Order Code RL31375

Report for Congress

Meeting Public Safety Spectrum Needs

Updated July 22, 2002

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Summary

In the aftermath of September 11, 2001, Congress reaffirmed its concern regarding the availability of spectrum to meet the wireless communications needs for public service agencies. Issues include the amount of spectrum available, the timing of spectrum availability, interoperability, interference, technology, access, standards, and funding. The Department of Homeland Security would, as currently proposed, address some of the issues concerning spectrum policy and public safety. Several important policy decisions that would increase the amount and efficiency of spectrum used by first responders and other public safety organizations are currently under consideration by Congress and the Federal Communications Commission (FCC). This report focuses on key proposals for improving wireless telecommunications for public safety and recent actions to achieve this goal. Efforts by the FCC and other agencies to improve interoperability, reduce interference, and promote new technology are reviewed.

Sufficient and appropriate spectrum is fundamental to the future development of wireless communications for public safety. The manner in which the spectrum is allocated is also important and this is illustrated, for example, in the problem of interference to public safety communications. This problem has opened a debate over how to reallocate spectrum not only to reduce interference but also to maximize the benefit to other users in adjacent bands. Business and industrial users, for example, are examining their need for spectrum for applications such as pipeline surveillance and some have petitioned the FCC to reclassify their licenses to reflect the public safety aspects of their private networks.

Interoperability — the ability to communicate effectively among all wireless networks used for public safety — depends both on spectrum and technology. Some spectrum is already designated specifically for interoperability but plans for future development are hampered by uncertainty over the release of the spectrum, currently used for analog television. Meanwhile, the availability of new broadband technologies has further increased the need for spectrum. The FCC announced in February 2002 that it would allocate new spectrum for public safety broadband. Uses would include wireless ambulance support; highspeed file transfers including medical histories, photo images of wanted and missing persons, maps and building plans, and videos of incidents in progress; multimedia connections to support police officers, firefighters and SWAT missions; low flying surveillance videos; and mobile robotics that could, for example, enter hazardous areas for rescue missions and inspect non-accessible areas.

The FCC has also allocated spectrum to test ultra-wideband (UWB) applications geared primarily to the needs of first responders. Ultra-wideband technology is a potential source of interference, especially for satellite systems, although commercial mobile communications might also be affected. Responding to these and other concerns, the rules adopted by the FCC represent a compromise position that will be revisited. Potential uses of UWB in law enforcement and fire and rescue operations include imaging technology for in-ground, in-wall, and through-wall detection of people and objects.

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Introduction

Heightened awareness of the integral role of the nation's wireless communications infrastructure in providing homeland security is bringing to the fore technical issues about public safety spectrum that have lain fallow for a number of years. This report focuses on issues concerning technology, the connection between technology standards and spectrum allocation, and the competition for spectrum among many users with diverse needs. A "spectrum reform bill" covering spectrum management and policy is reportedly being prepared for introduction in the Senate. Some believe it will spark a two- to three-year debate in Congress.[1] Public safety spectrum will be integral to the debate on such reform. Proposals for the Department of Homeland Security have focused on some aspects of public safety communications needs. This and other congressional activities are reviewed in the final sections of this report.

This report has two main sections. In the section "Identifying Public Safety Needs," some of the organizations — created by government, industry, or not-for-profit associations — that deal with public safety telecommunications are introduced, and key activities dealing with wireless and spectrum issues are summarized. This section provides an overview of activity and government initiatives that address wireless technology and spectrum use for public safety agencies.

The second main section, "Spectrum for Public Safety," is organized by the major spectrum bands where public safety wireless communications are in use or planned. These are at: 100-512 MHz; 700 MHz; 800 MHz; 900 MHz and 4.9 GHz. Ultra-wide band (UWB), that broadcasts across a broad range of frequencies is also discussed.

Background

Public safety agencies such as firefighters and police officers, and non-government organizations such as private ambulance services, are the nation's first responders in times of emergency. Communications, often wireless, are vital to these agencies' effectiveness and to the safety of their members and the public.

Redundancy and inter-connectivity are two key words in designing plans to protect critical telecommunications infrastructure. The catastrophic events at the World Trade Center and the Pentagon on September 11, 2001, provided many

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[1] Reuters wire service, "Sen. Burns to Offer Wireless Spectrum Bill," April 8, 2002.

lessons in the successes and failures of telecommunications and information technology, particularly in responding to the massive crisis in lower Manhattan.

Despite major disruptions to wireline, wireless and broadcasting infrastructure, communications were sometimes gridlocked, but not paralyzed. Commercial cell phones were mostly useless because of insufficient capacity for the high demand, but telephones continued to function throughout most of the five boroughs of New York City. The Internet, built on packet-switch technology, operated normally and some of the survivors found their way to safety guided by e-mail. The Stock Exchange shut down but the Federal Reserve System and the nation's banking network continued to function. Priority Access Service, an established plan to assure that wireline phone calls among key personnel could move through busy telephone switches, was activated. Telecommunications companies rushed additional equipment to the area and wherever possible switched connections from damaged switching centers to intact ones, even when operated by rival companies. Cell towers were rolled in to replace those lost in the holocaust. These were some of the successes.

