-shelf public safety equipment that spans both bands
  - The channel widths in the 700 MHz and 800 MHz band are different sizes, which presents difficulties in manufacturing multi-band equipment

- As noted on the facing table, several of the bands below 1 GHz identified by PSWAC as potential public safety allocations are no longer available because they have been reallocated for other uses or are scheduled to be auctioned for commercial services

- The PSWAC also identified several bands above 1 GHz for potential public safety use involving wideband data, video, and microwave applications
  - 1710–1755 MHz–wideband data and video
  - 1990–2110 MHz–microwave or wideband data/video requirements
  - 4635–4685 MHz–point-to-point systems or short-range mobile video systems
  - 5850–5925 MHz–Intelligent Transportation Systems (ITS)

- Although there is a significant amount of spectrum potentially available above 1 GHz, acquiring it would create more public safety bands and require the development of new systems that can operate at higher frequencies

CURRENT SPECTRUM ALLOCATIONS ABOVE 700 MHz, AS WELL AS THOSE IDENTIFIED BY PSWAC, MAY NOT RESOLVE EXISTING FREQUENCY BAND FRAGMENTATION OR TECHNICAL OBSTACLES (Continued)

- Furthermore, there are significant questions regarding the appropriateness of higher frequency systems for land mobile communications; these questions (e.g., building penetration and coverage area) could be significantly more troublesome above 1 GHz

THE PSWN PROGRAM SHOULD OUTLINE SPECIFIC STEPS TO DETERMINE THE APPROPRIATE SPECTRUM BANDS FOR PUBLIC SAFETY, INCREASE THE PRIORITY OF PUBLIC SAFETY ALLOCATIONS AMONG DECISION MAKERS, AND OBTAIN THE NECESSARY ALLOCATIONS

- The PSWN program should compare and contrast the propagation characteristics of each public safety band
  - The PSWN program commissioned a study of technical characteristics and management of the 800 MHz band[16]
  - The knowledge gained as a result of this study has enabled the PSWN program and FLEWUG to make well-informed and strategic comments in WT Docket 96–86
  - Studies of other bands would help the PSWN program, the FLEWUG, and other members of the public safety community to continue to make well-informed and strategic comments in other proceedings

- The PSWN program should obtain a complete assessment of current spectrum allocations and use below 1 GHz
  - Thorough knowledge of each band would assist the PSWN program in identifying appropriate frequency bands for public safety use
  - This knowledge could be applied to comments in FCC or NTIA proceedings or to other public policy initiatives related to public safety spectrum allocation

- The PSWN program should assess the viability of public safety data applications in frequency bands above 1 GHz by conducting pilot tests and demonstrations
  - Public safety has not traditionally used higher frequency bands in the past and the technical characteristics and capabilities associated with data applications above 1 GHz are not necessarily known among public safety groups
  - The PSWN program would be able to evaluate performance and feature sets that best meet the needs of the public safety community
  - The PSWN program should provide advice and support to establish baseline operational requirements and standards for higher frequency data applications

[16] Booz·Allen & Hamilton. *800 MHz Study: A Study to Assess the Relative Merits of Spectrum Around 800 MHz as an Operating Frequency Band for Public Safety Communications*, March 23, 1998.

THE PSWN PROGRAM SHOULD OUTLINE SPECIFIC STEPS TO DETERMINE THE APPROPRIATE SPECTRUM BANDS FOR PUBLIC SAFETY, INCREASE THE PRIORITY OF PUBLIC SAFETY ALLOCATIONS AMONG DECISION MAKERS, AND OBTAIN THE NECESSARY ALLOCATIONS (Continued)

- The PSWN program should perform pilot tests and demonstrations on multi-band equipment that works across public safety bands to take advantage of adjacent spectrum allocations
  - The PSWN program should conduct pilot tests and demonstrations on equipment that works on the 700 MHz and 800 MHz bands
  - The PSWN program would be able to evaluate performance and feature sets that best meet the needs of the public safety community
  - The PSWN program pilot test and demonstrations could serve as a means to establish baseline requirements and standards for multi-band equipment

- The PSWN program should continue PSWAC efforts to identify available spectrum in bands that are in or adjacent to current public safety bands
  - Some of the bands identified by PSWAC have been reallocated for other services
  - Until public safety is allocated appropriate spectrum, an ongoing assessment of spectrum allocation and use will help identify appropriate bands and enable the public safety community to provide options to policy makers

IV. INTEROPERABILITY SPECTRUM

- Problem Statement
- Desired End State
- Achievements
- Challenges
- Recommendations and Actions

TO DATE, AN INSUFFICIENT AMOUNT OF SPECTRUM HAS BEEN DEDICATED TO MEET INTEROPERABILITY REQUIREMENTS

- Interoperability spectrum is required in all public safety bands to support multi-disciplinary, multi-jurisdictional operations for day-to-day response, mutual-aid response, and specialized task forces
  - Day-to-day responses involve coordination during routine public safety operations
  - Mutual aid responses involve a joint and immediate response to an incident and require tactical communications among groups of public safety personnel
  - Task force operations involve local, state, or federal agencies coming together for an extended time period to address a public safety challenge
  - Nearly 90% of local fire and EMS agencies surveyed indicate the need to interoperate with other local public safety organizations on a daily or weekly basis[17]
  - 93% of all law enforcement agencies interoperate with local organizations, while 63% interoperate with state organizations, and 15% interoperate with federal organizations[18]

- However, only a limited number of interoperability channels have been allocated to local and state public safety agencies on a nationwide basis. These channels are:

  - 155.475 MHz (Nationwide Law Enforcement)
  - 821/866.0125 MHz (National Calling Channel)
  - 822/867.0125 MHz (Mutual Aid Tactical Channel)
  - 823/868.0125 MHz (Mutual Aid Tactical Channel)
  - 47.420 MHz (Special Emergency/American Red Cross)
  - 821/866.0525 MHz (Mutual Aid Tactical Channel)
  - 822/867.0525 MHz (Mutual Aid Tactical Channel)

  - Aside from these few channels, additional nationwide interoperability spectrum in other public safety bands does not exist

[17] PSWN. *PSWN Program Analysis of Fire and EMS Communications Interoperability*, December 1998.
[18] National Institute of Justice. *State and Local Law Enforcement Wireless Communications and Interoperability: A Quantitative Analysis,* January 1998.

TO DATE, AN INSUFFICIENT AMOUNT OF SPECTRUM HAS BEEN DEDICATED TO MEET INTEROPERABILITY REQUIREMENTS (Continued)

- Spectrum allocations for interoperability purposes in all public safety frequency bands are needed to reduce the severity of obstacles to interoperability for many agencies
  - While the obstacles to interoperability caused by frequency band fragmentation will not be solved, interoperability among agencies in the same bands would drastically improve

- In order to improve interoperability, many areas of the country have designated region-wide channels (from their general use spectrum assignments) to support their interoperability requirements
  - In some instances, states have established state-wide interoperability channels for law enforcement, fire, and emergency medical services
  - These channels are generally found in the high-band VHF range and in the 800 MHz band and only provide interoperability between users operating in the same band in a particular region

- Interoperability between local, state, and federal public safety entities is also hampered by spectrum management constraints of designated interoperability spectrum
  - Historically, the FCC and NTIA have managed interoperability issues for individual bands and users as dictated by the immediate circumstances, rather than addressing interoperability across the entire spectrum and between all user groups
  - For example, interoperability spectrum designated by the FCC is strictly available for state and local entities, while interoperability spectrum designated by the NTIA is strictly designated for Federal Government use; limiting the spectrum's utility by all levels of public safety
  - The FCC and NTIA have not defined processes for sharing spectrum between federal and state or local users

SPECTRUM SHOULD BE DESIGNATED SPECIFICALLY TO SUPPORT INTEROPERABILITY REQUIREMENTS AS PART OF AN OVERALL NATIONAL STRATEGY

- Interoperability spectrum divided among all existing public safety bands would greatly promote interoperability, specifically below 512 MHz
  - Over half (51.7%) of all public safety radio channels are in bands below 512 MHz, but only 2 channels are available for national interoperability below 512 MHz
  - The PSWAC recommends an additional 2.5 MHz of spectrum below 512 MHz to support interoperability requirements

A more systematic, coordinated, and comprehensive approach should be taken to address the need for interoperability spectrum

- A national strategy involving coordination between the FCC and NTIA is needed to establish a plan for the management of interoperability spectrum
  - A strategy where the FCC and the NTIA pool, coordinate, and jointly manage public safety interoperability spectrum would engender a collaborative environment, promote the use of the spectrum, and ease the development of interoperable radio systems
  - A joint approach would reaffirm the FCC's and the NTIA's commitment to address unmet spectrum requirements necessary for achieving interoperability throughout the nation

- The establishment of joint rules for public safety interoperability spectrum would ensure a consistent approach for obtaining and maintaining assignments, securing approvals for systems plans, and validating the use of the spectrum for interoperability purposes
  - Interoperability plans at the local and regional level are necessary to implement a national interoperability strategy
  - Joint rules would help to create a single, unified set of procedures for making use of interoperability spectrum for all public safety entities
  - Joint rules would create an administratively efficient environment for systems developers to obtain and maintain interoperability frequencies

PUBLIC SAFETY AGENCIES ARE IN THE PROCESS OF GAINING ADDITIONAL INTEROPERABILITY SPECTRUM IN DESIGNATED PUBLIC SAFETY BANDS

- The FCC recognized the need for adequate amounts of interoperability spectrum for public safety communications and designated 2.6 MHz of the newly allocated 700 MHz band for interoperability purposes
  - The 128 narrowband and 36 wideband channels can be used for voice, data, image/high-speed data (HSD), and video transmissions
  - The interoperability spectrum is allocated on a nationwide basis and accounts for 10.8% of the total 700 MHz band allocation
  - Early analysis of the FCC rulemaking indicates that federal public safety entities will be granted access to the new interoperability and general use spectrum to perform joint operations with state and local governments
  - If federal users are eligible for co-equal access to the 700 MHz spectrum, an environment would exist where multi-jurisdictional interoperability could occur[19]

- The FCC recognized the need for interoperability spectrum below 512 MHz and proposed designating specific channels for interoperability in existing VHF and UHF public safety bands
  - The FCC has assigned five channels in the 150–174 MHz band and five channels in the 450–512 MHz band for interoperability purposes

- While interoperability spectrum in these bands would help improve public safety interoperability challenges, the FCC's proposed designations in the VHF and UHF bands would provide only a small fraction of the required 2.5 MHz below 512 MHz identified by PSWAC
  - The allocations would amount to only 5 percent of the PSWAC requirement for 2.5 MHz

[19] The FLEWUG filed a Petition for Reconsideration and Clarification to the First Report & Order in WT Docket 96-86 to better understand federal access to the 700 MHz band and qualify federal agency risks related to entering into partnerships on state and local systems.

