Order Code RL32622

Public Safety, Interoperability and the Transition to Digital Television

Updated August 8, 2005

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Summary

Plans for the use of spectrum intended for wireless emergency communications and interoperability are enmeshed in the technical requirements and complex economic and policy issues that surround the planned transition to digital television (DTV) in the United States, a transition that will free up wireless communications channels for other uses. The Balanced Budget Act of 1997 requires the Federal Communications Commission (FCC) to allocate 24 MHz of spectrum at 700 MHz to public safety, without providing a hard deadline for the transfer. The channels designated for public safety are among those currently held by TV broadcasters.

The 9/11 Commission Report recommended in 2004 that "Congress should support pending legislation which provides for the expedited and increased assignment of radio spectrum for public safety purposes." This was a reference to the Homeland Emergency Response Operations Act (HERO Act) — introduced by Representative Jane Harman — that would have required the FCC to "take all actions necessary to complete assignments" for these channels so that operations could begin no later than January 1, 2007, in line with the deadline originally envisioned for the completion of the transition to DTV for all affected channels. The HERO Act has been reintroduced in the 109th Congress (H.R. 1646).

Language in the Intelligence Reform and Terrorism Prevention Act of 2004 (P.L. 108-458) conveys the sense of Congress that the first session of the 109th Congress must act to establish a comprehensive approach to the timely return of spectrum and that any delay in doing this will delay planning by the public safety sector. There are also provisions in the act for studies that could provide the foundation for achieving significant improvements in public safety communications. The scope of a bill to clear spectrum and facilitate the transition to digital televison is under discussion in the House where draft legislation has been reviewed, but not introduced. In the Senate, Senator Ted Stevens has announced his intention of introducing a comprehensive bill. In the interim, Senator John McCain has introduced the SAVE LIVES Act (S. 1268, Spectrum Availability for Emergency-response and Law-enforcement to Improve Vital Emergency Services). Also, Senator Olympia J. Snowe has introduced a bill (S. 1600) that would help low-power television stations convert to digital broadcasting technology.

Although policy-makers continue to discuss different proposals for legislation, it appears that consensus has been reached on several points. For example, there is general agreement to set a firm date for the clearing of 700 MHz spectrum; to use $4.8 billion of auction proceeds toward congressional commitments to reduce the budget deficit by 2010; and to take measures so that TV-viewers will not lose access to television programming. The steps needed to achieve the latter remains a major point of disagreement, within and outside Congress. Because of the intention to use spectrum funds to meet the Budget Resolution (H.Con.Res. 95), many believe that the major points of a DTV transition act could be included as part of the reconciliation process. This report will be updated.

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Background

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. Many public safety wireless communications programs suffer from funding difficulties and technical limitations due largely to the evolution of the market and technology for public safety communications and to the constraints of spectrum allocation (radio frequency assignments). There is a perceived need for timely resolution of problems that the public safety sector finds increasingly critical, such as reducing commercial transmission interference to emergency calls, implementing high-speed services, using Wi-Fi[1] technologies to deliver data, providing interoperability, increasing standardization, and expanding spectrum capacity.

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. The lead program for fostering interoperability is SAFECOM, part of the Department of Homeland Security. SAFECOM has absorbed the Public Safety Wireless Network (PSWN) Program, previously operated jointly by the Departments of Justice and Treasury. PSWN was created to respond to recommendations made by the Public Safety Wireless Advisory Committee (PSWAC)[2] regarding the improvement of public safety communications over wireless networks. PSWN operated as an advocate for spectrum management policies that would improve wireless network capacity and capability for public safety. SAFECOM, however, has no authority over spectrum management decisions.

Interoperability and the 9/11 Commission Report

Interoperability, also referred to as compatibility or connectivity, allows different systems to readily contact each other and provides needed redundancy. A significant barrier to achieving interoperability is the lack of sufficient spectrum on

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[1] Wi-Fi, for wireless fidelity, provides Internet access from web-enabled devices through wireless local area networks, or "hotspots."

[2] "Final Report of the Public Safety Wireless Advisory Committee," September 11, 1996.

similar radio frequencies. Spectrum allocations for public safety are fragmented at many different frequencies. Existing wireless technology is designed to work within specified frequency ranges. Communications equipment must be specially built to handle multiple frequency ranges, thereby limiting interoperability, adding to the cost, and affecting operations in various ways. Insufficient capability for interoperable communications for first responders and for other public safety response units has been identified by many, including the 9/11 Commission, as a serious problem in any effective response to a terrorist attack or other major disaster. The 9/11 Commission, in one of its recommendations, linked the need for spectrum with the need to improve connectivity.[3] The FCC has designated 2.5 MHz of spectrum in the public safety channels at 700 MHz for interoperability. Most public safety organizations recommend an increase in the amount of spectrum for public safety use at 700 MHz as a way to maximize interoperability and operating efficiency. The 700 MHz spectrum, however, is encumbered by broadcasters and could remain unavailable until issues surrounding the transition to DTV are resolved.

Spectrum for Public Safety Use

Many public safety officials believe that additional spectrum needs to be assigned for public safety use — and not exclusively for first responders.[4] In addition to providing spectrum for other types of users, the spectrum available for public safety needs to support high-speed transmissions capable of quickly sending data (such as photographs, floor plans and live video). This requires providing frequencies with greater bandwidth to enable wireless broadband and new-generation technologies. Most frequency assignments for first responders are narrowband and most are located below 512 MHz.[5] Commonly-used frequencies are VHF or UHF.[6] Problems for users in the lower frequencies are primarily congestion and a

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[3] The National Commission on Terrorist Attacks Upon the United States, *The 9/11 Commission Report: Final Report of the National Commission on Terrorist Attacks Upon the United States*, Official Government Edition, Washington, D.C. 2004, p. 397. This recommendation is discussed in CRS Report RL32594, *Public Safety Communications: Policy, Proposals, Legislation and Progress.*

[4] In 1997 amendments to the Communications Act of 1934 , Congress defined public safety services as "services — (A) the sole or principal purpose of which is to protect the safety of life, health or property; (B) that are provided (I) by State or local government entities; or (ii) by nongovernmental organizations that are authorized by a governmental entity whose primary mission is the provision of such services ; and (C) that are not made commercially available to the public by the provider." Some believe that critical infrastructure industry workers should be specifically included in this definition. Utility company technicians, for example, often arrive at a fire in tandem with fire fighters, to shut off electricity and gas.