At Ground Zero, turmoil predominated as first responders converged on the scene, arriving with incompatible communications equipment. Many perished in the twin towers because of inadequate communications, including the failure of out-dated wireless communications equipment used by firefighters.[2]

In general, the systems that held up the best were those designed with redundancy and back-up in mind, where standardization and inter-modality are the norm. These systems, such as the banking system, relied on — and could often use interchangeably — internet, wireline and fiber optic communication backbones. They benefitted from significant investments in systems integration including seamless connectivity to operating systems and information databases. The systems that tended to fail were those with the least standardization, and sometimes with the least investment in needed technology. First responders' communications plans centered primarily on wireless technology and transmission over assigned bandwidths of spectrum; when the technologies and the radio frequencies didn't mesh, the back-up system was hand-carried notes. In addition to poor capacity for inter-connectivity — or interoperability — among public safety agencies, the wireless communications networks often lacked connectivity to databases and diagnostic systems.

Insufficient interoperability — the technical capacity of different systems to communicate with each other — is one of the defects in America's public safety communications networks. Interoperability is indicative of the problems besetting this network. Common factors interoperability shares with other components of the country's flawed public safety network include:

- Unresolved questions regarding spectrum: amount needed, bandwidth locations and regulations for use.

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[2] "Fatal Confusion: A Troubled Emergency Response . . .", New York Times, July 7, 2002.

- Incomplete standards, rooted in a long history of proprietary manufacturer standards that stocked public safety agencies with incompatible hardware.

- Lagging technology: throughout the country, public safety agencies at the local, state and federal level are using technology that many studies have described as outmoded New communications technologies exist but are barely implemented for a variety of reasons relating to cost, organization and the technical capabilities of various public safety agencies.

- Lack of a coordinating network policy, exemplified by an absence of operational standards or protocols and incomplete efforts for federal/state/local programs for cooperation and coordination.

Spectrum

Radio frequency spectrum provides an invisible roadway for wireless transmissions; each band of measured spectrum is like a highway lane guiding communications to their destination. It is used for all forms of wireless communications, such as cellular telephony, paging, radio and television broadcast, telephone radio relay, aeronautical and maritime radio navigation, and satellite command and control. Users include federal, state, local and tribal governments, private industry, and amateur radio operators. Commercial operators include broadcasters, wireless communications companies, and the manufacturing, transportation and utilities industries. Government users include agencies of the federal government, such as the Department of Defense, and state and local public safety agencies, such as state highway patrols. Spectrum, a valuable resource, limited by technology, is managed by the federal government to maximize efficiency in its use and to prevent interference among spectrum users.

Wireless communications operate on designated frequencies using spectrum managed, in general, by either the Federal Communications Commission (FCC) or the National Telecommunications and Information Administration (NTIA). Among other responsibilities, the FCC supervises spectrum for services that include commercial wireless telephony, radio and television broadcasts, and public safety agency communications. The NTIA — part of the Department of Commerce — administers spectrum used by federal entities, including the Department of Defense (DOD), and serves as the principal adviser to the executive branch on domestic and international telecommunications issues. The NTIA and the FCC work together, and with Congress and the President, to coordinate spectrum policy.

Wireless (radio frequency) spectrum is measured in cycles per second, or hertz (Hz).[3] Spectrum allocations are divided into channels. Placing many channels in a designated spectrum band constitutes narrowband. Broadband has comparatively fewer channels and therefore greater capacity for sending images and other data at high speeds. Contiguous spectrum for broadband is important for advanced wireless telecommunications applications. The term wideband is sometimes used in the

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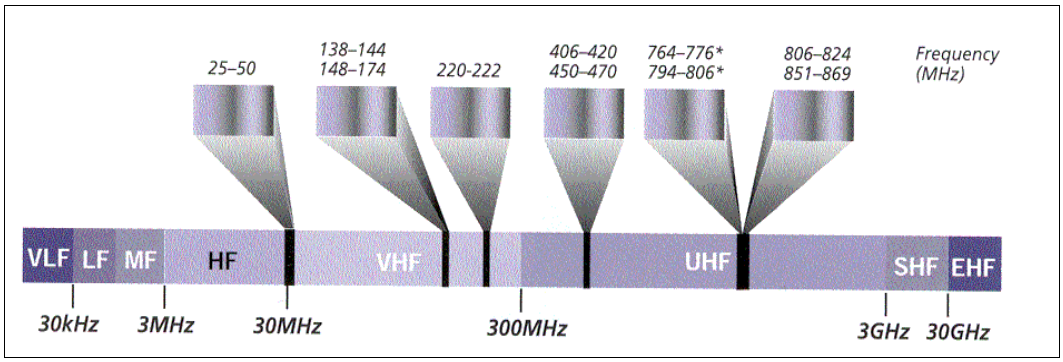
[3] Standard abbreviations for measuring frequencies include: kHz — kilohertz or thousands of hertz; MHz — megahertz, or millions of hertz; and GHz — gigahertz, or billions of hertz.

telecommunications industry to describe limited broadband applications transmitted on narrowband channels. An example is "mobile data" for public safety. This provides voice and data communications and supports interoperability for text messages.