PUBLIC SAFETY AGENCIES ARE IN THE PROCESS OF GAINING ADDITIONAL INTEROPERABILITY SPECTRUM IN DESIGNATED PUBLIC SAFETY BANDS (Continued)

- The NTIA is also beginning efforts to designate interoperability channels in the VHF and UHF bands
  - On June 23, 1999, the NTIA's Office of Spectrum Management announced a Joint Public Safety Interoperability Channeling Plan. The plan, developed in cooperation with the FLEWUG, Ad Hoc 214 and IRAC, designates Interoperability channels within federally allocated radio frequencies for use by federal, state, and local public safety agencies, as well as non-government agencies with FCC approval
  - A total of 40 National Calling Channels have been allocated under this plan in the federal VHF and UHF narrowband channel allotment plans; with 20 designated as Law Enforcement channels and 20 designated as Incident Response Channels
    - 50% of the channels are in the VHF band (138–150.8 MHz and 162–174 MHz)
    - 50% of the channels are in the UHF band (406.1–420 MHz)

- The FCC created the Public Safety National Coordinating Committee (PSNCC, hereafter known as the NCC) to establish plans relating to the use of spectrum in the 700 MHz band designated for interoperability as well as spectrum in other frequency bands The NCC's responsibilities include—
  - Formulating an operational plan to achieve national interoperability that includes a shared or priority system among users of the interoperability spectrum for day-to-day and emergency operations
  - Making recommendations regarding Federal Government access to the interoperability spectrum
  - Recommending technical standards to achieve full interoperability
  - Formulating recommendations for the use of interoperability spectrum, including recommendations for Federal Government users' access, that will allow public safety licensees to make use of the spectrum until final rules are developed
  - Providing recommendations on an advisory basis to the regional planning committees (RPCs) in order to ensure the development of coordinated regional plans

EFFECTIVE INTEROPERABLE COMMUNICATIONS BETWEEN PUBLIC SAFETY AGENCIES WILL BE DEPENDENT ON THE IDENTIFICATION AND COORDINATION OF INTEROPERABILITY SPECTRUM IN EACH PUBLIC SAFETY BAND ON A CO-EQUAL BASIS

- Interoperability spectrum needs to be identified that meets the needs of all public safety users
  - As mentioned earlier, PSWAC recommended that public safety should have access to 2.5 MHz of interoperability spectrum below 512 MHz, which still has not been addressed
  - Interoperability spectrum needs to be identified in each public safety frequency band
  - Interoperability spectrum needs to be accessible to all public safety users (law enforcement, fire, EMS, etc.) at all levels of government (local, state, and federal) on a co-equal, or equally shared, basis

- Many public safety agencies may be financially restricted from migrating to the newly allocated 700 MHz band, limiting the effectiveness of the interoperability spectrum in the 700 MHz band
  - Users of the 700 MHz interoperability spectrum may be further isolated from agencies operating in other public safety bands
  - If manufacturers develop equipment that can operate across the 700 MHz and 800 MHz bands, 800 MHz users will have access to the 700 MHz band interoperability spectrum
  - Because all current federal frequency allocations are in bands below 420 MHz, the 700 MHz interoperability spectrum will not aid interoperability between local, state, and federal users unless federal users have co-equal access to this band
  - Early analysis of the FCC rulemaking indicates that federal public safety entities will be granted co-equal access to the new interoperability and general use spectrum, but final rules are still uncertain

EFFECTIVE INTEROPERABLE COMMUNICATIONS BETWEEN PUBLIC SAFETY AGENCIES WILL BE DEPENDENT ON THE FORMULATION OF PLANS THAT PROMOTE EFFECTIVE USE AND MANAGEMENT OF THE INTEROPERABILITY SPECTRUM

- Once spectrum has been identified and allocated, the FCC and NTIA need to formulate and implement coordinated plans to improve interoperability among all public safety agencies
  - The NCC is charged with the creation of an operational plan to achieve national interoperability for the 700 MHz band
  - The NCC needs to ensure that their plan is compatible with interoperability guidelines established for other bands
  - To facilitate multi-jurisdictional interoperability, the NCC needs to ensure that federal users have access to the 700 MHz band general use and interoperability spectrum
  - The plan needs to recommend appropriate technical standards to promote affordable, realistic options for interoperability

- After interoperability plans have been formulated, the FCC and NTIA need to ensure that their processes facilitate efficient and effective implementation of the plans
  - FCC and NTIA need to coordinate their rules and processes or examine methods to jointly manage public safety spectrum
  - The FCC rules for interoperability spectrum (particularly for the 700 MHz band, whose rules have not yet been finalized) need to facilitate interoperability and spectrum sharing with federal agencies; NTIA rules for interoperability need to facilitate interoperability and spectrum sharing with state and local agencies

THE FCC AND NTIA SHOULD TAKE STEPS TO ENSURE THAT ALL PUBLIC SAFETY AGENCIES, AT ALL LEVELS OF GOVERNMENT, ARE AFFORDED THE OPPORTUNITY TO ACCESS INTEROPERABILITY SPECTRUM IN EACH PUBLIC SAFETY BAND ON A CO-EQUAL BASIS

- The FCC should identify and reallocate spectrum to public safety to satisfy unmet interoperability requirements identified by PSWAC
  - The FCC should conduct a public proceeding to designate interoperability channels in all state and local public safety bands below 512 MHz

- The NTIA should continue its efforts to identify and designate interoperability spectrum from current federal spectrum allocations to satisfy unmet interoperability requirements identified by PSWAC

When the FCC or the NTIA designates interoperability spectrum in public safety bands, each should coordinate with the other to ensure corresponding interoperability channel allocations
- Coordination will ensure that local, state, and federal agencies can access the same interoperability channels
- Coordination could be done through the IRAC

- The NCC should formulate and submit to the FCC recommendations for the use of interoperability spectrum, including Federal Government users' access, that will allow public safety licensees to make use of the spectrum until final rules are developed

- The FCC should, through the NCC, develop an operational plan to achieve national interoperability that includes a shared or priority system among users of the interoperability spectrum for both day-to-day and emergency operations and for Federal Government access to the spectrum
  - The FCC should require that every public safety mobile radio have the capacity to transmit and receive on at least one nationwide interoperability channel in the band in which it is operating

THE PSWN PROGRAM AND THE FLEWUG SHOULD CONTINUE TO ACTIVELY PARTICIPATE IN FCC ACTIVITIES IMPACTING INTEROPERABILITY SPECTRUM AND CONDUCT ANALYTICAL STUDIES TO ADVANCE PROGRESS ON INTEROPERABILITY ISSUES

- The PSWN program should conduct a study to identify appropriate interoperability channels in local, state, and federal public safety bands
  - The PSWN program and FLEWUG could use this knowledge base to—
    - Comment in FCC proceedings to promote interoperability spectrum in existing public safety bands
    - Bring proposals to the IRAC and NTIA on interoperability spectrum allocations in federal bands

- The PSWN program and the FLEWUG should continue to participate in WT Docket 96–86 to support the designation of interoperability spectrum below 512 MHz with specific conditions, including—
  - Interoperability channels should permit co-equal access for federal entities to support multi-jurisdictional interoperability
  - Interoperability channels should be available on a nationwide basis
  - Interoperability channel planning should be consistent with FCC refarming initiatives

- Representatives from the PSWN program and the FLEWUG are participating on the NCC to help develop the national plan for the use of interoperability spectrum

V. AFFORDABLE MULTI-BAND TECHNOLOGY

- Problem Statement
- Desired End State
- Achievements
- Challenges
- Recommendations and Actions

AFFORDABLE MULTI-BAND TECHNOLOGY IS NOT READILY AVAILABLE TO THE PUBLIC SAFETY COMMUNITY

- Due to equipment characteristics and user preferences regarding characteristics related to frequency such as capacity and range, safety agencies will continue to operate in multiple bands; the most hopeful scenarios for band consolidation result in public safety operations in two or three distinct bands
  - In the current environment, public safety agencies operate across nine different frequency bands, making interoperability among users difficult
  - In many instances, users must carry multiple radios or communicate through a third-party (i.e., dispatch center) to communicate with agencies operating in different frequency bands
  - As discussed earlier, the probability of migrating to one public safety band, regardless of the practicality or desirability of doing so, is minimal

- Systems architectures and equipment that support multi-band communications are not readily available from many vendors
  - There is significant interest by users in equipment that is capable of operating across multiple frequency bands
  - However, most manufacturers do not provide equipment that enables multi-band communications using a single radio
  - Many equipment manufacturers do not believe that there is sizeable demand in the public safety LMR market for multi-band equipment
  - Therefore, they do not produce many types of multi-band equipment nor do they invest in research and development for new multi-band technologies

- Multi-band systems are considerably more expensive than single band systems due to a dramatic increase in secondary costs for designing the system. These costs include, but are not limited to, the following:
  - *Engineering costs* – Complicated engineering studies must performed to design systems to operate across multiple bands (i.e., coverage area concerns)
  - *Planning costs* – An increase in systems planning costs is expected because multiple agencies must coordinate budgets, operations, and procedures

AFFORDABLE MULTI-BAND TECHNOLOGY TO SUPPORT MULTI-BAND COMMUNICATIONS SHOULD BE MORE READILY AVAILABLE TO THE PUBLIC SAFETY COMMUNITY

- There needs to be increased community awareness of currently available technology and systems capabilities which support multi-band communications
  - Multi-band communications can be achieved at the infrastructure level by using methods such as analog or digital baseband connectivity
    - *Baseband connectivity* directly connects the audio level of base stations and/or repeaters that operate in different frequency bands using a central control facility
    - *Protocol conversion* connects two or more different radio systems into a single wide area network (WAN) using algorithms that allow the use of equipment from multiple manufacturers and in multiple frequency bands
  - Single-unit multi-band radios offer another method of enabling communications across multiple bands

- Increased competition among vendors would provide an affordable market for products which facilitate communications across multiple frequency bands
  - Increased availability of multi-band radios will reduce costs for such equipment
  - Alternatives to multi-band radios are interconnect systems that interface different communications mediums, as well as offer cross band connections among several different radio systems

- Testbeds and demonstration platforms would help users evaluate new multi-band technologies and products
  - Evaluation of multi-band technology will help maximize the utility of the technology and identify existing limitations
  - Efforts to demonstrate new technologies will increase public awareness of available technology and promote effective systems planning for interoperability purposes

