

CRS Report for Congress

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Spectrum Management: Public Safety and the Transition to Digital Television

Linda K. Moore

Analyst in Telecommunications and Technology Policy
Resources, Science, and Industry Division

Summary

The clearing of channels in the upper 700 MHz spectrum intended for use in wireless emergency communications is complicated by the many technical requirements, and complex economic and policy issues, that surround the planned transition to digital television in the United States. H.R. 1425 (Rep. Harman) — the Homeland Emergency Response Operations Act, or HERO Act — now before Congress, would require the Federal Communications Commission (FCC) to “take all actions necessary to complete assignments” for these channels so that operations could begin no later than January 1, 2007. Compliance with the bill, if it were to become law, would force the FCC to develop a band-clearing plan for the designated channels while meeting the requirements of the Auction Reform Act of 2002 (P.L. 107-195). The Auction Reform Act deals primarily with the FCC’s spectrum auction authority and its management of spectrum relocation, including the channels designated for public safety.

The issues regarding spectrum at 700 MHz have been framed by the television industry and its supporters in terms of guaranteeing seamless access to free broadcast programs. Supporters of the timely clearing of the channels intended for public safety, however, view the issues from a different perspective. For this group the focus is on what needs to be done to release the public safety channels, freeing them in a timely manner for their intended use.

This report brings to the foreground those issues most relevant to the clearing of the frequencies, or channels, designated for public safety. It identifies a number of questions raised by the public safety community that focus on the specifics of gaining access to the spectrum designated for their use. The report will be updated.

Background: Wireless Communications for Public Safety

Public safety agencies include the nation’s first responders (such as firefighters, police officers, and ambulance services) and a number of local, state, federal — and sometimes regional — authorities. Communications, often wireless, are vital to these agencies’ effectiveness and to the safety of their members and the public. Wireless technology requires radio frequency capacity in order to function. Due largely to the

evolution of the market for public safety communications, the limits of technology, and the constraints of spectrum allocation (radio frequency assignments), many public safety wireless communications networks are not compatible with each other. Compatibility, also referred to as interoperability or inter-connectivity, allows different systems to readily contact each other, and provides needed redundancy in a mission-critical situation. In general, the technology to support interoperability exists. For it to be fully implemented, key elements must be in place, such as standardization and coordination, spectrum allocation, and funding.¹ The key agencies for spectrum management are the Federal Communications Commission (FCC) and the National Telecommunications and Information Administration (NTIA). Among other responsibilities, the FCC supervises spectrum for non-federal public safety agency communications. The NTIA — part of the Department of Commerce — administers spectrum used by federal entities.

An important policy issue regarding spectrum allocation for public safety is enmeshed in the efforts to bring about the transition from analog to digital television. This report explores questions regarding the possibility of separating the single issue of spectrum availability from the many issues regarding digital television transmission and reception — with the objective of a timely resolution for certain problems that the public safety industry finds increasingly crucial, such as capacity, high-speed transmission, interoperability, and standards.

Existing wireless technology is designed to work within specified frequency ranges. Communications equipment must be specially built to handle multiple frequency ranges, adding to the cost and affecting operations in various ways. The preponderance of frequency assignments for public safety are located below 512 MHz.² Many newer systems use frequencies in the 800 MHz range. Problems for VHF and UHF users in the lower frequencies are primarily: congestion; FCC requirements for reducing the amount of bandwidth used;³ and a dependency on out-dated, analog equipment. Problems in the 800 MHz range are created by interference from commercial wireless transmissions and insufficient bandwidth for advanced applications such as image transfer. Recently, the FCC designated 50 MHz of spectrum for public safety use at 4.9 GHz, appropriate for data-rich transmissions such as live video. Unlicensed spectrum, notably that used for Wi-Fi and Ultra-Wide Band (UWB), is also being tested for public safety communications. Wi-Fi is considered a promising bridge for developing applications to be used at 4.9 GHz. Obstacles to widespread use of UWB include limited broadcast ranges and unresolved questions about interference. Neither Wi-Fi nor UWB is suitable for sustained voice communications. Radio frequencies have been designated for public

¹ Additional information on the topic of spectrum use for public safety can be found in CRS Report RL31375, *Emergency Communications: Meeting Public Safety Spectrum Needs*.