Currently, non-federal public safety agency communications use VHF and UHF[4] frequencies below 512 MHz and UHF frequencies in the 806-824/851-869 MHz ranges.[5] At 4.9 GHz, the FCC has recently designated 50 MHz for public safety. Also, ultra-wideband technology that has been provisionally approved will be used for public safety. The trends in public safety technology and spectrum management are on track to place broadband in higher frequencies and to develop digital narrowband and wideband in the lower frequencies. The lower bands (illustrated below) are the main focus of discussions about spectrum policy and management. (Note that spectrum at 764-776/794-806 MHz, designated in the illustration with an asterisk, is not yet available for use by public safety.)

Figure 1. Public Safety Spectrum Bands



Source: *Public Safety Wireless Communications Systems*, PSWN Program Information Brief

Because public safety networks operate on many different frequencies and because most wireless communications equipment in use was designed to operate on a limited number of frequencies, interoperability is a critical technical issue. Interoperability means that different public safety agency networks can readily contact each other in a mission-critical situation because they have invested in the necessary communications technology and infrastructure. In general the technology to support interoperability exists. For it to be fully implemented, three critical elements must be in place: standardization and coordination; comprehensive spectrum allocation; and funding.

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

[5] Frequency ranges 25-50 MHz; 150-174 MHz; 220-222 MHz (shared with federal agencies); 421-430 (three urban areas); 450-470 MHz; and 470-512 MHz (11 urban areas).

Identifying Public Safety Needs

Responding to the challenges after September 11, 2001, a number of government agencies have launched new initiatives dealing with national defense, infrastructure, first responders and other critical components of security. The FCC has, for example, created a Homeland Security Policy Council[6] to assist its staff and its constituents with information related to telecommunications and public safety, including spectrum and the spectrum needs of public safety organizations. The Federal Emergency Management Administration (FEMA) has been given the responsibility of creating a grants program to channel funds for telecommunications equipment, training and other needs to the nation's first responders. Proposals for the formation of the Department of Homeland Security would further expand the role of FEMA in directing and supporting first responders.

FEMA, the FCC, and other federal agencies directing programs that deal with public safety spectrum can tap a wealth of information resources, expertise and administrative frameworks — the product of two decades of efforts to build consensus, establish national goals and priorities, identify technical issues, and implement programs. This section highlights some of the entities that have contributed and continue to contribute to the furtherance of public safety spectrum programs. Possible reallocation of responsibility under the Department of Homeland Security is also referenced.

Future Programs: Project SAFECOM. Authorized by the Office of Management and Budget (OMB) as one of 24 electronic government (e-government)[7] initiatives, the primary objective of this program is to support interoperability. Responsibility for the Wireless Public SAFEty Interoperable COMmunications Program, dubbed Project SAFECOM, had been assigned by the OMB to the Wireless Directorate of the Department of the Treasury. At the recommendation of the Chief Information Officers of several federal agencies, including the Departments of Treasury, Commerce and Justice, Project SAFECOM would be administered by FEMA and follow that agency to the Department of Homeland Security.[8] The proposed top-level division of responsibility will be: FEMA, issues related to first responders; Justice, federal-to-state interoperability; Treasury, federal-to-federal interoperability, Commerce, interaction with private industry. Other interoperability programs, such as those at the Department of Justice, described below, may be coordinated under SAFECOM.

The long-term objectives of Project SAFECOM are to achieve, nationwide: federal-to-federal interoperability; federal-to-state/local interoperability; and state/local interoperability. In line with the goals proposed for the Department of

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[6] See http://www.fcc.gov/hspc; this home page provides links to other key federal agencies.

[7] "E-government solutions are prominently represented in efforts to improve the management and efficiency of government information technology resources." CRS Report RL31057, "A Primer in E-Government," March 28, 2002.

[8] "FEMA Takes Lead for Broader Public Safety Wireless Program," Communications Daily, June 10, 2002.

Homeland Security, it is intended for emphasis to be placed initially on state and local needs. By year-end 2002, a "gap analysis" is to be performed to assess the status of public safety wireless communications at all levels. This would include spectrum use and needs as well as an inventory of equipment. Public safety spectrum needs would be examined by SAFECOM, working with the FCC and the NTIA. The "gap analysis" is expected to lead to equipment guidelines for state and local governments intended to "govern what they purchase"[9] by providing a common menu of equipment choices. At present, the budget for Project SAFECOM has not been established. Funding may come by redirecting agency money from existing programs to the single objective of SAFECOM, as provided in the Clinger-Cohen Act.[10] SAFECOM's budget is not expected to cover equipment purchases for state and local first-responders.