[5] 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.

[6] Very High Frequency (VHF) and Ultra High Frequency (UHF) are transmitted in three bands in the United States — low VHF, high VHF, and UHF.

dependency on out-dated, analog equipment. Many newer systems use frequencies in the 800 MHz range. Problems in the 800 MHz range are created by interference from commercial wireless transmissions and insufficient bandwidth for advanced applications such as image transfer. To reduce interference to public safety, the FCC has developed a spectrum relocation plan that is to place public safety channels together at the lower end of the 800 MHz band and might increase the amount of spectrum available to first responders.[7] Radio frequencies have been designated for state and local public safety use in the 700 MHz range but there are no allocations specifically for federal use at 700 MHz. The FCC has coordinated with the NTIA for federal access to public safety spectrum but additional spectrum would have to be allocated by Congress for federal agencies to have comparable access and interoperability at 700 MHz. Also, the bandwidth assignments are judged by most experts to be too narrow for broadband services.

Although, cumulatively, the amount of radio frequencies designated for non-federal public safety totals over 90 MHz,[8] the characteristics of these frequencies are dis-similar, requiring different technological solutions. The fragmentation of spectrum assignments for public safety is a significant barrier to achieving interoperability in the future and, in the past, has been the source of many of the technical problems that plague public safety communications, such as out-of-date equipment, proprietary solutions, congestion and interference. The immediate barrier to achieving radio communications interoperability is — simply put — that UHF and VHF frequencies cannot connect directly with each other; and older, analog equipment widely used below 512 MHz cannot connect with newer digital equipment at 800 MHz. None of the frequency assignments can, using current technology, support wide-area communications relying on high-speed, data-rich transmissions.

Cost of Fragmentation. The number of radio frequencies available for interoperable communications capability can significantly impact first responder communications, and the range of these frequencies can significantly impact the cost of equipment. Manufacturers cite short production runs for wireless handsets as one of the causes for higher costs associated with public safety communications equipment. An analog walkie-talkie might cost $300, a recent "typical" price. A radio with limited interoperability that meets Project 25 standards[9] might cost as much as $3,000 in a short production run. The greater the number of communications devices using compatible frequencies, the greater are the opportunities for economies

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[7] This plan is discussed in CRS Report RL32408, *Spectrum Policy: Public Safety and Wireless Communications Interference.*

[8] Estimated at approximately 97 MHz in Testimony of Michael K. Powell, Chairman, Federal Communications Commission, at Hearing of Senate Committee on Commerce, Science and Transportation, "Spectrum for Public Safety Users," September 8, 2004. The NTIA has apparently not supplied a similar estimate of frequencies assigned to federal agencies that are or can be accessed for public safety purposes.

[9] Project 25 refers to the suite of standards for public safety communications under development by the Telecommunications Industry Association, a standards-setting body authorized for this program. [http://www.tiaonline.org/standards/project_25/]. Viewed June 29, 2005.

of scale in production, which in turn typically lowers the cost and final price on equipment. Purchasing "cross-talk" equipment — to provide interoperability by linking radio frequencies through a black box — can run into the millions of dollars. Beyond issues such as risk-assessment, prioritizing, and equity in funding programs, many within Congress and without are concerned about the long-term implications of funding short-term communications solutions, such as cross-talk equipment.[10] Many believe that the unavailability of spectrum at 700 MHz is stalling advances in technology and planning for new networks, thus adding to the short-term costs of maintaining public safety communications. Therefore, many argue that creating common, interoperable channels at 700 MHz is cost-effective as well as organizationally and technologically desirable.[11]

Freeing Spectrum at 700 MHz

In 1997, responding to the request from the public safety community for more spectrum, Congress passed legislation[12] that included providing some of the needed frequencies. 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. To meet 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 60-62 and 65-67[13] 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 for voice communications 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.

TV Broadcasters Occupy Needed Spectrum. The general uncertainty about 700 MHz spectrum availability is seen by many as an obstacle to implementation of public safety communications on the frequencies for which advanced levels of standards, systems interoperability, and performance can be expected.[14] As noted by the FCC, "the major urban areas where the need for additional public safety spectrum is most acute are

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[10] For example, statements at Hearing of the House of Representatives, Committee on Homeland Security, Subcommittee on Emergency Preparedness, Science and Technology, "The Need for Grant Reform and The Faster and Smarter Funding for First Responders Act of 2005," April 13, 2005.

[11] Speakers at a CRS-sponsored seminar provided equipment cost estimates. *Public Safety Communications: Interoperability Technology Workshop*, November 17, 2003.

[12] Balanced Budget Act of 1997, P.L.105-33, Title III.

[13] 746-764 MHz and 776-794 MHz, respectively.

[14] For example, National Task Force on Interoperability, "Why Can't We Talk," February 2003.

some of the same areas in which this band is most encumbered by broadcast stations."[15] The FCC attempted to work with the broadcasting industry and wireless carriers on a "market-driven" approach for voluntary clearing of the 700 MHz channels designated for auction or assigned to public safety agencies. The FCC showed a willingness to relax some technical requirements in order to facilitate voluntary band clearing that relied on channel swapping.[16] Proposals that might lead to freeing television spectrum through channel swapping for commercial wireless use could be similarly applied to freeing spectrum for public safety wireless communications. Proposals regarding policy or requests for action — for example by some broadcasting companies, Motorola, Inc. and New York State — claim 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.[17] In testimony before Congress in September 2004, representatives from Motorola, Inc. reaffirmed the conviction that a timely clearing of public safety channels could be achieved, estimating that 75 television broadcasting stations would be affected.[18]

Expediting the Transition to Digital TV.[19] 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 digitally-compatible equipment would, presumably, quickly lose access to all television programs. Congress is seeking to protect those households without DTV sets, digital-to-analog converters, or cable or satellite set-top boxes from the loss of over-the-air television broadcasts. In the interim, the FCC is taking concrete steps to facilitate the eventual move to DTV with a number of technical requirements.[20]

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

[16] 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.) Comments can be found by going to the FCC Electronic Comment Filing System (ECFS) on the FCC website [http://www.fcc.gov]. In ECFS, click "Search for Filed Comments," insert the docket number in the box marked "Proceeding," and search the file.