A FEW VENDORS HAVE DEVELOPED PRODUCTS TO FACILITATE COMMUNICATIONS ACROSS MULTIPLE FREQUENCY BANDS

- Racal Radio has developed a single unit multi-band hand-held radio called the Multi-Band Inter/Intra Team Radio (MBITR)
  - The MBITR is a radio capable of operating on frequencies ranging from 30-512 MHz, specifically 30-90 MHz, 116-174 MHz, 225-400 MHz, and 400-512 MHz
  - Currently, a large amount of Racal's product is used by the military for tactical operations

- Vertex Radio Communications has developed a dual-band radio, the FTH-2070, capable of operating in the VHF and UHF bands
  - The Vertex product is a digital, dual-band radio that operates on frequencies in the 50-174 MHz and 409-490 MHz bands
  - According to Vertex, the FTH-2070 is compatible with Motorola, General Electric, and Uniden radios
  - The Vertex product is competitively priced with current mid-range single-band radios

- The San Diego Integrated Program Team (IPT) demonstrated the capabilities of the JPS Communications, Inc. (ACU-1000) switch in a mobile configuration that could be used to help satisfy short-term interoperability requirements
  - The ACU-1000 provides a modularized approach, using computer controlled processing, to interconnect the analog baseband signal of diverse communications medium
  - The ACU-1000 was primarily designed for radio interface, but also provides interface with other communications media (e.g., satellite, Public Switched Network, and cellular)
  - The switch allows interconnection of radios operating in multiple bands and provides user adjustable transmit and receive levels to optimize performance

PHYSICAL AND FINANCIAL LIMITATIONS IMPEDE THE AVAILABILITY OF MULTI-BAND TECHNOLOGIES FOR THE PUBLIC SAFETY COMMUNITY

- The physical characteristics of a single radio that operates across multiple frequency bands may preclude its utility for public safety use
  - Multi-band radios are often larger and bulkier than typical single band radios, hindering their portability

- The costs associated with developing multi-band technology may limit manufacturer's efforts in this area
  - The vendor community might be unwilling to allocate funds for research and development in a market that may not be sizeable enough to recover costs
  - In addition, multi-band technology must be affordable, potentially limiting manufacturers' ability to develop a product that meets all of the public safety community's communication requirements or set a price that covers research, development, and manufacturing costs
  - The vendor community's current solution for multi-band communications offers them the opportunity to sell more of their product
    - For example, Motorola's multi-band solution involves purchasing a VHF radio and a UHF radio with connection through a console capable of controlling both radios
    - This option costs twice as much as purchasing one single-band radio plus the cost of the console

- Extensive testing and evaluation in this market is largely dependent upon the vendor community
  - Vendor testing may not be completely reflective of real-life scenarios faced by the public safety community
  - No testbeds or demonstrations are being undertaken to develop equipment specifications

- With the advent of multi-band technology, consideration must be given to the implications on spectrum management processes (i.e., technical specifications for LMR equipment)

THE PSWN PROGRAM SHOULD TAKE STEPS TO SUPPORT PUBLIC SAFETY'S EFFORTS TO UNDERSTAND MULTI-BAND TECHNOLOGIES, DEFINE ITS SPECIFIC NEEDS, AND DEVELOP A COMPETITIVE MARKET FOR EQUIPMENT AMONG PROSPECTIVE VENDORS

- The PSWN program should fully evaluate the current state of multi-band technologies (e.g., equipment options, price ranges, and engineering requirements)
  - This would help members of the community become more aware of multi-band technologies and allow for additional alternatives for systems planners to best meet their short-term and long-term goals
  - The PSWN program could draw on its understanding of multi-band technologies to develop recommendations on ways these technologies could provide a potential solution to meet interoperability and spectrum requirements in shared systems situations

- The PSWN program should help to create visible demand for multi-band technologies
  - The PSWN program should hold forums and focus groups to educate members of the public safety community on ways that multi-band technologies could help satisfy existing communications requirements
  - The PSWN program should coordinate and pool resources of local, state, and federal public safety entities to explore the possibility of large-scale procurement of multi-band radios
  - The community could use this new understanding to influence or encourage the vendor community to develop affordable multi-band technology

- The PSWN program should perform pilot tests and demonstrations using multi-band equipment that work across public safety bands to evaluate performance and features that best meet the needs of the public safety community
  - The PSWN program could influence vendor research and development towards multi-band equipment by including multi-band requirements in its Request for Proposals for pilot tests and demonstrations

VI. SPECTRUM MANAGEMENT PROCESSES

- Problem Statement
- Desired End State
- Achievements
- Challenges
- Recommendations and Actions

THE REGULATIONS AND PROCEDURES USED BY THE FCC AND THE NTIA TO MANAGE SPECTRUM ARE NOT ALWAYS WELL UNDERSTOOD AND HAVE NOT NECESSARILY BEEN DESIGNED TO ENCOURAGE AND ENABLE INTEROPERABILITY

- The processes by which spectrum is allocated, assigned, and administered for public safety use can appear complex to most system managers and users
  - The state and local processes and regulations are contained in Part 90 of the *Code of Federal Regulations*; federal processes and regulations are contained in the *NTIA Manual of Regulations & Procedures for Federal Radio Frequency Management*
  - These documents are cumbersome and not very user-friendly, which presents a challenge to public safety users trying to understand the rules, regulations, and processes that govern their spectrum use

- Local and state public safety agencies pay fees to obtain frequency assignments and these fees add non-trivial costs to the development costs for radio systems
  - While the FCC does not directly charge fees to public safety licensees, public safety applicants must acquire frequencies through the FCC's frequency coordinators, who levy fees for their services
  - The NTIA has recently revised its fee methodology, and now charges on a per assignment basis similar to the FCC

- Coordination between the FCC and NTIA to specifically address interoperability among public safety entities is insufficient
  - No overarching national strategy for the management of public safety interoperability spectrum exists
  - The sharing of federal and non-federal public safety frequencies is not well established and generally handled on a case-by-case basis by both the FCC and NTIA
  - Separate advisory committees have been established for various bands (i.e., 700 MHz RPCs, 800 MHz RPCs), potentially increasing the difficulty of spectrum management coordination between these bands

- There are multiple spectrum management processes and rules in place depending on the frequency band which leads to fragmented management, difficulties in establishing interoperability across multiple bands or with multiple licensees, and obstacles to sharing spectrum

SPECTRUM MANAGEMENT PROCESSES SHOULD BE BETTER UNDERSTOOD AND SHOULD EVOLVE TO ENCOURAGE INTEROPERABILITY AND THE EFFICIENT USE OF SPECTRUM

- User-friendly information regarding spectrum management processes should be readily accessible to the community to promote a better understanding of FCC and NTIA regulations and procedures
  - An adept understanding of the regulatory processes will increase the efficiency and speed at which users navigate through the frequency assignment processes
  - Understanding spectrum management processes is also key to developing strategic position and valuable recommendations regarding improving the policy making and regulatory environment

- Spectrum management processes need to be streamlined to encourage interoperability and shared resources
  - Streamlined regulations would make help to streamline processes, which would make them more understandable and more user-friendly

- The frequency coordinator fees structures should be reasonable, consistent, managed, and regulated
  - "Reasonable," i.e., based on the actual costs per transaction while remaining competitive
  - "Consistent," i.e., normalized with comparable transaction types among all coordinators
  - "Managed," i.e., put in place only after approval by the FCC
  - "Regulated," i.e., only changed after the need is demonstrated to the FCC and approved

- Extensive coordination between the FCC and the NTIA is needed to ensure spectrum management processes meet the growing demands of public safety communications and encourage interoperability of local, state, and federal public safety agencies
  - Establishment of joint-rules, adopted by the FCC and NTIA for interoperability spectrum, would create an administratively efficient environment for systems developers to obtain and maintain interoperability frequencies
  - Common rules allowing shared, joint use of federal and non-federal spectrum would promote the establishment of shared systems among local, state, and federal public safety entities
  - Alignment of spectrum management processes to allow greater flexibility to the pubic safety community in terms of the types of communications supported, the kinds of technologies, and the systems solutions implemented

THE FCC IS TAKING STEPS TO STREAMLINE AND IMPROVE COORDINATION OF SPECTRUM MANAGEMENT PROCESSES

- The FCC is implementing the Universal Licensing System (ULS), an integrated database and automated processing system developed to facilitate electronic filing of wireless applications, licensing information, and public access to such information
  - The ULS eliminates the need for wireless carriers to file duplicative applications while increasing the accuracy and reliability of licensing information
  - For the first time ever, wireless applicants are able file all licensing-related applications electronically, thus increasing speed and efficiency of the application process

- The FCC implemented an Electronic Comment Filing System (ECFS), making it much simpler for members of the public to participate in the FCC rulemaking process and increasing the efficiency of the FCC's operations
  - ECFS allows users to file, review, and print documents on-line over the Internet, rather than having to rely on paper copies from the FCC reference room or copy contractor
  - The ECFS will lower costs of filing comments by limiting the number of paper copies reproduced for filing and serving other parties

- The refarming proceeding allowed the FCC to consolidate seven former public safety pools into one pool, which should create a more centralized spectrum management environment for state and local public safety spectrum

- The FCC has tasked the NCC to provide recommendations concerning a national plan for responsive and reliable public safety interoperability
  - The NCC will formulate and submit an operational plan to achieve national interoperability that includes federal users' access to the interoperability spectrum
  - The NCC will provide voluntary assistance to the development of coordinated regional plans and provide recommendations to the FCC on technical matters that are common to the public safety community

THE FCC AND NTIA ARE TAKING STEPS TO STREAMLINE AND IMPROVE COORDINATION OF SPECTRUM MANAGEMENT PROCESSES

- The First R&O allows all certified public safety frequency coordinators (the Association of Public–Safety Communications Officials-International [APCO], the American Association of State Highway and Transportation Officials [AASHTO], the Forestry–Conservation Communications Association [FCCA], and the International Municipal Signal Association [IMSA]) to provide coordination services in the 700 MHz band under the premise that competition will provide incentives for lower fees and better services

- Ad Hoc 214 is an NTIA committee that is tasked with removing regulatory barriers enabling federal, state, and local public safety agencies to share common frequencies and systems. Specifically, Ad Hoc 214 has, and will continue where appropriate to—
  - Develop recommendations to address the issue of shared and joint-use public safety systems
  - Develop recommendations dealing with the effect of current and planned public safety telecommunications activities on spectrum management policy

- To date, Ad Hoc 214 helped coordinate a Memorandum of Agreement (MOA) between the State of Wisconsin and the DOD to build a shared system
  - Ad Hoc 214 helped the DOD establish terms and conditions for building the shared system based on federal frequencies
  - Ad Hoc 214 assisted in the establishment of the NTIA's VHF/UHF Public Safety Interoperability Plan

- The FCC and NTIA have formed the FCC/NITA Public Safety Joint Working Group as a conduit to coordinate rules and procedures
  - The group provides a forum for discussing spectrum use and management strategies