Public Safety Wireless Advisory Committee. The Public Safety Wireless Advisory Committee (PSWAC) was chartered in 1995, at the request of Congress, to study public safety spectrum and make recommendations for meeting spectrum needs through the year 2010. The following year, PSWAC submitted a report[11] containing recommendations for the improvement of public safety communications over wireless networks. Key among these was the request for 95 MHz of additional spectrum for state and local public safety needs. The report concluded that current federal public safety spectrum bands would meet projected requirements through 2010, providing there were no interim reductions in the amount allocated. In response to this report, Congress directed the FCC to allocate 24 MHz of spectrum to public safety agencies from the 746-806 MHz range as part of the reallocation of channels 60-69, to be cleared in the migration from analog to digital televison broadcasting.[12]

Federal Law Enforcement Wireless Users Group. Several interagency groups were established to address public safety wireless issues following the National Performance Review (NPR) issued by Vice President Gore in 1993. The NPR called for, among other things, the nationwide development of interoperable wireless systems for all types of public safety agencies at the local, state, and federal levels of government. As a result, in 1994, a Memorandum of Understanding between the Departments of Justice and the Treasury formalized what had been an

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[9] FEMA Chief Information Officer/Assistant Director IT, Ronald Miller, as quoted in Communications Daily, *op.cit.*

[10] Under the Clinger-Cohen Act of 1996 (P.L. 104-106, Divisions D and E, as amended by P.L. 104-208), OMB is authorized to manage capital planning and investment for information technology, including coordination of agency programs and pooling budget resources to achieve over-arching goals. Drawing on this authority, "Clinger-Cohen letters" are being sent by OMB to agencies, informing them of planned program cuts. ("OMB Wields Budget Authority," Federal Computer Week, July 1, 2002.) For additional information about the Clinger-Cohen Act, see CRS Report RS21260, "Information Technology (IT) Management: The Clinger-Cohen Act and Homeland Security Proposals" July 15, 2002.

[11] "Final Report of the Public Safety Wireless Advisory Committee," September 11, 1996 [http://ntiacsd.ntia.doc.gov/pubsafe/final.htm].

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

ad hoc working group as the Federal Law Enforcement Wireless Users Group (FLEWUG). Its role is to assist federal agencies in sharing information about wireless communications issues and to "plan, coordinate and implement future shared-use wireless telecommunications systems and resources."[13] Among its goals are the development of common standards for land mobile radio, improving interoperability, and identifying cost-saving processes. More than 30 federal departments and agencies are members of the users group.

Public Safety Wireless Network (PSWN). FLEWUG created the Public Safety Wireless Network (PSWN Program)[14] in 1996 to implement plans to foster interoperability among wireless networks. The PSWN Program explores options available for providing spectrally efficient, interoperable, and cost-effective wireless communications that will meet the requirements of local, state, and federal public safety organizations. SAFECOM is expected to rely heavily on assistance from PSWN in fulfilling its charter at the state and local level.

Shortly after September 11, 2001, PSWN petitioned the FCC to revisit the need for additional spectrum for wireless communications within and between public safety agencies and other first responders.[15] In the report it filed with the FCC, PSWN noted that spectrum from channels 60-69 (the Upper 700 MHz band) designated for public safety use by the FCC had still not been freed for this purpose. It reiterated the need for spectrum to support interoperability and made recommendations for additional allocations for public safety communications that would meet the spectrum needs identified by PSWAC in 1996. Specifically, PSWN identified the need for more spectrum for interoperability below 512 MHz and requested that spectrum in the 4.9 GHz range be used for public safety instead of being auctioned for commercial use. The report evoked the potential for using this spectrum for numerous broadband applications and new technologies that would aid first responders. The 24 MHz in the Upper 700 MHz band is judged by PSWN and others[16] to be insufficient for broadband. Also they believe additional spectrum is needed for localized network support such as Personal Area Network/Vehicular Area Network (PAN/VAN) systems.

PSWN subsequently prepared an analysis of the effectiveness of communications in the Washington, D.C. metropolitan area after the attack on the Pentagon on September 11.[17] The report evaluates the level of interoperability

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[13] See http://www.pswn.gov/about.htm.

[14] The PSWN Program is administered jointly by the Departments of Justice and the Treasury. The Program is scheduled to end in 2010 [http://www.pswn.gov].

[15] "Petition for Rule Making by the Public Safety Network to Promote the Allocations of Spectrum for Public Safety Agencies and Other Matters to Address Communications Needs Through 2010," PSWN, September 14, 2001 [http://www.fcc.gov/e-file/ecfs.html].

[16] See, for example, "4.9 GHz: A Public Safety Spectrum Opportunity," ex parte filing July 31, 2001 regarding FCC WT Docket 00-32, by John Lyons, Motorola Government Relations, Washington, DC [http://www.fcc.gov/e-file/ecfs.html].

[17] "Answering the Call: Communications Lessons Learned from the Pentagon Attack," (continued...)

among the public safety agencies responding to the attack as well as other measures of performance. Some of the recommendations developed as a result of the study cover specific steps that could be implemented by public safety agencies at all levels to enhance communications interoperability.

In 1998, PSWN estimated the total cost to replace existing core infrastructure for public safety telecommunications systems nationwide at $18.3 billion.[18] The costs for upgrading systems with new technologies, additional features, and interoperable capabilities would be higher.