[17] Comments and petitions filed for Proceeding 03-15 by New York State, Office for Technology, Statewide Wireless Network, April 21, 2003 and White Paper, "700 MHz TV Clearing, Its Impact on TV Viewership and Options for Accelerating Public Safety Access," Motorola, Inc, February 2, 2004, [http://motorola.com/cgiss/docs/700MHz_whitepaper.pdf]. Viewed June 29, 2005.

[18] Testimony of Gary Grube, Chief Technology Officer, Motorola, Inc. at Hearing of Senate Committee on Commerce, Science and Transportation, "Spectrum for Public Safety Users," September 8, 2004.

[19] This report focuses on spectrum issues. For more information on DTV, see CRS Report RL31260, *Digital Televison: An Overview*, by Lennard G. Kruger.

[20] For example, "FCC Modifies Digital Tuner Requirements to Advance DTV Transition," June 9, 2005 and "DTV Channel Election Information and Deadlines," October 7, 2004, FCC News at [http://www.fcc.gov].

Cost of the Transition. At the request of Congress, the Government Accountability Office (GAO) is preparing a series of studies of the costs, under different scenarios, of providing free set-top boxes to TV viewers who only receive analog television broadcasts.[21] At a hearing on February 17, 2005, Mark. L Goldstein, Director, Physical Infrastructure Issues at GAO, and other panelists discussed various aspects of a conversion to DTV and the possible use of converter boxes.[22] According to an estimate by the GAO, nearly 22 million households could lose their access to free television.[23] Providing affected households with converter boxes would enable them to continue to receive broadcast television; the set-top converter boxes would receive the new, digital signals and convert them to an analog format for viewing on older-model analog TVs. The GAO estimated that the cost of providing converter boxes ranged from $460 million to $10.6 billion, depending on the variables such as the cost of the box and the number of households eligible to receive assistance.[24] The cost of administering the program, distributing boxes, and other ancillary costs are not included in these estimates. At a hearing on May 26, 2005, GAO provided additional testimony on the possible costs and technical obstacles associated with an expedited deadline for ending analog television broadcasts.[25]

In June 2005, the Consumers Union and the Consumer Federation of America issued a joint study[26] that estimated the number of households that would lose all TV reception at approximately 16 million. Based on an estimate of a $50 price to purchase a converter box, the report concluded that "the direct government-imposed costs on consumers to preserve the usefulness of [analog television sets] would be $3.5 billion or more."[27]

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[21] Already published are: *Digital Broadcast Television Transition: Estimated Cost of Supporting Set-Top Boxes to Help Advance the DTV Transition*, GAO-05-258T, February 17, 2005; and *Digital Broadcast Television Transition: Several Challenges Could Arise in Administering a Subsidy Program for DTV Equipmen*t, GAO-05-623T, May 26, 2005.

[22] House of Representatives, Committee on Energy and Commerce, Subcommittee on Telecommunications and the Internet, "The Role of Technology in Achieving a Hard Deadline for the DTV Transition," February 17, 2005.

[23] GAO-05-258T, p. 3.

[24] GAO-05-258T, pp. 14-15.

[25] House of Representatives, Committee on Energy and Commerce, Subcommittee on Telecommunications and the Internet, "Staff Discussion Draft of the DTV Transition Act of 2005," May 26, 2005. *Digital Broadcast Television Transition: Several Challenges Could Arise in Administering a Subsidy Program for DTV Equipmen*t, GAO-05-623T, May 26, 2005.

[26] *Estimating Consumer Costs of a Federally-Mandated Digital TV Transition; consumer survey results*, Consumers Union and Consumer Federation of America, June 29, 2005 at [http://www.hearusnow.org/fileadmin/sitecontent/DTV_Survey_Report-_Final_6-29-05.pdf].

[27] *op. cit.*, page 7.

Proposals for Increasing Spectrum for Public Safety

The number of radio frequencies available for interoperable communications capability can significantly impact first responder communications, and the range of these frequencies can significantly impact the cost of equipment. Public safety officials and planners are among those calling on Congress to allocate 30 MHz of additional spectrum at 700 MHz to increase the efficiency of public safety communications. The Spectrum Coalition for Public Safety is among those that has asked for legislation that would allocate additional spectrum at 700 MHz for use by state and local first responders, critical infrastructure industries and federal public safety agencies.[28] Public safety communications equipment manufacturers are among those that believe significant economies of scale might be achieved if similar equipment on compatible spectrum is provided to a large block of like users. As public safety users migrate to 700 MHz, the need for costly equipment that patches together incompatible systems and frequencies will be reduced. Consolidation of public safety users at 800 MHz might also increase economies of scale over time.

Funding public safety is a major concern of Congress. Appropriations bills are not discussed in this report but are covered by other products from Congressional Research Service.[29] Beyond issues such as prioritizing and equity in grant distributions, many within Congress and without are concerned about the long-term implications of funding short-term communications solutions, such as cross-talk equipment.[30] As has been indicated in this report, decisions about spectrum allocation and management influence choices about which wireless technologies to use, and these decisions in turn impact the cost of communications equipment. Many believe that the unavailability of spectrum at 700 MHz is stalling advances in technology and planning for new networks, thus adding to the short-term costs of maintaining public safety communications.

New technologies that improve communications capacity are being introduced almost continuously, but the need to provide suitable spectrum for a full range of voice and data communications will persist. The need for greater spectral capacity for public safety will grow with the number of participants in interoperable systems and the amounts of information being shared on these systems. Bottlenecks in communications are a problem that is already manifest among federal computer networks and landline transmissions, and many believe it will worsen as more information is pushed through. As emergency response units become more mobile, demand for time-critical, wireless communications capacity will also increase.

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[28] Spectrum Coalition for Public Safety at [http://www.spectrumcoalition.org].