RECENT STUDIES BY THE PSWN PROGRAM HAVE HELPED TO FOSTER A GREATER UNDERSTANDING OF PUBLIC SAFETY SPECTRUM MANAGEMENT PROCESSES

- The PSWN program designed "how to" guides to increase understanding of local, state, and federal public safety spectrum management processes
  - The *State and Local Spectrum Management Processes Report* explained FCC spectrum allocation, assignment, and administration processes from a user perspective
  - The *Federal Spectrum Management Processes Report* explained NTIA spectrum allocation, assignment, and administration processes from a user perspective

- Both reports have been widely distributed to the public safety community—
  - Both reports have been posted on the PSWN web page, www.pswn.gov, for consumption by the public safety community and the general public
  - Both reports were available to individuals attending PSWN program symposia and FLEWUG meetings
  - The *State and Local Public Safety Spectrum Management Processes Report* has been approved by the public safety frequency coordinators as a comprehensive treatment of state and local spectrum management processes
  - The *Federal Spectrum Management Processes Report* was reviewed by members of the IRAC

WHILE THE FCC AND NTIA HAVE MADE CHANGES TO IMPROVE SPECTRUM MANAGEMENT PROCESSES, CHALLENGES EXIST FOR MAKING THE PROCESSES MORE USER-FRIENDLY AND EFFICIENT

- The FCC needs to ensure that rules for the 700 MHz band are complementary to rules for other public safety bands
  - In light of the additional allocations in the 700 MHz band, the FCC has indicated its approval of the role of RPCs in managing this band, but has as yet to address the many shortfalls of the regional planning process
  - A broader representation of the public safety community, including federal participation, is needed to promote effective and efficient communications in the 700 MHz band
  - As stated in the *PSWN Program 800 MHz Study*, 800 MHz RPCs are predominantly comprised of representatives from large and well funded state and local agencies, with no federal agency representation
  - Participation of smaller agencies will be difficult without the appropriate funding sources
  - Furthermore, achieving a national perspective strictly through the RPC process is unlikely without a national controlling body determining and managing the use and licensing of the spectrum

- As public safety receives additional spectrum and new rules are created for the use and management of the spectrum, provisions need to be made to include user-friendly spectrum management processes
  - Even though all public safety frequency coordinators are permitted to provide frequency coordination services in the 700 MHz band, the FCC did not make provisions for the development of a common frequency coordinator database
  - The FCC stated that a common frequency coordinator database is not a viable option[20]
  - However, coordination between all frequency coordinators is essential for effective management of 700 MHz license applications and frequency assignments
  - A common database would also provide information in a timely manner created by heightened competition among frequency coordinators

[20] FCC. *Development of Operational, Technical, and Spectrum Requirements For Meeting State and Local Public Safety Agency Communication Requirements by the Year 2010*, WT Report and Order 96-86, August 8, 1998.

WHILE THE FCC AND NTIA HAVE MADE CHANGES TO IMPROVE SPECTRUM MANAGEMENT PROCESSES, CHALLENGES EXIST FOR MAKING THE PROCESSES MORE USER-FRIENDLY AND EFFICIENT (Continued)

- The FCC should address the frequency coordination fee structure to bring fees in line with costs or otherwise examine alternative methods to fund frequency coordination fees in a way that would eliminate fees for government users

- The FCC and NTIA need to ensure that the entities examining spectrum management processes (IRAC, Ad Hoc 214, the FCC/NTIA Public Safety Joint Working Group) are facilitating coordination of rules and processes between the two agencies

THE FCC AND NTIA SHOULD DEVELOP MORE EFFICIENT AND USER-FRIENDLY SPECTRUM MANAGEMENT PROCESSES THAT ARE ACCESSIBLE TO ALL TYPES OF PUBLIC SAFETY ENTITIES

- The FCC and NTIA should make additional progress on making its processes more user-friendly, including—
  - Training courses to educate the public safety community on spectrum management processes
  - A stand alone manual based on pertinent FCC regulation and NTIA rules to be used as the guidebook for managing the sharing of spectrum
  - Open dialogue with the public safety community, perhaps through a forum or rulemaking, to ensure rules governing public safety spectrum, particularly addressing the spectrum sharing, remain consistent with operational needs
  - The FCC should develop a common frequency coordinator database to centralize and standardize public safety licensing information, possibly making it accessible through the Internet
    - A database would provide readily-available information to systems planners when designing their systems
    - A database would also reduce duplication of data and administrative errors associated with having multiple sets of information

- A summit should be held among the FCC, its public safety frequency coordinators, and the NTIA to explore potential changes to the frequency coordinator fee system or alternative ways to fund frequency coordinator activities
  - An independent fact-finding should be conducted to establish an information baseline regarding the current fee structures, cash flows, and financial standing of each public safety frequency coordinator
  - The information baseline should be analyzed to determine broad resource requirements, e.g., amounts currently paid by public safety, funding needed by the FCC to defer costs, future demand for frequency coordinator services
  - Recommendations should be developed to bring fees in line with actual costs or to establish alternative funding sources to pay for frequency coordination activities in a way that would eliminate fees for government users

THE FCC AND NTIA SHOULD DEVELOP MORE EFFICIENT AND USER-FRIENDLY SPECTRUM MANAGEMENT PROCESSES THAT ARE ACCESSIBLE TO ALL TYPES OF PUBLIC SAFETY ENTITIES (Continued)

- The FCC should strive to create a strong national coordinating body to promote effective use and licensing of public safety spectrum
  - The FCC should extensively participate in this body to ensure the best interests of the public safety community are represented

- The FCC and NTIA should continue to work through the IRAC, the FCC/NTIA Public Safety Joint Working Group, Ad Hoc 214, and the NCC to streamline public safety planning and management processes and develop rules to facilitate sharing of resources
  - Because these committees are working toward similar goals, the FCC and NTIA should ensure that each committee communicates and coordinates actions with one another

THE PSWN AND FLEWUG SHOULD INCREASE THEIR PARTICIPATION IN PUBLIC PROCEEDINGS AND THEIR ATTENDANCE OF MEETINGS AT REGULATORY BODIES THAT EXAMINE SPECTRUM MANAGEMENT PROCESSES

- The PSWN program and the FLEWUG should continue to participate in FCC rulemaking proceedings
  - Both bodies should continue to monitor and comment on requests for waivers by public safety agencies planning to share system resources with other entities, such as industrial and land transportation companies
  - Both bodies should participate in the activities of the NCC as stated in the First R&O
  - The PSWN and the FLEWUG should continue to file comments, reply comments, and conduct ex parte presentations in response to the Third NPRM when appropriate
  - Both bodies should participate in 800 MHz and 700 MHz RPCs for information purposes and to facilitate discussions regarding systems planning and shared systems development

VII. MIGRATION STRATEGY

- Problem Statement
- Desired End State
- Achievements
- Challenges
- Recommendations and Actions

Migration Strategy…Problem Statement…

AS PUBLIC SAFETY SPECTRUM ISSUES ARE RESOLVED AND ADDITIONAL SPECTRUM IS MADE AVAILABLE, THE PUBLIC SAFETY COMMUNITY MUST ENSURE THAT MIGRATION TO A LIMITED NUMBER OF BANDS IS ACCOMPLISHED IN A COORDINATED, DELIBERATE MANNER

- Ad hoc, short-term actions and uncoordinated regional efforts could result in a transformed spectrum environment that is as problematic as the current one (if not more so)

- Thorough national planning that connects to public safety operations and integrates local, regional, and nationwide efforts is necessary for establishing a strategy for migration
  - Public safety agencies currently lack an overall national plan or any mechanism that provides national coordination or influence over all the public safety bands or on public safety spectrum issues

- The development of a well-planned migration strategy is further complicated because it requires progress be made on several of the previously identified spectrum issue areas
  - The community needs to identify the bands that most adequately meet their needs and decide the most appropriate bands for migration keeping in mind existing public safety allocations
  - There must be radio technology that works across the desired spectrum bands
  - There must be adequate, efficient, and understandable spectrum management processes in place to encourage public safety entities to migrate to different bands

- Actual implementation of a migration strategy is difficult because of the rules (e.g., channel size, channel spacing, frequency planning) that manage public safety spectrum are different across all of the bands
  - For example, rules governing the general use spectrum of the National Public Safety Planning Advisory Committee (NPSPAC) 800 MHz channels are different from the rules governing the general use spectrum of the remainder of the 800 MHz band, which are in turn different from the rules governing the use of spectrum in the 700 MHz band
  - Rules governing federal spectrum use are also different from rules governing local and state spectrum use

A STRATEGY TO MIGRATE THE PUBLIC SAFETY COMMUNITY TO NEWLY ALLOCATED PUBLIC SAFETY BANDS IN A COORDINATED, DELIBERATE MANNER SHOULD BE DEVELOPED

- A well planned migration strategy should be flexible enough to take into account the different local, regional, or national operational needs of the user community

- Any effective migration strategy must involve a coordinated, nationwide effort to manage public safety communications
  - Coordinated national planning will reduce fragmented management of public safety spectrum while preventing the proliferation of a variety of incompatible systems
  - In an environment focused on shared infrastructure, it is necessary to have the participation of federal public safety agencies in any coordination effort

- A process for on-going evaluations of implementation efforts relative to this strategy will also be essential to ensure that development efforts are consistent with plans

- The plan should be consistent with current FCC and NTIA rules

- The migration strategy should be promoted to gain the support of major public safety entities
  - For any migration strategy to be successful, it must be widely accepted by associations, programs, and entities that have influence throughout the public safety community (e.g., The International Association of Fire Chiefs, the International Association of Chiefs of Police, the National League of Cities, the PSWN program)
  - Further, the migration strategy must have champions at all levels of government who are willing to keep the process moving forward

THE NEW 700 MHz ALLOCATION AND SUBSEQUENT RULINGS ON ITS MANAGEMENT PROVIDE THE FOUNDATIONS ON WHICH A MIGRATION STRATEGY CAN BE DEVELOPED

- The new 700 MHz allocation is adjacent to the most recent spectrum allocations in the 800 MHz band
  - This move signals an awareness on the part of the FCC that public safety spectrum should be located in common bands
  - Additionally, the close proximity of these bands provides public safety with a sound reason to begin migrating operations to these higher bands

- The NCC has been tasked to formulate an operational plan to achieve national interoperability
  - This plan will include a shared or priority system for users in interoperability bands (in both the 700 MHz and all other bands that have interoperability spectrum)
  - Additionally, the committee will make recommendations regarding Federal Government users access to interoperability spectrum

- The NCC has also been tasked to serve as an advisor to the regional planning committees to ensure the development of coordinated regional plans

- The NCC's involvement in these issues provides a starting point for developing a comprehensive strategy for public safety spectrum use
  - The committee will provide a necessary focus on national coordination which will have significant impact on the future direction of public safety communications