The Federal Communications Commission. The FCC has created several key administrative groups to participate in spectrum management and planning. In 1986, it formed the National Public Safety Planning Advisory Committee to advise it on management of spectrum in the 800 MHZ band, newly designated for public safety. The following year, the FCC adopted a Public Safety National Plan that, among other things, established Regional Planning Committees (RPCs) to develop plans that met specific planning needs. The regional planning approach is also being applied to spectrum in the Upper 700 MHz band.[19] The FCC encourages the formation of RPCs with a broad base of participation. The RPCs have flexibility in determining how best to meet state and local needs, including spectrum use and technology.

Public Safety National Coordinating Committee. Technical and operational standards for the Upper 700 MHz band are being developed and recommended to the FCC by the Public Safety National Coordination Committee (NCC). Established by the FCC in 1999, the NCC is also working on a plan for nationwide interoperability. The NCC will be submitting recommendations to the FCC for broadband technology on these public safety bandwidths in February 2003. Standards for other public safety technologies using 700 MHz have been established and the technical specifications have been agreed upon and sent to manufacturers. Issues of coordination that must still be agreed upon include channel-naming protocols. The FCC has declined to rule on naming protocols, saying the industry should reach consensus according to "best practices," and not by mandate.[20]

The NCC has a Steering Committee of government, the public safety community and the telecommunications equipment manufacturing industry. Government agencies that are co-sponsors of the NCC, with the FCC, are the NTIA, FEMA, and the Departments of Justice and the Treasury. The charter for the NCC is scheduled to expire in early 2003.

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[17] (...continued)
January 2002, [http://www.pswn.gov].

[18] "Land Mobile Replacement Cost Study," June 1998, [http://www.pswn.gov].

[19] See [http://wireless.fcc.gov/publicsafety/700MHz/regional.html].

[20] Kathleen Wallman, Chair of the Public Safety National Coordination Committee (NCC), conversation June 26, 2002

FCC and Homeland. The Homeland Security Policy Council (HSPC), recently formed by the FCC, has announced initiatives "to improve public safety by addressing spectrum issues, including interoperability and redundancy."[21] To this end, the HSPC is providing coordination and oversight of the FCC's actions related to public safety, many of which are discussed in this report. The HSPC is comprised of FCC staff; all divisions are represented.

In January, 2002, HSPC re-chartered the Network Reliability and Interoperability Council. The Council's members are senior representatives from the telecommunications industry who make recommendations to the FCC and the industry that might "assure optimal reliability and interoperability of wireless, wireline, satellite and cable public telecommunications networks."[22] Joseph P. Nacchio, former Chairman and Chief Executive Officer of Qwest Communications was appointed as Council Chairman. Mr. Nacchio currently is also Vice Chairman of the National Security Telecommunications Advisory Committee (NSTAC) that advises President Bush on national security telecommunications matters. The NSTAC works closely with the National Communications System, now part of the Department of Defense, but slated to be incorporated into the Department of Homeland Security.

Spectrum Policy Task Force. A cross-bureau, multi-disciplinary task force was announced June 6, 2002 to assist the FCC in identifying and evaluating changes in spectrum policy. Comprised of senior staff from within the FCC, the Task Force is seeking public comment on spectrum policy. Additionally, workshops will be held during July and August 2002 to facilitate debate on policy topics. In the request for comments, the FCC provided five major categories of policy issues: (1) market-oriented allocation and assignment; (2) interference protection; (3) spectral efficiency; (4) public safety communications; (5) international issues. The Task Force is to provide a report to the FCC in October 2002.[23]

National Telecommunications and Information Administration. To address the need for interoperability spectrum, in June 1999 the NTIA designated certain federally-allocated radio frequencies for use by federal, state, and local law enforcement and incident response entities. The frequencies are from exclusive federal spectrum, and are adjacent to spectrum used by state and local governments. NTIA's "interoperability plan," developed in coordination with the Interdepartmental Radio Advisory Committee (IRAC)[24] and the Federal Law Enforcement Wireless Users Group, was intended to improve communications in response to emergencies and threats to public safety. NTIA described the plan, along with the efforts of the FCC and the PSWN, as one of "the first steps to ensuring that sufficient radio

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[21] See [http://www.fcc.gov/hspc].

[22] Council Charter, see [http://www.nric.org]

[23] See [http://www.fcc.gov/sptf].

[24] IRAC, with representation from 20 major federal agencies, develops policies for federal spectrum use, and represents the United States at International Telecommunications Union conferences. [http://www.ntia.dov.gov/osmhome/irac.htm/].

spectrum is available when and where an emergency or public safety need may arise."

NTIA created a Public Safety Program Office in 1996 to coordinate federal government activities for spectrum and telecommunications relating to public safety. In June 2002, the Public Safety Program and PSWAC co-sponsored an "executive leadership summit" on public safety interoperability.

Office of Spectrum Analysis and Management. The focal point for spectrum management within the Department of Defense is the Office of Spectrum Analysis and Management (OSAM).[25] Among its functions are to provide strategic planning for spectrum management, analyze the impact of sharing spectrum on current and future military operations, coordinate the development and implementation of spectrum management technologies, and ensure the efficient use of spectrum.