[29] For example, CRS Report RS21677, *Office for Domestic Preparedness Grants for 2004: State Allocation Fact Sheet;* CRS Report RL32696, *Fiscal Year 2005 Homeland Security Grant Program: State Allocations and Issues for Congressional Oversight;* and CRS Report RS22050, *FY2006 Appropriations for State and Local Homeland Security*, all by Shawn Reese.

[30] For example, statements at Hearing of the House of Representatives, Committee on Homeland Security, Subcommittee on Emergency Preparedness, Science and Technology, "The Need for Grant Reform and The Faster and Smarter Funding for First Responders Act of 2005," April 13, 2005.

Primary concerns of the proponents of providing additional spectrum for public safety use are insufficient number of channels to support interoperability with federal agencies and insufficient bandwidth for federal, state and local agencies to transmit data at high speeds (broadband). Responding to these concerns, Congress included in the Intelligence Reform and Terrorism Prevention Act a requirement that the FCC prepare a study on spectrum needs for public safety and homeland security.[31]

Legislation in the 109th Congress

Beginning with the 107th Congress, Representative Jane Harman has introduced in each Congress legislation that would assure the timely release of radio channels at 700 MHz for public safety use. The Homeland Emergency Response Operations Act, or HERO Act (H.R. 1646), reintroduced in April 2005, requires the FCC to "take all actions necessary to complete assignments" for these channels so that operations could begin no later than January 1, 2007, in line with the deadline originally envisioned for the completion of the transition to DTV for all affected channels.

Other bills covering the release of spectrum and the transition to DTV have been introduced or are planned. A bill (S. 1268) introduced by Senator John McCain, the Spectrum Availability for Emergency-response and Law-enforcement to Improve Vital Emergency Services, or SAVE LIVES Act, would specify a hard date of December 31, 2008[32] for the release of spectrum held by broadcasters and would address issues of the transition from analog to digital broadcast technology. Among the provisions of the bill are several that respond to public safety communications needs. The bill would allow spectrum auction proceeds from the sale of cleared analog spectrum to be allocated directly to a grant program to improve communications interoperability for first responders.[33] Allowance is made for the possibility that Congress will ask the FCC to allocate additional spectrum for public safety after it has considered the FCC report on spectrum needs.[34] The auctions must be completed and the proceeds paid to the Treasury not later than June 30, 2008.[35] To ensure that the FCC has the authority to conduct the auction of the designated radio frequencies, the bill extends the auction authority of the FCC until September 30, 2009;[36] it is currently set to expire in September 2007. The bill covers many aspects of concern in carrying out the transition to digital TV. The bill, for example, establishes criteria for distributing set-top converter boxes[37] and authorizes funds for the program.[38] These funds will be paid out from revenue generated by the auction

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[31] P.L. 108-458, Title VII, Subtitle E, Sec. 7502 (a). Due December 2005.

[32] S. 1268, Sec. 2 (a) (1).

[33] S. 1268, Sec. 5 (f).

[34] S. 1268, Sec. 3 (a) (2) "(iii) (cc)."

[35] S. 1268, Sec. 3 (a) (2) "(iii) (bb)."

[36] S. 1268, Sec. 3 (b).

[37] S. 1268, Sec. 4.

[38] S. 1268, Sec. 4 (f).

of designated spectrum.[39] Other provisions cover rules for notifying consumers of the pending transition;[40] sending digital signals over cable;[41] and requirements for the FCC to complete certain pending proceedings that impact the DTV transition.[42]

Senator McCain reportedly plans to work with Representative Joe Barton (Chairman, Committee on Energy and Commerce, House of Representatives) and Senator Ted Stevens (Chairman, Committee on Commerce, Science, and Transportation, Senate) who are preparing bills covering the release of spectrum and the transition to DTV.[43] In the House, discussions of a draft bill have reportedly stalled over disagreement about subsidies for tuners, among other issues.[44] Commenting on Senate hearings on DTV, held July 12, 2005, Mr. Barton reaffirmed his commitment to "working with the Senate to set a hard deadline this year."[45]

Concerned that plans have lagged for converting low-power television broadcasts from analog to digital technology, Senator Olympia J. Snowe has introduced a bill (S. 1600, Digital Translator and Low Power Television Transition Assistance Act) to ensure full access to digital television in areas served by low-power television. Eligible TV stations would receive funds for upgrading from a trust fund set up with auction proceeds.[46] Based on FCC estimates of the cost of upgrading and transition for low-power TV, funding for the Low-Power Digital Transition Trust Fund would be $100 million.[47]

Scope of the Debate. By the end of FY2010, Congressional policy-makers would like to allocate $4.8 billion from 700 MHz auction funds toward meeting a Budget Resolution to reduce the federal deficit.[48] They would like to maximize the amount of 700 MHz spectrum available in a timely manner while minimizing the cost and inconvenience to TV-viewers and the television industry that might result

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[39] S. 1268, Sec. 4 (f) (1).

[40] S. 1268, Sec. 6.

[41] S. 1268, Sec. 7.

[42] S. 1268, Sec. 9.

[43] "NAB Thwarting Return of Spectrum, McCain Says," *Communications Daily*, June 15, 2005.

[44] "House Leadership Concern over Subsidy Slows Barton DTV Bill," Communications Daily, June 16, 2005.

[45] U.S. House Committee on Energy & Commerce Press Office release, "Barton Committed to Work With Senate on Setting DTV Hard Deadline," July 12, 2005.

[46] S. 1600, Sec. 103.

[47] S. 1600, Sec. 103 (b)and comments by Senator Snowe on the introduction of S. 1600, *Congressional Record*, July 29, 2005.