- The FLEWUG and the PSWN program should strongly encourage the NCC to recommend interoperability standards to the FCC. The FCC should adopt them as soon as possible so that manufacturers can commence with research and development efforts to expedite the deployment of interoperable 700 MHz equipment to the market

THE CURRENT SPECTRUM MANAGEMENT ENVIRONMENT IS THE GREATEST CHALLENGE TO THE DEVELOPMENT OF A STRATEGY TO MIGRATE PUBLIC SAFETY TO NEWLY ALLOCATED SPECTRUM BANDS

- The size and scope of the public safety community makes agreement on a migration strategy extremely difficult
  - The NCC has an open membership policy that allows for participants from many backgrounds (e.g., local through Federal Government, industry, trade associations, consultants, and interested parties) to serve on the committee
  - The diversity of backgrounds and opinions may make consensus difficult

- Current spectrum management processes differ and are not conducive to the timely development of an effective migration strategy
  - The FCC's spectrum allocation and management process are naturally slow because of the long cycles that involve comments, reply comments, ex parte briefings, petitions for reconsideration, and the like
  - The NTIA's processes also involve many stages of review and modification
  - A truly effective migration strategy would be forced to endure these long processes before being accepted

- Competition for spectrum in and around the current public safety bands prohibits public safety entities from identifying, and migrating to, a limited number of spectrum bands
  - Spectrum reallocation and the auctioning of spectrum to commercial entities is significantly reducing the amount of spectrum to which the public safety community has access
  - Without sufficient spectrum in or near current bands, public safety agencies can not create a successful migration strategy

THE FCC AND NTIA SHOULD DEVELOP PROCESSES THAT LEAD TO COORDINATED NATIONAL PLANNING IN ORDER TO ACHIEVE MIGRATION OF PUBLIC SAFETY COMMUNICATIONS TO NEW BANDS IN A COORDINATED, DELIBERATE MANNER

- A comprehensive and coordinated national plan for public safety communications needs to be developed
  - Specifically, both the PSWN program and the FLEWUG should continue to participate in the Docket WT 96–86 proceeding to emphasize the importance of strong national planning for the development of a sound migration strategy for the 700 MHz band
  - As voting members of the NCC, both the PSWN program and the FLEWUG should actively participate in the NCC so that they can express the views of the local/state, and federal public safety communities, respectively

- The FCC and NTIA can facilitate the implementation of a migration strategy through coordinated and compatible policies and rulemakings
  - The actions of the FCC and NTIA should promote interoperability and shared systems development
  - The FCC and NTIA should evaluate the migration plan as it is implemented to ensure consistency with any national plans or standards

- A comprehensive migration strategy that takes the needs of all users into consideration needs to be developed
  - Congress needs to consider the communications and spectrum needs of federal users before reallocating more federal spectrum for commercial use
  - The PSWN program should perform a comprehensive study to determine the appropriate number of frequency bands where public safety can efficiently migrate but still satisfy their operational requirements

APPENDIX A: ACRONYMS

Appendix A…Acronyms…

APCO	Association of Public Safety Communications Officials International
AASHTO	American Association of State Highway and Transportation Officials
BBA 97	Balanced Budget Act of 1997
DOD	Department of Defense
DOJ	Department of Justice
DTV	Digital Television
EA	Economic Area
EIA	Electronic Industries Association
ECFS	Electronic Comment Filing System
EMS	Emergency Medical Service
FAS	Frequency Assignment Subcommittee
FCC	Federal Communications Commission
FCCA	Forestry–Conservation Communications Association
FLEWUG	Federal Law Enforcement Wireless Users Group
GHz	Gigahertz
GLONASS	Global Orbiting Navigation Satellite System
GNSS	Global Navigational Satellite System
GPS	Global Positioning System
IMSA	International Municipal Signal Association
IRAC	Interdepartment Radio Advisory Committee
ITS	Intelligent Transportation Systems
ITU	International Telecommunication Union
IWG	Informal Working Group
kbps	kilobytes per second
kHz	Kilohertz
LMR	Land Mobile Radio
MBITR	Multi-Band Inter/Intra Team Radio
MHz	Megahertz
MOA	Memorandum of Agreement
MSS	Mobile Satellite Service
NCC	National Coordination Committee
NPRG	National Partnership for Reinventing Government
NPRM	Notice of Proposed Rule Making
NPSPAC	National Public Safety Planning and Advisory Committee
NTIA	National Telecommunications and Information Administration
OBRA 93	Omnibus Budget Reconciliation Act of 1993
OMB	Office of Management and Budget
PCIA	Personal Communications Industry Association
PCS	Personal Communications System
PSWAC	Public Safety Wireless Advisory Committee
PSWN	Public Safety Wireless Network
R&O	Report and Order
RCS	Radio Conference Subcommittee
RIPS	Record Imaging Processing System
RPC	Regional Planning Committee
SMR	Specialized Mobile Radio
TIA	Telecommunications Industry Association
UHF	Ultra High Frequency
ULS	Universal Licensing System
VHF	Very High Frequency
WAN	Wide Area Network
WRC	World Radio Conference
WTB	Wireless Telecommunications Bureau

APPENDIX B: RECENT DEVELOPMENTS

RECENT POLICY AND REGULATORY DEVELOPMENTS HAVE HAD AN IMPACT ON PUBLIC SAFETY SPECTRUM ISSUES

- **Federal Communications Commission (FCC) Developments:**
  - The FCC released First Report and Order (R&O) in Wireless Telecommunications Bureau (WT) Docket No. 96-86 establishing service rules for licensing and use of 24 MHz of spectrum in the 700 MHz band
  - The FCC released the Third Notice of Proposed Rule Making (NPRM) in WT Docket No. 96-86 to seek comment on additional proposals to implement effective public safety communication in the 700 Megahertz (MHz) band
  - The FCC continues to develop an aggressive migration plan for broadcasters to vacate the 700 MHz band and transition to digital television (DTV)
  - The FCC implemented new information technologies to streamline the license application procedures for radio services licensed by the Wireless Telecommunications Bureau (WTB) of the FCC
  - The FCC implemented new information technologies to promote participation in the FCC rulemaking process
  - The FCC continues to raise revenue through commercial spectrum auctions
  - The FCC lifted filing freeze on public safety radio channels in the 220 MHz band
  - Commissioner Ness called for a hearing to discuss the effectiveness of current spectrum management processes

- **National Telecommunications and Information Administration (NTIA) Developments:**
  - Ad Hoc 214 established to examine and promote interoperability through shared systems among local, state, federal public safety agencies
  - Approved plan to designate certain federally allocated radio frequencies for use by federal, state and local law enforcement and incident response entities

- **Congressional Developments:**
  - Congress began a series of hearings to review the current structure of the FCC and to consider whether it should be reformed into more of an enforcement agency as opposed to its current regulatory nature
  - FCC and NTIA will continue work on the congressional mandate to reallocate over 400 MHz of spectrum for commercial spectrum auctions

RECENT POLICY AND REGULATORY DEVELOPMENTS HAVE HAD AN IMPACT ON PUBLIC SAFETY SPECTRUM ISSUES (Continued)

- **International Developments:**
  - The International Telecommunication Union (ITU) is considering a worldwide allocation for MSS systems to share frequencies with existing land mobile radio (LMR) systems

- **PSWN Program Developments:**
  - The Public Safety Wireless Network (PSWN) program developed companion “how-to” guides for local, state, and federal public safety entities to obtain and manage radio spectrum
  - The PSWN program comparison of local/state and federal spectrum management processes yielded a series of recommendations to improve the quality and efficiency of spectrum management for public safety entities
  - The PSWN program created the *Public Safety and Radio Spectrum Guide* to educate lawmakers on the importance of spectrum to public safety's mission
  - In response to the FCC Third NPRM Docket No. 96-86, the PSWN program filed comments and reply comments and made ex parte presentations before the Commissioners to make contributions regarding public safety spectrum matters

- **FLEWUG Developments:**
  - The FLEWUG filed a petition of reconsideration and clarification in WT Docket 96-86 in regards to public safety issues ranging from federal co-equal access to support of Project 25 standards
  - The Federal Law Enforcement Wireless Users Group (FLEWUG) filed comments and reply comments to the Third NPRM to address public safety issues ranging from administrative decisions regarding the 700 MHz band to the year 2000 problem

FCC RELEASES FIRST REPORT & ORDER (R&O) IN WT DOCKET NO. 96-86 ESTABLISHING SERVICE RULES FOR LICENSING AND USE OF 24 MHz OF SPECTRUM IN THE 700 MHz BAND

- In the rules adopted in the First R&O, the spectrum is channelized into narrowband and wideband channels to accommodate voice, data, image, high speed data and video transmission
  - Specifically, the First R&O divides the spectrum into three pieces by designating 2.6 MHz for interoperability, 12.6 MHz for general use, and 8.8 MHz of reserve spectrum

- Further, the First R&O established the rules for the management of the new spectrum
  - The FCC concluded that the regional planning approach is appropriate for assignment of licenses for spectrum designated as general use spectrum in the 700 MHz band
  - The regional planning process adopted to manage the 700 MHz band will be similar to that which governs the 821-824/869-869 MHz band, with distinct and separate regional planning committees (RPC) for each band
  - To allow for additional flexibility, states included in multi-state regions or have portions of their states included in more than one region have the option to opt out of their current region and form new regions conforming to state boundaries

- The FCC chartered a new entity, the National Coordinating Committee (NCC), to provide a national structure to establish coordinated planning for the interoperability spectrum
  - The NCC will formulate and submit an operational plan to achieve national interoperability that includes federal users' access to the interoperability spectrum
  - The FCC suggested that the NCC develop standards for the interoperability channels pursuant to ANSI guidelines
  - The FCC further suggested that the NCC provide voluntary assistance to the development of coordinated regional plans and provide recommendations to the FCC on technical matters that are common to the public safety community

FCC RELEASES FIRST REPORT & ORDER (R&O) IN WT DOCKET NO. 96-86 ESTABLISHING SERVICE RULES FOR LICENSING AND USE OF 24 MHz OF SPECTRUM IN THE 700 MHz BAND

- The First R&O allows all certified public safety frequency coordinators (Association of Public Safety Communications Officials International [APCO], American Association of State Highway and Transportation Officials [AASHTO], Forestry–Conservation Communications Association [FCCA], and International Municipal Signal Association [IMSA]) to provide coordination services in the 700 MHz band under the premise that competition will provide incentives for lower fees and better services

- The First R&O established standards to protect analog and digital TV stations from harmful interference