Federal Emergency Management Agency. The Office of National Preparedness at FEMA was chartered by President Bush in May 2001 to coordinate federal programs at the Department of Defense, Justice, Health and Human Services, and Energy focused on "weapons of mass destruction consequence management." The Office of National Preparedness is comprised of the affected agencies, plus the Coast Guard, the U.S. Fire Administration and representatives of local first responders, among others. Post 9-11, the Office of Homeland Security asked the new FEMA office to study the response capability at the state level in case of terrorist attack. Prior to the proposal for the creation of a Department of Homeland Security, the Office of National Preparedness had begun to structure a program to assist first responders, centered on key steps such as training, joint exercises, national assessment, and grants for training and equipment. One of the Office's objectives is to establish operational standards and protocols that would define procedures to be taken by first responders.[26]

Emergency Alert System and Reverse 911. FEMA provides direction for state and local emergency planning officials in planning and implementing emergency alerts using the Emergency Alert System (EAS). EAS went live in 1997 as the digitized replacement of the Emergency Broadcast System. It broadcasts warnings over radio, television and, increasingly, cable channels. EAS was designed by the FCC and is jointly managed by the FCC and FEMA. The National Weather Service is linked to EAS through the Weather Radio digital signaling of the National Oceanic and Atmospheric Administration (NOAA). Historically, the bulk of emergency alerts broadcast over the EAS system have been weather-related natural disasters. Originally conceived during the Truman administration, what is now known as EAS was to be used to alert the populace in case of a treat to the nation, such as a nuclear attack. In 1963, the emergency alert system was extended to state and local communities. Broadcast stations are required to disseminate emergency messages from the president; cooperation at the state and local level is optional. EBS/EAS has never been used by a president.

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[25] See [http://www.disa.mil/ops/spectrum/].

[26] "FEMA Seeks National Rules for Emergency Response," Federal Times, March 11, 2002.

EAS was not activated at either the national or local level on September 11 and this episode in the history of EAS has brought the validity of the system into question by many. In particular, the question has been raised as to whether a broadcast system is the best way to alert people in time-critical emergencies. Among the proposals addressing this concern is one for the development of warning systems that use existing technology for 911 calls to provide telephone subscribers with a telephone warning of an emergency system — "reverse 911."[27] This technology could be extended to cell phone subscribers and users of various messaging devices based on Internet or other communications protocols, such as BlackBerries.

Other Organizations. Many other associations and government agencies work actively to solve critical issues concerning public safety spectrum. The Association of Public-Safety Communications Officials, International (APCO),[28] for example, has taken a leadership role in dealing with problems of network interference. APCO is a charter member of the National Public Safety Telecommunications Council (NPSTC),[29] a federation of associations. The Council was created in 1997 to follow up on recommendations made by the Public Safety Wireless Advisory Committee. In addition, the group acts as a resource and advocate for public safety telecommunications issues. Other charter members include FEMA, International Association of Emergency Managers, National Association of State Telecommunications Directors, National Association of State Emergency Medical Services Directors, American Association of State Highway Transportation Officials, and the International Association of Fire Chiefs.

At the Department of Justice, the National Institute of Justice (NIJ), created the AGILE Program in 1998 to combine all interoperability projects then underway at NIJ.[30] The program addresses interim and long-term interoperability solutions through standardization encompassing wireless telecommunications and information technology applications. The AGILE Program also has provided funding to the Regional Planning Committees for start-up costs and the preparation and distribution of regional plans. The focus of AGILE is on interoperability within criminal justice agencies and between public safety agencies. Prior to the introduction of the plan to create a Department of Homeland Security, it had been proposed that this and related programs at Justice be integrated with project SAFECOM. The National Institute of Justice manages the Justice Technology Information Network as part of the Office of Science and Technology. This department at Justice is not among those currently proposed for transfer to the Department of Homeland Security.

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[27] For example, the New Hampshire State Legislature has created a committee to study the feasibility of reverse 911 and report its findings by November 1, 2002. (2002 New Hampshire Laws CH 43 (S.B. 361.)

[28] See [http://www.apcointl.org].

[29] See [http://npstc.du.edu].

[30] AGILE stands for Advanced Generation of Interoperability for Law Enforcement. See http://www.nlectc.org/agile/.

Spectrum for Public Safety

Congestion, interoperability, interference, access, and sufficient spectrum to support broadband technologies communications are the major concerns most often mentioned in discussions of public safety wireless communications. The following review of public safety spectrum discusses different bands in reference to what appears to be the dominant topic of debate regarding that frequency.

Congestion: 100-512 MHz Range. The need for spectrum for interoperability is particularly acute in the lower spectrum ranges, where the majority of agencies operate. FCC licensing records show that the frequencies between 150-174 MHz are the most intensively used. Surveys by PSWN and others indicate that approximately 73% of all law enforcement entities and 65% to 70% of firefighters and EMS agencies operate land-mobile radio systems in the 100-300 MHz bands, the VHF high-band.[31] Out-dated analog equipment adds to this congestion; the cost of acquiring more spectrum-efficient narrowband technology has delayed plans for conversion.