[48] For the House Committee on Energy and Commerce, the commitment could be $14,734,000,000 for fiscal years 2006 through 2010; H. Con. Res 95, Concurrent Resolution on the Budget for Fiscal Year 2006, Title II, Sec. 201 (a) (2) (C). Reportedly the House would use $4.8 billion of spectrum auction revenue to help meet this goal, see, for example, "DTV Bill to be Subsumed in Budget Bill," Communications Daily, July 8, 2005.

from the disruption. As efforts to provide legislation that will expedite the transition to digital television intensify, stakeholders' interests in influencing the outcome seem to increase as well.[49] The public safety community has long urged the timely release of spectrum at 700 MHz that it needs for improved communications and interoperability.[50] In April 2005, the National Association of Broadcasters (NAB) drew a line in the sand by refuting this assertion of need in a letter stating that "... in the ten cities most likely to be struck by a terrorist attack, the communications interoperability issue has been resolved."[51] This conclusion was criticized by public safety officials as incorrectly based on a misinterpretation of a news story.[52] The dispute between the broadcasting association and a conglomerate of public safety associations and their supporters over the urgent need for spectrum has been joined by a new major contender, a coalition known as the High Tech DTV Coalition.[53] Coalition members have also has urged the early release of spectrum concluding that the release of spectrum at 700 MHz will "spark growth in the U.S. high-tech sector," especially the market for advanced wireless services, a category that includes DTV broadcasting to next-generation wireless phones and computers.[54] They, too, have written to Congress to press their point and urge the establishment of "an early date-

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[49] Many of the stakeholder groups were represented at back-to-back Senate Hearings on DTV: Senate, Committee on Commerce, Science and Transportation, "Digital Television Transition," July 12, 2005. Panelists were: (Hearing I) Edward Fritts, National Association of Broadcasters; Manuel Abud, KVEA-TV/ Telemundo, Los Angeles; Kyle McSlarrow, National Cable & Telecommunications Association; Patrick Knorr, American Cable Association; Richard Slenker, DirecTV, satellite TV; John M. Lawson, Association of Public Television Stations; (Hearing II) Harlin R. McEwen, International Association of Chiefs of Police — and on behalf of additional public safety associations; Charles Townsend, Aloha Partners; Mike Kennedy, Motorola, Inc.; Gary Shapiro, Consumer Electronics Association; Gene Kimmelman, Consumers Union; Michael Calabrese, New America Foundation.

[50] For example, letter to the Honorable Joe Barton, the Honorable John D. Dingell, the Honorable Fred Upton and the Honorable Edward J. Markey from the Association of Public-Safety Communications Officials-International; Congressional Fire Services Institute; International Association of Chiefs of Police; International Association of Fire Chiefs; Major Cities Chiefs Association; Major County Sheriffs' Association; National Association of Counties; National League of Cities; and National Sheriffs' Association, May 5, 2005. Also, comments made at panel discussion on first responder spectrum needs organized by the Congressional Wireless Caucus, June 28, 2005.

[51] Letter to the Honorable Joe Barton, the Honorable John D. Dingell, the Honorable Fred Upton and the Honorable Edward J. Markey, from Edward O. Fritts, President and CEO, National Association of Broadcasters, April 27, 2005.

[52] The rebuttal from public safety officials was part of their letter of May 5, 2005, noted above.

[53] Formed April 2005. Members include Alcatel, Aloha Partners, AT&T, Dell, Cisco Systems, IBM, Intel, Microsoft, Qualcomm, Texas Instruments and a number of associations. Source: Press Kit, High Tech DTV Coalition, April 27, 2005.

[54] "Analysis of an Accelerated Digital Television Transition," prepared by the Analysis Group, sponsored by Intel Corporation, May 31, 2005 at [http://www.itic.org/reports/DTV%20Transition%20Report.pdf]. Viewed June 29, 2005. For a brief discussion of some of the technologies, see CRS Report RS20993, *Wireless Technology and Spectrum Demand: Advanced Wireless Services.*

certain" for the transition.[55] Also advocating the early release of spectrum and other policies to "facilitate the rapid and effective delivery of new advanced wireless services" is The 700 MHz Advancement Coalition. [56] The coalition is comprised of owners of licenses for 700 MHz sold in 2002 and of technology and equipment suppliers that support their goals.

Representatives of NAB have testified that they expect the 85% market penetration test will be abandoned and they are therefore prepared to respond to any deadline provided by Congress.[57] NAB's expectation is that "Congress will pass a DTV bill this year with a hard date for turning off analog television with minimal consumer disruption."[58] This position is echoed by the Consumers Union and the Consumer Federation of America in urging Congress to identify "the level of compensation necessary to hold customers harmless from the congressionally mandated transition to digital television."[59]

Other interested parties seeking a hard date include satellite and cable companies; manufacturers of consumer electronics — including companies that can gear up production of set-top converter boxes.

Spectrum Allocation and Auctions. Although estimates vary, spectrum auctions of frequencies in the 700 MHz band have typically been projected to gross $20 billion to $30 billion.[60] In 2002, some frequencies at 700 MHz — that were (and for the most part still are) encumbered by broadcasters — netted $88,651,630 for the U.S. Treasury.[61] Revenue potential is dependent on a number of factors, including timing of auctions and the date at which spectrum will be cleared and available. The Congressional Budget Office has reportedly provided an estimate of $10 billion for the spectrum in question based on the assumption that other auctions will soak up available capital. [62]

Many of the estimates for the amount of revenue raised from spectrum auctions assume that 60 MHz of prime spectrum will be auctioned, with all channels

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[55] For example, letters to the Honorable Joe Barton, the Honorable John D. Dingell, the Honorable Fred Upton and the Honorable Edward J. Markey, and to Senators Ted Stevens and Daniel K. Inouye, from the High Tech DTV Coalition, April 26, 2005.

[56] See [http://www.700MHz.org/]. Viewed July 13, 2005.

[57] Testimony of Edward Fritts, Senate Hearing July 12, 2005.

[58] "Statement," NAB Newsroom press release, June 29, 2005 at [http://www.nab.org/newsroom/pressrel/statements/062905_CU-CFA_Survey_Statement.htm]. Viewed July 6, 2005.

[59] *Estimating Consumer Costs of a Federally-Mandated Digital TV Transition; consumer survey results*, Consumers Union and Consumer Federation of America, page 1.

[60] "Analysis of an Accelerated Digital Television Transition," page 6.

[61] "Lower 700 MHz Band Auction Closes," FCC Public Notice, DA 02-2323, September 20, 2002.