FCC RELEASES THIRD NOTICE OF PROPOSED RULEMAKING (NPRM) IN WT DOCKET NO. 96-86 TO SEEK COMMENT ON ADDITIONAL PROPOSALS TO IMPLEMENT EFFECTIVE PUBLIC SAFETY COMMUNICATIONS IN THE 700 MHz BAND

- In the Third NPRM, the FCC requested comment on how to license the portion of the 700 MHz spectrum band designated as reserve spectrum
  - Specifically, the FCC sought comment on whether the reserve spectrum should be licensed through the RPC process, directly to states for deployment of statewide systems, or licensed pursuant any other alternative process
  - The FCC encouraged commenters to suggest refinements and modifications to the RPC process that will provide more efficient and effective methods of spectrum management

- The FCC also sought comment on improving interoperable communications among public safety agencies
  - The FCC sought comment on how to license the 2.6 MHz of spectrum in the 700 MHz band designated as interoperability spectrum in the First R&O
  - In addition, the FCC sought comment on designating interoperability spectrum below 512 MHz as recommended by the Public Safety Wireless Advisory Committee (PSWAC)
  - The FCC proposed and requested comment on designating five interoperability channels in existing public safety bands below 512 MHz (including 150–174 and 450–512 MHz bands), channels in the 138–144 MHz bands, and redesignating three frequency pairs in the 156–162 MHz band for interoperability in 33 Economic Areas (EAs)[21]

- The FCC sought comment on the establishment of technical solutions to protect Global Orbiting Navigation Satellite System (GLONASS) and Global Positioning System (GPS) from second harmonic inference from public safety LMR systems operating in the 700 MHz band

- The FCC also requested comment on the level of Year 2000 readiness among public safety communications systems and ways to prepare public safety entities for potential Year 2000 problems

[21] Economic Areas (EAs) refer to The Bureau of Economic Analysis of the U.S. Department of Commerce designation of 175 EAs in the United States as licensing boundaries for some wireless services.

THE FCC ESTABLISHED A DTV IMPLEMENTATION SCHEDULE WHOSE ENFORCEMENT WILL AFFECT THE AVAILABILITY OF THE PUBLIC SAFETY 700 MHz BAND

- Receipt of the 700 MHz band allocation is contingent on successful implementation of DTV because in some areas of the country, broadcasters are using the 700 MHz band (channels 60–69) until 2006, when they are to be turned over to public safety

- As of November 1, 1998, 41 commercial stations began broadcasting DTV signals

- In addition to TV broadcasts, the FCC permits DTV operators will be able to provide what the FCC terms “ancillary and supplementary services,” including data transmission options such as Internet-based services and interactive programming
  - The FCC adopted a position of spectrum flexibility for DTV to facilitate these services being offered

- For a station to complete the transition process, it must:
  - Apply to build DTV facilities
  - Be granted a construction permit from the FCC
  - Complete the construction
  - Start broadcasting DTV signals

- The FCC established an aggressive implementation schedule for conversion to DTV, with varying deadlines for commercial and public TV stations

- The DTV transition schedule for commercial stations is as follows:
  - Twenty four major market commercial stations volunteered to complete construction of their DTV facilities early and must be finished by November 1, 1998
  - Commercial TV stations in the Top 10 markets that are affiliated with the Top 4 commercial networks (ABC, CBS, NBC, and FOX) were to have applied for their DTV construction permits as of May 1, 1998, and must have finished constructing their facilities by May 1, 1999
  - All remaining commercial licensees must construct their facilities by May 1, 2002

THE FCC ESTABLISHED A DTV IMPLEMENTATION SCHEDULE WHOSE ENFORCEMENT WILL AFFECT THE AVAILABILITY OF THE PUBLIC SAFETY 700 MHz BAND (Continued)

- Public TV/Noncommercial licensees must adhere to the following schedule:
  - Must file application for their DTV facilities by May 1, 2000
  - Must construct DTV facilities by May 1, 2003, unless they obtain extensions

- The FCC has adopted the following phased-in simulcast requirement for DTV stations so that viewers do not continue to depend solely on analog TV facilities. Broadcasters are free to accelerate the schedule:
  - Date and percentage of analog TV channel programming to be simulcast on the DTV channels:
    - May 1, 2003 – 50%
    - May 1, 2004 – 75%
    - May 1, 2005 – 100%

- In additional to areas where broadcasters already occupy channels 60–69, there are some areas of the country where the FCC will move DTV broadcasters temporarily to TV channels 60-69 (which is the public safety 700 MHz band) until spectrum in Channels 52 and below becomes available
  - The DTV Allotment Plan[22] allots specific channels for each station that will be broadcasting DTV in the United States

- According to provisions in the Balanced Budget Act (BBA) of 1997, the FCC can extend the 2006 conversion deadline in certain markets if—
  - A station in a particular market (licensed to one of the four largest television networks) is not broadcasting a DTV signal but satisfies FCC construction deadlines for DTV service
  - Digital-to-analog converter technology is not generally available in the market in question
  - If market penetration in a given area is below 85%

[22] *Memorandum Opinion and Order on Reconsideration of the Sixth Report and Order*, FCC 98-24, Released February 23, 1998.

THE FCC ESTABLISHED A DTV IMPLEMENTATION SCHEDULE WHOSE ENFORCEMENT WILL AFFECT THE AVAILABILITY OF THE PUBLIC SAFETY 700 MHz BAND (Continued)

- The FCC created the DTV Tower Strike Force to target potential problems in implementing DTV
  - The DTV Tower Strike Force will serve as an information resource for local zoning authorities on assessing tower modification or construction and to facilitate the deliberation of reviewing entities[23]

[23] FCC. *Commission Creates DTV Tower Strike Force To Target Potential Problems in Implementing Digital Television*, News Release, Report No. MM 98–6, May 29, 1998.

FCC IMPLEMENTS NEW INFORMATION TECHNOLOGIES TO STREAMLINE THE LICENSE APPLICATION PROCEDURES FOR RADIO SERVICES LICENSED BY THE WTB OF THE FCC

- The FCC adopted rules to implement the Universal Licensing System (ULS), an integrated database and automated processing system developed to facilitate electronic filing of wireless applications, licensing information, and public access to such information
  - The ULS will eliminate the need for wireless carriers to file duplicative applications while increasing the accuracy and reliability of licensing information
  - For the first time ever, wireless applicants are able to file all licensing-related applications electronically, thus increasing speed and efficiency of the application process

- The FCC adopted four consolidated ULS application forms for wireless services, replacing over 40 existing application forms
  - In doing so, the FCC consolidated wireless licensing rules currently in service specific rule parts into a single set of rules
  - Electronic filing in ULS will be mandatory for frequency coordinators regardless of the services and for volunteer examiner-coordinators in the amateur service by July 1, 1999
  - The ULS will be used to notify wireless licensees ninety days in advance of license expiration, but all licensees must file a timely renewal application regardless of receiving such early notification

- Electronic filing in ULS will be mandatory for applicants and licensees in services that are licensed by auction, but not for applicants and licensees in other wireless services
  - All common carrier services and geographically licensed services are subject to mandatory electronic filing
  - Public safety and private land mobile services on shared spectrum have the option of filing electronically or manually

- The ULS is located on the FCC web page at ***http://www.fcc.gov/wtb/uls/***

FCC IMPLEMENTS NEW INFORMATION TECHNOLOGIES TO PROMOTE PUBLIC PARTICIPATION IN THE FCC RULEMAKING PROCESS

- The FCC implemented an Electronic Comment Filing System (ECFS) to make it much simpler for members of the public to participate in the FCC rulemaking process and increase the efficiency of the FCC's operations
  - The FCC has amended its rules to allow the public to file comments and other pleadings electronically over the Internet in many rulemaking proceedings
  - Electronic filing will be permitted in most notice and comment rulemaking proceedings, most proceedings involving petitions for rulemaking, Notice of Inquiry proceedings, petitions for reconsideration in these proceedings, and ex parte filings

- ECFS allows users to file, review, and print documents on-line over the Internet, rather than having to rely on paper copies from the FCC reference room or copy contractor
  - The ECFS initiative was launched in early 1996, building upon prior information technology efforts at the FCC, such as the FCC Internet site and the FCC Record Image Processing System (RIPS)
  - The ECFS will replace the RIPS after all data and images have been transferred to the new systems, encompassing documents dating from 1992 onward

- The ECFS lowers costs of filing comments by limiting the number of paper copies reproduced for filing and serving other parties

- The FCC will monitor the ECFS to determine whether modifications are needed and whether it is feasible to expand the applicability of the system beyond rulemaking-related proceedings, and possibly to require electronic filing in the future

- The ECFS is located on the FCC web page at ***http://www.fcc.gov/e-file/ecfs.html***

FCC CONTINUES TO RAISE REVENUE THROUGH COMMERCIAL SPECTRUM AUCTIONS

- The FCC is committed to using competitive bidding as a mechanism for efficient spectrum distribution and spectrum management
  - In only four years, the FCC has auctioned more than 1700 MHz of spectrum and awarded over 5,500 licenses to auction winners
  - The funds generated from the spectrum auctions have financed the start-up and operational costs of the auction program with the remainder going to alleviate the federal budget deficit

- Spectrum auctions are designed under the objectives to promote economic opportunity and competition, avoid excessive concentration of licenses, and disseminate licenses among a wide variety of applicants
  - The FCC stresses that the auction program is designed to provide new and existing players a chance to quickly acquire licenses and take their place in the telecommunications marketplace of tomorrow
  - Significantly, the overwhelming majority of winning bidders have been small businesses
  - In addition, auctions have encouraged service to under-served areas and enabled rural telephone companies to participate in the bidding process

- Recently, the FCC closed the 220 MHz service auction, raising over $21 million
  - In the future, the FCC has plans to auction another 3 GHz of spectrum
  - Auctions in the near future will accept bids on licenses for a range of services, including paging, voice, data, fixed and mobile applications

FCC LIFTS FILING FREEZE ON PUBLIC SAFETY RADIO CHANNELS IN THE 220 MHz BAND

- In March 1998, the FCC lifted the filing freeze on 15 five-kilohertz (kHz) channel pairs (30 frequencies) in the 220-222 MHz band, allowing public safety agencies to begin submitting applications for these channels
  - The 5 kHz channels are much smaller than channels in any other bands, which range from 6.25 kHz to 25 kHz
  - The 220 MHz band is generally used by commercial specialized mobile radio (SMR)

- Ten of the 15 channel pairs are available to all public safety eligibles exclusively for base/mobile operations
  - Of these pairs, five are available to agencies for their individual use
  - The five additional pairs can be licensed among agencies on a shared basis
  - Public safety mobile/portable emergency communications are permitted on the mobile frequencies of the pairing(221-222 MHz) without an individual license

- The remaining five channel pairs are available for emergency medical use exclusively for their base/mobile operations