To facilitate interoperability and ease congestion in public safety channels below 512MHz, Congress as part of appropriations for 2001, reclaimed for federal use 3 MHz of spectrum that had previously been designated for mixed use in the 138-144 MHz band.[32] The Act also requested studies on spectrum use and reallocation from the DOD, the NTIA and the FCC. The DOD was required to study the 138-144 MHz band — occupied by the DOD — for possible sharing with public safety. The NTIA and the FCC were required to jointly submit a report to Congress on alternative frequencies available for public safety.

The NTIA responded by identifying bands used by public safety and by the federal government between 100 MHz and 1000 MHz.[33] It defined alternative frequencies as spectrum comparable to 138-144 MHz and concluded that the 162-174 MHz and 406.1-174 MHz bands met the criteria for comparable spectrum. After a detailed examination of the federal uses of these bands, the NTIA concluded that new sharing with non-federal public safety agencies was not feasible. It noted the federal government has a policy in effect that designates 40 channels for nationwide interoperability between federal, state and local public safety entities within the bands the NTIA studied. These channels encompass 0.5 MHz of spectrum. The NTIA report further noted that first PSWAC and then PSWN had recommended a minimum of 2.5 MHz be set aside for interoperability.

In identifying non-federal government spectrum as alternatives to the 138-144 MHz band, the FCC focused primarily on VHF frequencies administered under its authority because it deemed VHF to be "most comparable" to the 138-144 MHz

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[31] FCC, "Alternative Frequencies for Use by Public Safety Systems," 2002, [http://www.fcc.gov/hspc/].

[32] Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001, P.L. 106-398.

[33] NTIA, "Alternative Frequencies for Use by Public Safety Systems," December 2001, [http://www.ntia.doc.gov].

band. Noting that some channels in the VHF high-band have been designated for interoperability, the FCC focused on identifying frequencies that would be close to those already in use in order to support broadband radio. Broadband technology is more efficient when contiguous or nearly contiguous channels are used. After reviewing current uses in comparable frequencies, the FCC concluded that reallocation would excessively disrupt incumbent users.

Neither the NTIA nor the FCC recommended spectrum in the studied ranges that could be reallocated for exclusive public safety use. The DOD, in a classified document, reportedly concluded that sharing could be possible in the 138-144 MHz band if evaluated on a case-by-case basis.[34]

Interoperability: Upper 700 MHz Band. For administrative purposes, the FCC refers to the 700 MHz Band as the "Lower 700" (channels 52-59) and the "Upper 700" (channels 60-69). Public safety uses are allocated for the Upper 700 MHz band. Due mainly to the combination of different technology standards operating on different radio frequencies, communications between — and even within — local, state and federal agencies are not always assured. Achieving interoperability is an important goal of the public safety community. In the last decade, significant advances in technology and in funding to purchase communications equipment have eased, but not eliminated, problems of incompatible systems, inadequate technology, insufficient funding, and limited spectrum. President Bush's Fiscal Year 2003 budget proposal for homeland security includes $1.4 billion to improve interoperability.[35] Approximately half of that is to be distributed to local first responders through FEMA to buy equipment; the balance is to bolster funding for existing programs administered by the National Institute of Justice. The Department of Defense reportedly has provided $3.8 million in funding for fiscal year 2002 to develop new technology to support communications among the military and police, fire and other emergency agencies.[36]

Analog TV: Channels 60-69. Congress passed legislation[37] in 1997 with the intention of assuring an orderly and equitable transition from analog to digital television broadcasting. As mandated by Congress, analog television broadcasts on all channels, including 60-69, were to be phased out and the cleared spectrum reallocated for wireless communications. 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

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[34] BNA, Inc. Daily Report for Executives, February 11, 2002, "DOD Agrees to Share Spectrum . . ." [http://ippubs.bna.com].

[35] "Securing the Homeland Strengthening the Nation," President George W. Bush [http://www.whitehouse.gov/homeland/]

[36] AP Online, "Pentagon Plans New Technologies," March 5, 2002.

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

interoperability. Channels 60-62[38] and 65-67[39] were identified for auction for commercial wireless use.

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 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) if at least 15% of the televison 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.

Standards for narrowband applications in the Upper 700 MHz were recommended by the NCC to the FCC and adopted in early 2001. The NCC is working on developing standards for wideband, particularly interoperable wideband. Standardization is essential for interoperability. Manufacturers that specialize in public safety telecommunications are testing new wideband applications but they will not produce equipment to operate at 700 MHz in quantity until the standards have been finalized through the FCC and the market for the equipment has been scoped. The size of the potential market is prescribed by the availability of spectrum. In some localities, the needed Upper 700 MHz spectrum is already unencumbered.

For the most part, however, the band has not been cleared and is still occupied by television broadcasting. Recognizing that this spectrum is encumbered, Tom Sugrue, Chief of the FCC's Wireless Telecommunications Bureau has said, "many in the public safety community, and in the broadcast community, and in the commercial wireless industry, believe that if the statute remains in its present form, there will be very few stations that actually vacate the 700 MHz band by 2006."[40]

Voluntary Clearing and Auctions. 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 mandated auction was originally scheduled for May 2000, but has been postponed repeatedly. The FCC has 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.[41]

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[38] 746-764 MHz.