[62] "Estimates Vary on Value of Spectrum," by Drew Clark, Technology Daily, August 2, 2005.

available. Other proposals have been made that would reduce the amount of spectrum auctioned; consequently the revenue, all things being equal, would presumptively be less. As previously noted, Congress has asked the FCC to study allocating additional spectrum for public safety, possibly from the 700MHz band. There are also many who advocate that some portion of the freed spectrum be unlicensed.[63] Although these recommendations are based on policies that support public safety and accessible wireless technology, such actions might substantially reduce the revenue that is predicted from freeing the analog broadcast channels. There are also proposals to use spectrum auctions to fund specific programs such as subsidizing TV converter boxes for consumers, providing grants to low-power TV stations, supporting education, or funding public safety communications equipment purchases, to cite some examples.[64]

A significant factor in valuing spectrum is the size of the market served. Usually this value is expressed in terms of dollars per MHz-Population. Using this methodology, a value of $1.65 per MHz-Population, for example, yields a potential value of $28 billion for 60 MHz of spectrum at 700 MHz. Dollar per MHz-Population estimates for upcoming auctions are derived from results of earlier auctions for similar spectrum. This estimated value is then typically increased or decreased depending on assumptions about a number of variables. The different weight that analysts give to the impact of hard-to-measure market conditions largely explains the wide range of valuations predicted for 700 MHz auctions. For example, poor economic conditions may depress all markets and put downward pressure on prices for spectrum, just as an exuberant market — eager to implement new technology — may place an unusually high value on obtaining new licenses. The usability of spectrum is an important factor as well. There is a disincentive to invest in a non-performing asset, such as spectrum that is blocked by other users, or spectrum that doesn't serve an immediate market because new technology isn't ready for deployment. In the case of spectrum at 700 MHz, the general opinion is that there is significant risk that the spectrum will remain encumbered, despite hard dates, thereby tying up resources indefinitely and hampering investment in new communications technologies and services. As presently configured, 874 licenses in 60 MHz would be available for auction. Of these, 280 licenses are considered encumbered by television broadcast stations.[65] A majority of analysts believe that selling these frequencies, most of which serve lucrative markets, before they have been cleared or are irrevocably scheduled to be cleared will lower the value in an auction.[66]

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[63] For example, Gene Kimmelman of the Consumers Union has reportedly confirmed that consumer groups "would not support the establishment of a firm deadline unless Congress funds converter boxes and makes spectrum available for unlicensed service and new entrants." Source: "Consumer Groups Urge Protection for 70M TV Viewers," Telecommunications Reports, July 15, 2005.

[64] For additional information, see CRS Report RS21508, *Spectrum Management and Special Funds*.

[65] 700 MHz Advancement Coalition at [http://www.700MHz.org/700_MHz_band.htm]. Viewed July 13, 2005.

[66] For example, the Congressional Budget Office estimated that companies bidding for (continued...)

Setting a Hard Date. The National Association of Broadcasters has confirmed its acceptance of "whatever date Congress sets,"[67] for the transition to DTV. Reports of discussions about the choice of date have usually centered on December 31, 2008, although some discussions have pushed the date into mid-summer 2009 or later. Reportedly, Senator Stevens is considering an earlier date for legislation he will propose.[68] Below is a *hypothetical* time line, based on testimony,[69] of possible start dates for different elements of the transition. The projected dates deal with technological as opposed to administrative hurdles. The projected start date for supplying converter boxes in quantity appears on the time line, for example, but the administrative decision by the FCC to choose a 2007 deadline for channel selection does not. Note that other experts might provide different dates for achievable milestones.

Most of the dates on the time line are based on the assumption that Congress will pass a bill that is signed into law on October 1, 2005. This is the hypothetical "go" that would start the transition process. The time line could extend as far out as June 2009, roughly the last possible date by which 700 MHz spectrum auction proceeds might be used toward closing the budget deficit (H.Con.Res. 95). Note that the time line does not include specific hard dates for freeing spectrum. A hard date, or more than one hard date — if a "staggered rollout" is used[70] — would presumably occur within the time line.

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[66] (...continued)
encumbered spectrum in the 1710-1755 MHz band (auction now tentatively scheduled for June 2006) would "discount their bids by about $2 billion to $3 billion because of the uncertainty associated with the time and cost of relocating federal and commercial users." (House Report 108-137 - Commercial Spectrum Enhancement Act.) Note that this formula cannot be directly applied to spectrum at 700 MHz because of significantly different market conditions, a different climate of certainty, and different levels of actual encumbrance. The Commercial Spectrum Enhancement Act creates a trust fund to hold auction proceeds that will then be disbursed to government agencies to cover the costs of vacating the auctioned spectrum; see CRS Report RS21508, *Spectrum Management and Special Funds*. Another recent example of band clearing and relocation is exemplified by the FCC agreement with Nextel, Inc.; see CRS Report RL32408, *Spectrum Policy: Public Safety and Wireless Communications Interference*. In this instance, Nextel has taken on the obligation of paying for at least some of the costs of relocation.