² Radio frequency spectrum is measured in hertz. Radio frequency is the portion of electromagnetic spectrum that carries radio waves. The distance an energy wave takes to complete one cycle is its wavelength. Frequency is the number of wavelengths measured at a given point per unit of time, in cycles per second, or hertz (Hz). Typical designations are: kHz — kilohertz or thousands of hertz; MHz — megahertz, or millions of hertz; and GHz — gigahertz, or billions of hertz.

³ FCC regulations reducing the amount of bandwidth allowed for existing channels for licensed users, a means of increasing the number of channels available, is known as narrowbanding. Compliance with new bandwidth requirements often requires replacing radio equipment.

safety in the 700 MHz range but that portion of spectrum in some areas is used for analog television broadcasting. The FCC has coordinated with the NTIA for federal access to public safety spectrum at 700 MHz. There are no allocations specifically for federal use at 700 MHz; additional spectrum would have to be allocated by Congress for federal agencies to have access and interoperability for public safety comparable to what is being developed for state and local use.

Standards and Interoperability at 700 MHz

In 1997, responding to the request from the public safety community for more spectrum, Congress passed legislation⁴ that included providing some of the needed spectrum. Congress mandated that channels used to broadcast analog television were to be cleared and spectrum at 700 MHz was to be reallocated for wireless communications, including public safety. Following the instructions of Congress, the FCC assigned the frequencies 764-776 MHz and 794-806 MHz, in channels 63-64 and 68-69 respectively, for public safety use. At the behest of many public safety organizations, the FCC designated 2.5 MHz of this allocation specifically for interoperability. Channels 60-62⁵ and 65-67⁶ were identified for auction for commercial wireless use.

The FCC created the Public Safety National Coordinating Committee to develop recommendations for standards to be used for equipment and systems tuned to the designated channels in the upper 700 MHz band. By 2003, the bulk of standards work was completed and public safety agencies were able to test prototype equipment in areas where the designated frequencies are not in use for analog television broadcasts. As noted by the FCC, “the major urban areas where the need for additional public safety spectrum is most acute are some of the same areas in which this band is most encumbered by broadcast stations.”⁷ The uncertainty about when spectrum will be available in key urban areas makes it difficult for some states (New York is an example)⁸ to implement statewide networks using 700 MHz frequencies that support interoperability. The general uncertainty about spectrum availability is seen by many as an obstacle to implementation of public safety communications on the frequencies for which the most advanced level of standards, system interoperability, and performance can be expected.⁹

Transition to Digital Television

Congress set a date of December 31, 2006 for the cessation of analog television operations on channels 60-69, instructing the FCC to restrict broadcast licensing accordingly. At the same time, Congress required that the FCC grant exemptions for an

⁴ “Balanced Budget Act of 1997,” P.L.105-33, Title III.

⁵ 746-764 MHz.

⁶ 776-794 MHz.

⁷ FCC, *Report to Congress in the Matter of Auction Reform Act of 2002*, released June 19, 2003 (FCC 03-138).

⁸ FCC, Comments, Statewide Wireless Network, New York State Office for Technology, April 23, 2003 (Proceeding No. 03-15); see footnote 13.

⁹ For example, National Task Force on Interoperability, “Why Can’t We Talk,” February 2003.

undefined period of time if three major conditions were met. Briefly, these conditions are: 1) if one or more of the television stations affiliated with the four national networks are not broadcasting a DTV signal, 2) if digital to analog converter technology is not generally available in the market of the licensee, or 3) — often referred to as the “15% rule” — if at least 15% of the television households in the market served by the station do not subscribe to a digital “multi-channel video programming distributor” (including cable or satellite services) and do not have DTV sets or converters.¹⁰ Current market penetration studies place actual digital TV ownership at less than 2% of the population.¹¹ Consequently, TV broadcasting on channels 60-69 is expected to continue for an unknown number of years beyond the date set by Congress, in effect blocking public safety access to the spectrum indefinitely.