- The 15 channel pairs are available to all public safety eligible entities, including the Federal Government
  - Federal entities must follow the NTIA frequency assignment process to obtain a frequency assignment in this band
  - Applications for the ten exclusive use channels (Channels 166-170 and 181-185) will be granted on a first-come, first-served basis, with stations authorized at a single location and protected in accordance with the co-channel separation criteria specified in the FCC Rules
  - To determine whether there is mutual exclusivity between Federal Government and non-Federal Government applications filed on the same day for the same area, the FCC will use the date the application is filed with the Commission for non-federal government applications and the date the application is filed with the Frequency Assignment Subcommittee (FAS) for applications from Federal Government entities

COMMISSIONER NESS CALLED FOR A HEARING TO DISCUSS THE EFFECTIVENESS OF CURRENT SPECTRUM MANAGEMENT PROCESSES

- At the September 23, 1998, Personal Communications Industry Association (PCIA) PCS '98 trade show, Commissioner Susan Ness announced the need to host an en banc policy forum on spectrum management
  - Commissioner Ness described the FCC spectrum management as divided into three stages: allocating the spectrum for particular services, developing the service rules, and assigning license to use the allocated spectrum under the rules
  - She stressed that the rapidly changing marketplace requires a more streamlined regulatory process so that spectrum can be put to immediate use

- In response, the FCC held an banc hearing on spectrum management on April 6, 1999

- The purpose of the spectrum management en banc hearing was be to examine spectrum management policies and obtain feedback from the public on ways to improve the FCC's spectrum management processes
  - The forum enabled the FCC, and other interested parties, to examine spectrum policies without having to establish a formal proceeding
  - Specifically, Commissioner Ness was interested in discussing how well have the FCC's spectrum policies have served the American public and what policies are working and what are not

- In addition to broad spectrum management issues public safety and private LMR issues were discussed[24]

[24] Information on the spectrum management en banc hearing was obtained through telephone conversations with staff from Commissioner Ness's office on November 23, 1998 and January 19, 1999.

AD HOC 214 ESTABLISHED TO EXAMINE AND PROMOTE INTEROPERABILITY THROUGH SHARED SYSTEMS AMONG LOCAL, STATE, AND FEDERAL PUBLIC SAFETY AGENCIES

- Following the completion of the PSWAC, the NTIA established Ad Hoc Committee 214 to examine and improve federal regulations that enable local, state, and federal public safety agencies to develop shared systems using federal spectrum
  - Ad Hoc 214 prepares and submits plans, policies, rules and regulations to the NTIA's Interdepartment Radio Advisory Committee (IRAC) for review

- Ad Hoc 214 has acted as a mediator between the state of Wisconsin and the Department of Defense (DOD) in creating a Memorandum of Agreement (MOA) regarding the development of Wisconsin's statewide shared system that uses federal frequencies rather than the FCC's standard public safety pool
  - The MOA outlines the roles and responsibilities for the DOD, as owners of the shared system spectrum, and the state of Wisconsin, as one of the stakeholders on the system

NTIA HAS ALLOCATED 20 INTEROPERABILITY CHANNELS FOR FEDERAL GOVERNMENT LAW ENFORCEMENT USE

- All of the channels will be used for all types of the Federal Government's joint law enforcement activities

Local and state government agencies may only use these frequencies when cooperating with Federal Government agencies

- In the VHF band, the following 10 channels have been identified—

  - 162.0875 MHz
  - 162.2625 MHz
  - 162.8375 MHz
  - 163.2875 MHz
  - 163.4250 MHz
  - 167.0875 MHz
  - 167.2500 MHz
  - 167.7500 MHz
  - 168.1125 MHz
  - 168.4625 MHz

- In the In the UHF band, the following 10 channels have been identified ; three channel pairs (six of the ten channels) are provided by the Department of Justice (DOJ); the specific frequencies are as follows—

  - 409.9875 MHz
  - 410.1875 MHz
  - 410.6125 MHz
  - 418.9875 MHz
  - 419.1875 MHz
  - 419.6125 MHz
  - 414.0375 MHz
  - 414.0625MHz
  - 414.3125 MHz
  - 414.3375 MHz

NTIA HAS ALLOCATED 20 INTEROPERABILITY CHANNELS FOR FEDERAL GOVERNMENT INCIDENT RESPONSE

- These channels will be used for all types of the Federal Government's joint incident response activities

Local and state government agencies may only use these frequencies when cooperating with Federal Government agencies

- In the VHF band, the following 10 channels have been identified—

  - 164.7125 MHz
  - 165.2500 MHz
  - 165.9625 MHz
  - 166.5750 MHz
  - 167.3250 MHz
  - 169.5375 MHz
  - 170.0125 MHz
  - 170.4125 MHz
  - 170.6875 MHz
  - 173.0375 MHz

- In the In the UHF band, the following 10 channels have been identified—

  - 410.2375 MHz
  - 410.4375 MHz
  - 410.6375 MHz
  - 410.8375 MHz
  - 413.1875 MHz
  - 413.2125 MHz
  - 413.2375 MHz
  - 419.4375MHz
  - 419.6375 MHz
  - 419.8375 MHz

CONGRESS IS INVESTIGATING FCC REFORM

- The House Commerce Committee has appointed a task force and has begun to hold hearings to examine ways to reform the FCC
  - The review stems from some members of Congress's belief that the "FCC has stood in the way of congressional attempts to increase competition in the telephone and data communications markets[25]"

- Representatives John Dingell (D-MI) and Billy Tauzin (R-LA) will introduced a bill that will push the goals of the 1996 act forward, allowing local telephone companies to resell long distance service in their home territories almost immediately and removing any regulatory restrictions on telephone companies' ability to offer data services
  - Representative John Dingell (D-MI) has discussed the possibility of introducing a bill in the House to strip much of the regulatory power from the FCC and give it to the Commerce Department

- Senator John McCain (R-AZ) will also look at this issue in the Senate by using next year's re-authorization of the FCC's budget and functions to attack the way it has implemented the Telecommunications Act of 1996 (The 1996 Act)
  - McCain also wants to use this re-authorization to reopen The 1996 Act itself
  - McCain intends to examine each area that the FCC regulates and determine if its regulation of those areas is necessary
  - Lauren Belvin, senior counsel to the Senate Commerce Committee indicates that the Senate legislation would most likely come in a series of small bills targeted at individual issue areas[26]

[25] Borland, John, *"Lawmaker Promises 'Warfare' Over FCC Reform,* October 20, 1998, New York Times, quote from Rep. Billy Tauzin (R-LA)
[26] Borland, John, *"Congress Takes Aim at FCC,"* December 11, 1998, CNET News.Com.

FCC AND NTIA CONTINUE PROGRESS ON CONGRESSIONAL MANDATE TO REALLOCATE OVER 400 MHz OF SPECTRUM FOR COMMERCIAL SPECTRUM AUCTIONS

- The Omnibus Budget Reconciliation Act (OBRA) and the BBA of 1997 require the NTIA to identify and reallocate 235 MHz and an additional 20 MHz of spectrum below 3 GHz, respectively
  - This spectrum is currently allocated for government use and is to be reallocated to commercial entities through the commercial spectrum auctions process
  - The remaining 145 MHz that is being reallocated is provided by other commercial entities

- The NTIA has issued the *Spectrum Reallocation Final Report* identifying spectrum to be reallocated and its impact on Federal Government communications capabilities
  - In the report, the NTIA estimated that the government's cost of reallocation could range from $461.3 million to $494.3 million[27]

- The report also concludes that reallocation could increase congestion on government channels, but that the NTIA will try to balance spectrum requirements of the federal agencies with benefits to the public[28]

- To date, 110 MHz of this spectrum has been reallocated to the FCC and an additional 114 MHz is scheduled to be reallocated to the FCC in January 1999
  - Only 25 MHz (4660-4685 MHz) has been scheduled for auction in 1999, although a specific date has not yet been determined

[27] U.S. Department of Commerce. *Spectrum Reallocation Final Report, Response to Title VI – Omnibus Budget Reconciliation Act of 1993*, February 1995.
[28] U.S. Department of Commerce. *Spectrum Reallocation Report, Response to Title III of the Balanced Budget Act of 1997*, February 1998.

THE INTERNATIONAL TELECOMMUNICATION UNION (ITU) IS CONSIDERING A WORLDWIDE ALLOCATION FOR MSS SYSTEMS THAT WOULD SHARE FREQUENCIES WITH EXISTING LAND MOBILE RADIO SYSTEMS

- At the 2000 World Radio Conference (WRC), the ITU will be considering Mobile Satellite Services (MSS) allocations in the 405–406 MHz and 450–470 MHz bands
  - Public safety agencies also operate in, or near, these bands and could receive harmful interference

- The FCC and concerned industry members have formed an informal working group (IWG-2) to develop recommendations for the United States positions related to the proposed ITU allocation of MSS spectrum in LMR bands
  - IWG-2 develops positions and forwards them to the Radio Conference Subcommittee (RCS), which in turn formulates United States policy
  - The United States policies are represented at the ITU by the Department of State
  - State and local entities can influence the United States position on this issue by raising their concerns and suggestions to IWG-2
  - The IWG-2 posts all meeting notices and agendas on the FCC web page
  - At the time of this report, the next meeting had not been scheduled

- The United States is currently expressing concern that incumbents in this band (which includes public safety entities) may not be able to adequately share the frequencies in the band
  - The ITU is studying the effects of a potential MSS allocation in the 405-406 MHz and 450–470 MHz bands and the United States will finalize its position pending the result of these studies

PSWN PROGRAM DEVELOPS COMPANION "HOW-TO" GUIDES FOR LOCAL, STATE, AND FEDERAL PUBLIC SAFETY ENTITIES TO OBTAIN AND MANAGE RADIO SPECTRUM

- The *Federal Spectrum Management Process Report* is intended to explain, from a user's perspective, the processes involved in obtaining a frequency assignment, how to administer the spectrum following assignment, and the spectrum allocation process
  - The NTIA, an office within the U.S. Department of Commerce, is charged with managing Federal Government use of the radio spectrum and has established certain processes to allow for the flow of information between federal agencies with public safety responsibilities and NTIA
  - These processes provide NTIA with information it needs to make decisions about federal spectrum use and they enable NTIA to manage federal spectrum in an effective manner

- From the user's perspective, one of the first steps in the process of developing an LMR system is to acquire radio frequencies
  - Users must define their communications needs and prepare a justification for use of radio frequencies, details on the frequency request, and technical information on the proposed system to apply for frequencies from NTIA
  - The IRAC evaluates proposals to ensure that they meet guidelines and do not cause significant interference

- Once assignments are made, both NTIA and federal agencies have responsibilities to manage frequency assignments
  - NTIA administers programs, including technical studies and spectrum measurements, to monitor federal use of the radio spectrum and to determine if frequency usage is in accordance with NTIA rules