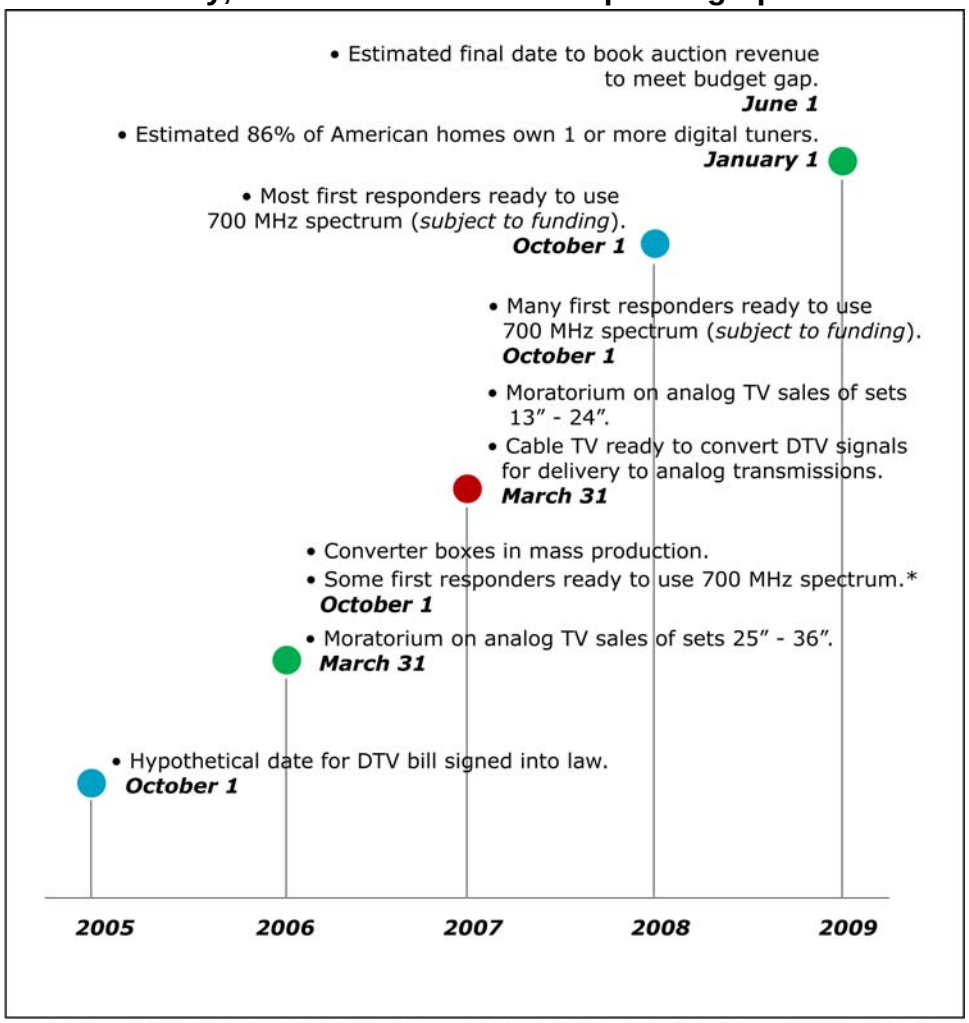
[67] Testimony of Edward Fritts, Senate Hearing July 12, 2005.

[68] "Broadcasters Support Hard DTV Date, NAB Tells Senate Hearing," Communications Daily, July 13, 2005.

[69] Testimony by panelists regarding time needed to meet certain requirements, Senate Hearing, July 12, 2004. This information was reconfirmed by telephone by CRS on July 13, 2005.

[70] As suggested in testimony of Michael Calabrese, Senate Hearing, July 12, 2005.

Figure 1. Hypothetical Time Line for Technological Milestones in DTV Transition Based on Start Date for Legislative Certainty, Not Hard Date for Relinquishing Spectrum



* Testimony of Mike Kennedy, Senate Hearing, July 12, 2005. Mr. Kennedy testified that there is already in place an imbedded base of interoperable radios working on 700 MHz and 800 MHz. On further inquiry, it was confirmed that states that have approved plans for using 700 MHz could obtain and install the remaining infrastructure (antennas, computers, etc.) within one budget cycle of approximately one year. Note that Washington, D.C. is using 700 MHz frequencies in a special program for emergency communications and interoperability.

Source: Based on Testimony, Senate Hearing, July 12, 2005.

Within the construct of the above *hypothetical* time line — administrative and cost issues aside — Congress could set a hard date as early as March 31, 2007 to end TV broadcasts on analog channels. Congress could also set a hard date for later than 2009 but the value of still-encumbered spectrum might be discounted by the market. Another possibility would be to phase in the transition to DTV, freeing public safety channels and some of the adjacent commercial channels[71] (that could be auctioned) at an early date and the remainder in mid-2009, a later date that has been proposed

[71] Because of interference with transmissions, some commercial channels adjacent to the frequencies going to public safety would have to be cleared at the same time.

in discussions.[72] As explained in testimony,[73] this might mean that the per-unit cost of converters would be higher for the initial rollout, but the numbers eligible to receive converters might be lower in the long term.[74] Another approach under discussion would be a multi-phase transition and auction process. The first phase would entail the release of spectrum for areas where public safety has 700 MHz plans approved and could therefore move promptly to put systems in place.[75] Some spectrum might be available for auction at that time. A second and possibly a third phase would release the remaining spectrum for designated uses and auction. Such an approach could increase or decrease revenue, depending on market demand and expectations; also, the FCC deducts the costs of administering auctions from gross sales revenue. For TV-viewers, there may be benefits in a managed conversion conducted at the local level instead of nationwide. Subsidy programs, as needed, could be developed to meet local needs. For the government, the experience acquired in smaller-scale projects would aid in the development of a nationwide program. One of the possible disadvantages might be consumer confusion about what areas are affected when, especially if broadcasters do a national consumer education program that does not explain local and regional timetables. In the United Kingdom, a phased approach over a four-year period (2008-2012) has been favored,[76] with preliminary trials underway in several markets. The transition is to be handled by a private company, SwitchCo.[77]

As discussed above, the total revenue from spectrum auctions could vary up or down depending on a number of circumstances. No matter what the timing of the auctions, it appears that any subsidy program that could be authorized would have to be funded before the spectrum is cleared.[78] If such is the case, auction funds to pay for such a program would only be available if the spectrum is sold while still

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[72] "Sen. Stevens Likely to Differ From House Leaders Subsidy," by Drew Clark, Technology Daily PM, July 12, 2005.

[73] Testimony of Michael Calabrese, Senate Hearing July 12, 2005.

[74] In testimony, Gary Grube, Chief Technology Officer, Motorola, Inc. at Hearing of Senate Committee on Commerce, Science and Transportation, "Spectrum for Public Safety Users," September 8, 2004, identified 75 stations that were effectively blocking access to 700 MHz channels for public safety. This suggests that no more than 75 communities across the nation would be affected, although some of them, such as Los Angeles, are densely populated.

[75] Regional plans and maps for public safety use of 700 MHz are available at [http://wireless.fcc.gov/publicsafety/700MHz/plans.html] and from state chairmen of the planning committees. Viewed July 15, 2005.

[76] Report of the Digital Television Project, press statement by the Secretary of State for Culture, Media and Sport, March23, 2005 at [http://www.digitaltelevision.gov.uk/publications/pub_dtv_project_report.html]. Viewed August 3, 2005.

[77] Details about DTV planning in the UK are available at the Digital Television Project website at [http://www.digitaltelevision.gov.uk/dtv_project/project_details_home.html]. Viewed August 3, 2005.