Band-Clearing for Public Safety and the Auction Reform Act

Among the provisions concerning digital TV is the requirement that spectrum in channels 60-69 not turned over to public safety agencies be auctioned for commercial purposes. The FCC worked with the broadcasting industry and wireless carriers on a “market-driven” approach for voluntary clearing of the spectrum to be auctioned or assigned to public safety agencies. The FCC had, for example, been willing to relax some standards in order to facilitate voluntary band clearing that relied on channel swapping.¹² A number of industry proposals and counter-proposals on the auction of commercial spectrum¹³ were presented to the FCC, with discussions continuing until the passage of P.L. 107-195 in June 2002. Known as the Auction Reform Act of 2002 (H.R. 4560), the new law delayed some of the planned auctions and set various constraints on the authority of the FCC to arrange for voluntary band-clearing. Any initiative that expedites band clearing for auctionable spectrum might concurrently free up encumbered spectrum for public safety agencies, since both are using similar technology and have similar profiles for interference with television broadcast signals. Because of FCC rules regarding interference and spacing, clearing some channels of television broadcasting for commercial wireless use can also require clearing adjacent channels of television broadcasting, making these channels also available for wireless use. Proposals that might have led to freeing television spectrum through channel swapping for commercial wireless use could be similarly applied to freeing spectrum for public safety wireless communications. The Auction Reform Act, however, limits the FCC in its ability to waive interference standards and rules about spacing if this results in “any degradation”

¹⁰ P.L. 105-33, Title III amends 47 U.S.C. 309 (j).

¹¹ See CRS Report RL31260, *Digital Television: An Overview*.

¹² Voluntary clearing of channels in advance of the 2006 “deadline” had been the primary focus of recent efforts by the FCC. In its *Upper 700 MHz Third Report and Order* (January 23, 2001), the FCC completed the adoption of policies to facilitate voluntary clearing of the 60-69 channels. Notably it allowed for three-way agreements (bi-lateral agreements had already been approved) that would allow incumbent broadcasters in the Upper 700 MHz range to relocate to channels below 59 in cases where these channels had already been vacated. An outline of the band-vacating plan proposed by a coalition of broadcasters, the Spectrum Clearing Alliance, was submitted to the FCC on March 16, 2001 (Comments, Docket No. 99-168.)

¹³ Comments can be found by going to the FCC Electronic Comment Filing System (ECFS) on the FCC web site [<http://www.fcc.gov>]. In ECFS, click “Search for Filed Comments,” insert “99-168” in the box marked “Proceeding,” and then search the file.

of television broadcasting. These limitations are intended to assure full access to free broadcasts for the television-viewing public. Although the Act exempts public safety channels from some requirements, only the four designated channels (63-64; 68-69) are specifically mentioned in the exclusion. Mandated band-clearing is prohibited by the Act and voluntary band-clearing that uses channel swapping is potentially hampered by limits on interference and location set by the Act.

The Role of the FCC in Clearing Spectrum for Public Safety

The Act also required annual reports to Congress from the FCC on certain spectrum management plans and progress in implementing them. In its first report,¹⁴ the FCC addressed band-clearing in both the lower and upper 700 MHz bands, covering the vacating of channels 52-69 primarily as a single issue. Although the future disposition of the public safety channels was touched upon in the report, the FCC did not address the specifics of what might be required to clear these particular channels in an expeditious manner. The FCC in its report does not explore the possibility of a channel swapping plan (a cost to broadcasters) exclusively to free-up spectrum for public safety. This is in contrast to the extensive discussions and participation of the FCC in developing a plan to clear spectrum for commercial use. The tone of its report implies that the FCC is relying upon measures directed toward expediting the transition to digital television in all channels as the sole means to achieve the band clearing needed for public safety.