- The FCC and NTIA work with other executive branch agencies to allocate portions of the spectrum to specified services
  - International allocations are heavily considered in the decisions to allocate spectrum within the U.S. The interests of the Federal Government and commercial spectrum users, however, generally take precedence
  - The U.S. Congress can also influence spectrum allocations through legislation

PSWN PROGRAM DEVELOPS COMPANION "HOW-TO" GUIDES FOR LOCAL, STATE, AND FEDERAL PUBLIC SAFETY ENTITIES TO OBTAIN AND MANAGE RADIO SPECTRUM

- The *State and Local Spectrum Management Processes Report* is also intended to explain, from a user's perspective, the processes involved in obtaining a frequency assignment, how to administer the spectrum following assignment, and the spectrum allocation process
  - However, state and local agencies follow a different set of spectrum management processes than do federal agencies because their process is primarily controlled through the FCC
  - The FCC manages the non-Federal Government use of the radio spectrum, including the spectrum used by state and local public safety entities; these organizations must interact with the FCC to secure the necessary approvals for operating in portions of the radio spectrum

- From a user's perspective, one of the first steps in the process of developing an LMR system is to complete the requisite FCC forms to acquire radio frequencies
  - Frequency coordinators are critical in reviewing user's applications and identifying and selecting usable frequencies
  - The FCC reviews the application and grants a frequency assignment that authorizes frequency use

- After assignments are granted and licenses are issued, both the FCC and the licensed state or local public safety entity have responsibilities to manage the use of assigned frequencies
  - The licensee must keep the FCC abreast of any changes or modifications to the licensed system, such as an address change, that affect the conditions of the original license and must renew their license every five years regardless of system modifications
  - On the other hand, the FCC monitors state and local use of the radio spectrum to determine if frequency usage is in accordance with FCC rules and if interference exists among FCC-authorized users
  - The FCC also intervenes on behalf of domestic licensees in cases of international interference

PSWN PROGRAM COMPARISON OF LOCAL/STATE AND FEDERAL SPECTRUM MANAGEMENT PROCESSES YIELDS A SERIES OF RECOMMENDATIONS TO IMPROVE THE QUALITY AND EFFICIENCY OF SPECTRUM MANAGEMENT FOR PUBLIC SAFETY ENTITIES

- The *Spectrum Management Processes Comparison Report* compares and analyzes current public safety spectrum management issues to identify priority matters for the NTIA, the FCC, and others to address in the near term
  - The comparison report identifies critical challenges in the following six areas:
    - Spectrum management costs to public safety
    - The management of public safety interoperability spectrum
    - The sharing of federal and non-federal spectrum
    - Peer review of frequency assignments
    - Frequency assignment alternatives for public safety
    - The impacts of commercial spectrum developments on public safety spectrum policy

- The report also includes the following recommendations to help improve the challenges in each area:
  - The FCC, in coordination with its frequency coordinators and the NTIA, should establish a cost-reimbursement system, with cost-control incentives and rational fee structures, through which the FCC absorbs frequency coordination costs now paid by public safety
  - The FCC and the NTIA should make available interoperability spectrum below 512 MHz and establish a joint-body to manage all public safety interoperability spectrum, in accordance with recommendations made by the PSWAC
  - The FCC and the NTIA should jointly establish and maintain rules that allow the sharing of spectrum on a routine and sustained basis that are agreeable to both federal and non-federal public safety users
  - The FCC should fund and adjust the membership of existing regional planning committees, extend the regional peer review concept to bands below 512 MHz, and empower the national coordinating committee as the oversight and managing authority for peer review
  - The FCC should validate the applicability of block assignments for public safety spectrum through additional analysis and pilot testing performed by the PSWN program, and establish rules and perform outreach for applicable circumstances
  - The FCC and the NTIA, with assistance from the PSWN program, should jointly develop and implement an action agenda that places public safety spectrum issues on par with commercial issues and that suggests priority actions for Congress and the Office of Management and Budget (OMB)

PSWN PROGRAM DEVELOPED THE *PUBLIC SAFETY AND RADIO SPECTRUM GUIDE* TO EDUCATE DECISION MAKERS ON THE IMPORTANCE OF SPECTRUM TO PUBLIC SAFETY'S MISSION

- In May 1998, the PSWN Program completed the *Public Safety and Radio Spectrum Guide* (*Spectrum Guide*) and has distributed over 10,000 copies to a variety of sources including members of Congress, the National League of Cities, PSWN program symposium attendees
  - The *Spectrum Guide* was also distributed in conjunction with the National Institute of Justice's interoperability video titled, *Why Can't We Talk?*
  - The Spectrum Guide has been endorsed by both the Attorney General, Janet Reno, and the National League of Cities

- The guide provides introductory explanations of the critical issues that public safety radio managers such as frequency band fragmentation and the scarcity, congestion, and interference problems that currently plague public safety communications systems

- Further, the guide highlights unresolved recommendations that would improve public safety communications problems
  - Specifically, the guide draws attention to the PSWAC recommendation calling for an additional 73.5 MHz of spectrum for public safety's use
  - The guide also raises awareness of the lack of a date certain for the transfer of 24 MHz of spectrum from television broadcasters to the public safety community and the difficulty this poses for agencies as they try to plan and design systems to use this new spectrum

THE PSWN PROGRAM SUBMITTED COMMENTS, REPLY COMMENTS AND MADE EX PARTE PRESENTATIONS AT THE FCC IN RESPONSE TO THE THIRD NPRM TO MAKE CONTRIBUTIONS REGARDING PUBLIC SAFETY SPECTRUM MATTERS

- The PSWN program requests that a portion of the 8.8 MHz of reserve spectrum be designated for pilot systems and experimental activities to enable and allow for exploratory efforts that could benefit the public safety community
  - These efforts would show how new technologies can improve spectrum efficiency, provide greater capability and flexibility, and determine methods for cost-effective solutions

- The PSWN program believes the regional planning process has several merits, however, shortfalls to the regional planning approach limit its utility and results in complications and frustrations for the public safety community
  - The PSWN program urges the FCC to improve the existing regional planning process, particularly in providing funding sources to support regional planning committee activities, areas of committee membership, multi-state region coordination, dispute resolution, and national oversight responsibilities

- The PSWN program believes that interoperability is a national initiative and the administration of spectrum intended to support interoperability should be at the national level
  - The PSWN program reminds the FCC that interoperability spectrum designations proposed in the Third NPRM constitute a minor fraction of the 2.5 MHz of spectrum below 512 MHz recommended by the PSWAC

- In regards to interference with Global Navigation Satellite System (GNSS) operations, the PSWN program urges the FCC to not adopt measures that would preclude the use of the 700 MHz band by any portions of the public safety community

- To assess Year 2000 readiness of the public safety community, the PSWN program recommends the FCC administer a survey to an appropriate sample of the community rather than burden organizations (i.e., frequency coordinators and regional planning committees) with collecting this information

THE FLEWUG FILED A PETITION OF RECONSIDERATION AND CLARIFICATION IN DOCKET 96-86 IN THE MATTER OF THE DEVELOPMENT OF OPERATIONAL, TECHNICAL, AND SPECTRUM REQUIREMENTS FOR MEETING FEDERAL, STATE, AND LOCAL PUBLIC SAFETY AGENCY COMMUNICATION REQUIREMENTS THROUGH THE YEAR 2000

- In its filing, the FLEWUG states that—
  - The First R&O authorizes co-equal access to federal public safety entities to operate within the band for interoperability purposes or as part of a shared- or joint-use system and seeks clarification to better understand and qualify federal agency risks related to entering into partnerships on state and local systems
  - Significant reform in the regional planning process such as federal participation in RPCs, FCC funding for RPC operations, and redefining regional boundaries to match trends toward statewide system development is still needed
  - National coordination is needed and believes the proposed NCC should be a stronger entity with oversight and decision-making authority but should not be a standards development body
  - Support for the development of a common coordinator database and asks the FCC to reverse its decision on this point
  - Support for the adoption of the current Telecommunication Industry Association (TIA)/Electronic Industry Association (EIA) 102 (Project 25) standards as the digital interoperability standard for radio communications and urges the FCC to not undertake a separate standards effort through the NCC
    - A separate standards effort would likely cause duplication of effort with existing standards development, possibly cause the development of incompatible standards, and possibly delay use of the 700 MHz band for public safety purposes
    - The FLEWUG publicly supports TIA/EIA 102 to be the common air interface and the vocoder standard. On November 18, 1999, the NCC Technology Subcommittee voted to adopt these as well

THE FLEWUG FILED COMMENTS, REPLY COMMENTS, AND MADE EX PARTE PRESENTATIONS IN RESPONSE TO THE THIRD NPRM TO ADDRESS PUBLIC SAFETY ISSUES RANGING FROM ADMINISTRATIVE DECISIONS REGARDING THE 700 MHZ BANDS TO THE YEAR 2000 PROBLEM

- In its petition, the FLEWUG states that—
  - The 8.8 MHz of reserve spectrum should be allotted as general use spectrum to reduce the as-yet unmet 12.4 MHz required by the PSWAC and urges an expeditious allocation of the remaining 3.6 MHz to support short term public safety spectrum requirements
  - There is a need for strengthened oversight authority of the NCC, which would entail the same level of involvement and responsibilities for the general use and the interoperability spectrum
    - The FLEWUG urges the FCC to improve the existing regional planning process, particularly in the areas of membership, dispute resolution, regional boundaries, and funding sources to support regional planning committee operations
    - The FLEWUG does not support state licensing and believes spectrum management should be standardized
  - FCC efforts to designate an interoperability band below 512 MHz are appreciated, but believes a more comprehensive solution is needed
    - The FLEWUG supports the designations made in the 150-174 MHz and 450-512 MHz bands, but takes exception with the consideration of the 138-144 MHz band in the 3rd NPRM
    - The FLEWUG stresses that the 138-144 MHz band is regulated by the NTIA and not the FCC

- The FLEWUG also comments on GLONASS and Y2K issues, including—
  - The current band plan for the 700 MHz band allows for mobile transmission in the 794-806 MHz band; such transmissions may interfere with Global Navigation Satellite System (GNSS) radionavigation functions in the 1559-1605 MHz band
    - To reduce the scope of this problem, the FLEWUG requests that the band plan be changed to prohibit mobile-to-fixed transmissions in the 794-806 MHz band
  - Appreciation of the FCC's leadership in raising the question of Y2K readiness of public safety radio systems and encourages the FCC to collect readiness information through various means, such as collaboration with the FLEWUG Y2K Working Group
  - The FLEWUG discourages use of regional planning committees, frequency coordinators, and licensees as mechanisms to collect Y2K readiness data