[78] S. 1268, for example would require the auction process to be concluded at least six months before the hard date for clearing spectrum.

encumbered. In preparing to fund a transition program (distributing converter boxes, or other), Congress could follow the precedent set by the Spectrum Enhancement Act (P.L. 108-484) and specify that spectrum sales must raise sufficient funds to cover projected costs and obligations associated with the transition plan. Another possibility for funding a program to cover some of the DTV transition costs would be to charge broadcasters fees for using the analog channels.[79]

Provisions in the Intelligence Reform Act

Title VII, Subtitle E — Public Safety Spectrum, of the Intelligence Reform and Terrorism Prevention Act of 2004, recognizes the merits of the arguments for increasing the amount of spectrum at 700 MHz available for public safety and homeland security. It requires the FCC, in consultation with the Secretary of Homeland Security and the NTIA, to conduct a study on the spectrum needs for public safety, including the possibility of increasing the amount of spectrum at 700 MHz.[80] The same section of the act also instructs the Secretary of Homeland Security to lead a study to "assess strategies that may be used to meet public safety telecommunications needs."[81] The strategies study is to address the need for nationwide interoperable communications networks, the capacity of public safety to use wireless broadband applications, and the communications capabilities of "all emergency response providers. . . ." The use of "commercial wireless technologies to the greatest extent possible" is to be considered. Both the FCC and the Homeland Security studies are to be submitted by year-end 2005.

Studies and other measures regarding interoperable communications are also addressed in the act. Title VII, Subtitle C - National Preparedness, requires the Secretary of Homeland Security to establish a program to enhance public safety interoperable communications.[82] Among the responsibilities of the program are the development of a "comprehensive national approach to achieving public safety interoperable communications." Several of the specific requirements for the study overlap those detailed in Subtitle E, Sec. 7502. Subtitle C requirements that are closely connected to spectrum use include information on the life cycle and technical requirements of existing infrastructure;[83] and the need for international, cross-border interoperability.[84] Another section in Subtitle C addresses communications support for urban and other high risk areas specifically.[85] There is also provision to establish pilot projects in high threat urban areas or regions that might serve as a national

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[79] The President's budget for FY2004 and again for 2006 proposed that 1) the FCC's authority to conduct auctions be extended indefinitely; 2) user fees be levied on unauctioned licensed spectrum; and 3) broadcasters pay an annual lease fee on analog TV spectrum that they are holding as part of the Congressionally-mandated transition to digital television.

[80] P.L. 108-458, Title VII, Subtitle E, Sec. 7502 (a).

[81] P.L. 108-458, Title VII, Subtitle E, Sec. 7502 (b).

[82] P.L. 108-458, Title VII, Subtitle C, Sec. 7303 (a).

[83] P.L. 108-458, Title VII, Subtitle C, Sec.7303 (a) (1) (C) (i).

[84] P.L. 108-458, Title VII, Subtitle C, Sec.7303 (a) (1) (D) (ii).

[85] P.L. 108-458, Title VII, Subtitle C, Sec.7303, ''Sec. 510.

model for a strategic plan. Specifically the purpose of the pilots is to establish the basis for a regional strategic plan that would foster interagency communications.[86]

The Intelligence Reform and Terrorism Prevention Act of 2004 conveys the sense of Congress that the first session of the 109th Congress must act to establish a comprehensive approach to the timely return of spectrum[87] and that any delay in doing this will delay planning by the public safety sector.[88] The act, therefore, proposes or requires a number of actions regarding public safety interoperability and spectrum use within a specified time:

- Sense of Congress that it must pass legislation that resolves spectrum release as part of the transition to digital television; first session. (Sec. 7501.)
- Requirement for a study on spectrum for public safety and homeland security; December 2005. (Sec. 7502.)
- Requirement for a study on strategies to meet interoperable communications needs; December 2005. (Sec. 7502.)
- Requirement to establish a program to enhance public safety interoperable communications; report on program, April 2005. (Sec. 7303.)[89]
- Establishment by the President of a mechanism for coordinating cross-border interoperability issues with Canada and Mexico; June 2006. (Sec. 7303.)
- Requirement to establish at least two pilot projects in high threat or urban areas for interagency communications; March 2005. (Sec. 7303, Sec. 510.)[90]
- Reports on interagency communications pilots; interim, June 2005; final June 2006. (Sec. 7304.)
- Provision of funds for authorized program for interoperable communications; fiscal years 2005 through 2009. (Sec. 7303.)

Related Actions by the Administration. On November 30, 2004, President George W. Bush issued a memorandum to the heads of Executive Departments and agencies regarding steps to be taken to improve the management of spectrum assigned for federal use.[91] Most of these steps are to implement recommendations made by the Federal Government Spectrum Task Force in its

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[86] P.L. 108-458, Title VII, Subtitle C, Sec. 7304.

[87] P.L. 108-458,Title VII, Subtitle E, Sec. 7501 (b) (1).

[88] P.L. 108-458, Title VII, Subtitle E, Sec. 7501 (b) (2).

[89] Responding to a CRS inquiry on status, DHS has indicated that the program is being reviewed.

[90] *ibid*

[91] "Presidential Determination: Memorandum for the Heads of Executive Departments and Agencies," November 30, 2004, Office of the Press Secretary, News & Policies, at [http://www.whitehouse.gov/news/releases/2004/11/20041130-8.html]. (Viewed January 4, 2005.)

report to the President in June 2004.[92] Among the deadlines provided in the memorandum are two requirements related specifically to public safety. One requirement is for the Secretary of Homeland Security to identify public safety spectrum needs by June 2005. The Secretary is to work with the Secretary of Commerce and, as needed, with the Chairman of the Federal Communications Commission and representatives from the public safety community; state, local, regional and tribal governments; and the private sector. Also, by year-end 2005, the Secretary of Homeland Security is to lead the preparation of a Spectrum Needs Plan, "to address issues related to communication spectrum used by the public safety community, as well as the continuity of Government operations." Concurrently, the Secretary of Commerce is to develop a Federal Strategic Spectrum Plan.

[92] *Spectrum Policy for the 21st Century: The President's Spectrum Policy Initiative*.