The FCC in its report, and the National Association of Broadcasters (NAB) and broadcasting alliances such as the Association for Maximum Service Television, Inc., in their petitions to the FCC,¹⁵ are among those that would appear to prefer the monolithic treatment of the issue of spectrum use at 700 MHz. NAB in particular has focused on the potential loss of free TV-viewing power, or the forced purchase by consumers of digital-to-analog converters, as the cost for freeing any spectrum.

Congress and Public Safety Communications

H.R. 1425 (Rep. Harman) — the Homeland Emergency Response Operations Act, or HERO Act — now before Congress, would require the FCC to “take all actions necessary to complete assignments” for the public safety frequencies so that operations could begin no later than January 1, 2007. It is not clear what the stance of the FCC would be but it does appear that “all actions necessary” might include actions prohibited by a strict interpretation of the Auction Reform Act. In the above-noted report, the FCC has stated that if using channels 63-64 and 68-69 for public safety creates interference in adjacent channels beyond what the Auction Reform Act allows, then communications in the public safety channels must be curtailed or prohibited.

¹⁴ FCC, *Report to Congress in the Matter of Auction Reform Act of 2002*, released June 19, 2003 (FCC 03-138).

¹⁵ See, for example, comments and petitions submitted by NAB on March 17, 2000, August 16, 2000 and September 15, 2000 and the by the Alliance on August 16, 200, October 9, 2001, November 09, 2001 and December 27, 2001 (Comments, Docket No. 99-168); see footnote 13.

In studying the link between spectrum availability and emergency communications needs, Congress might consider questions that have been raised by public safety industry officials, such as:

- ! What should be the role of the FCC in managing the clearing of channel frequencies designated by Congress for public safety use?
- ! Is the existing division of responsibility among federal and state agencies that regulate telecommunications the appropriate formula for public safety communications?
- ! How important is it to public safety communications and interoperability that the 700 MHz channels be freed expeditiously?
- ! How would freeing these channels impact federal programs for developing standards for interoperability?
- ! How would freeing these channels impact federal programs for funding new communications equipment for public safety?
- ! How would freeing these channels improve the capacity of the nation to develop comprehensive networks for public safety communications?
- ! What precisely is the extent to which consumers will lose access to TV programs if these channels are cleared?
- ! What is the estimated cost for broadcasters to engage in channel swapping that would minimize or possibly eliminate problems of TV program interference or loss of service?
- ! What compromises might the television industry need to agree to? Is it possible to apply any such compromises only for stations affected by the clearing of channels for public safety, and not across-the-board?

The FCC appears to be taking the position that the release of spectrum for public safety will occur *eventually* as the transition to digital television moves along. Proposals or requests — for example by some broadcasting companies, Motorola, Inc. and New York State — suggest that, with some modification to the rules, the freeing of public safety channels can be achieved *by date certain* with minimal loss of television reception for over-the-air broadcasts.¹⁶ In the Balanced Budget Act of 1997, Congress established 85% as the threshold for the percentage of households, by market, that must be able to receive digital signals in order for the FCC to end the licenses for analog, over-the-air broadcasting. In this scenario, the 15% that lacked digital equipment would, presumably, quickly lose access to all television programs.

A study of television-viewing markets where public safety spectrum is encumbered by broadcast stations finds that a small number of over-the-air TV-viewers might lose one or two channels in a band-clearing arrangement that freed channels for public safety. The median number of affected households is 3% for all markets.¹⁷ To achieve band-clearing requires steps such as: changes in FCC rules; compromise by broadcast and cable television companies; and decisions on how to recoup the costs of channel-clearing.

¹⁶ Comments and petitions filed for Proceeding 03-15; see footnote 13.

¹⁷ White Paper, “700 MHz TV Clearing and Its Impact on TV Viewership,” Motorola, Inc., November 11, 2003, contact Steve B. Sharkey, Director, Spectrum and Standards Strategy, Motorola, Inc., (202) 371-6953