[39] 776-794 MHz.

[40] Opening remarks by Tom Sugrue, Chief, Wireless Telecommunications Bureau, FCC, at a General Membership Meeting of the FCC's Public Safety National Coordination Committee, Brooklyn, New York, November 15, 2001.

[41] Voluntary clearing of channels in advance of the 2006 "deadline" has 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

(continued...)

Any initiative that expedites band clearing for auctioned spectrum may concurrently free up encumbered spectrum for public safety agencies. In some situations, stringent FCC rules regarding interference will require the vacating of adjacent public safety spectrum. An example of band clearing, cited by the FCC, would be for a wireless telecommunications company acquiring spectrum (for commercial use) in channel 67 in a major metropolitan area. An analog television station transmitting on channel 68 (designated for public safety) in the same area would also have to be cleared to meet FCC rules regarding interference. For the same reason, the FCC decided to include channel 59 in its band clearing and reallocation efforts for the Upper 700 MHz band because this channel must also be cleared to avoid interference from transmissions in channel 60.

A coalition of broadcasters, known as the Spectrum Clearing Alliance, developed a plan whereby the broadcasters would vacate both commercial and public safety spectrum on an expedited schedule.[42] The proposal by the Spectrum Clearing Alliance is for the commercial bands of the Upper 700 MHz spectrum to be auctioned to the wireless telecommunications companies; these companies will then negotiate with the current (broadcaster) occupants for a speedy vacating of the newly-licensed bands. This scenario is based on the assumption that the value of the spectrum to the wireless companies will be such that they will be motivated to pay the broadcasters to surrender the spectrum in a timely manner. The Spectrum Clearing Alliance also wanted to be able to relocate from the Upper 700 MHz band to the Lower 700 MHz band, if needed.

Members of the Spectrum Clearing Alliance opposed the FCC's proposal to link the auctions of the Upper and Lower 700 MHz bands, as this would jeopardize the relocation scenarios envisioned by the group.[43] On March 19-20, 2002, the FCC issued separate auction notices setting the date of June 19, 2002 for both bands in the 700 MHz range.

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[41] (...continued)
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. In an "Order on Reconsideration" (September 17, 2001) the FCC reaffirmed the *Third Report and Order* and added new incentives to encourage agreements for incumbent broadcasters to vacate the affected spectrum. Note that these reports and orders address only the channels intended for auction to commercial wireless users. (Service Rules for the 746-764 and 776-794 MHz Bands, WT Docket No. 99-168).

[42] A broad outline of the band-vacating plan that would be provided by the Spectrum Clearing Alliance was submitted to the FCC on March 16, 2001. "The Spectrum Clearing Alliance Petition for Clarification and Recommendation," WT-Docket No. 99-168; CS Docket No.98-120; MM Docket No. 00-39.

[43] See, for example, "Reply Comments of Members and Supporters of the Spectrum Clearing Alliance," WT Docket No. 99-168, DA 02-260.

The Cellular Telecommunications and Internet Association (CTIA) challenged the 700 MHz auction dates and asked for an indefinite postponement.[44] In a letter to Chairman Powell dated April 3, 2002, the CTIA cited passages of the Communications Act of 1934 that require "sufficient time to develop business plans, assess market conditions" and so forth and argues that the uncertainty surrounding the auctions does not make "rational business decisions" possible. If the Upper 700 auction is postponed, some believe the Spectrum Clearing Alliance might be dissolved and the voluntary band-clearing plan abandoned.[45]

The Wireless Telecommunication Bureau division of the FCC responded within days that the auctions would go forward as planned. In late April and early May, bills were introduced in the House and Senate respectively[46] to postpone both auctions. On June 19, 2002, President Bush signed into law the "Auction Reform Act of 2002" which delays auctions for all of the Upper 700 MHz band and most of the Lower 700 MHz band. (Additional information appears in the section on Congressional Activity.)

In the meantime, Chairman Powell announced a "Proposal for Voluntary Industry Action" that would expedite the transition to digital TV.[47] The proposal has twin goals of increasing the level of digital content available and of providing cable subscribers access to that content. In addition to setting voluntary goals for a shift to digital content and increased access for consumers by January 2003, the proposal also calls for equipment manufacturers and retailers to commit voluntarily to a schedule to roll-out DTV-ready broadcast television receivers.[48] DTV penetration of American households remains low, between 2% and 3%, as estimated by the Consumer Electronics Association.

An Alternate Proposal. The CTIA has circulated a concept paper[49] proposing that various federal law enforcement agencies relocate to the Upper 700 MHz band from other spectrum bands (that, consequently, would be freed for commercial wireless). The CTIA asserts that federal and state public agencies could benefit from a harmonized block of spectrum and that the Upper 700 MHz band could be used to support the advanced services, such as mobile data, that the National Coordinating Committee plans to implement as spectrum becomes available in the channels already assigned to public safety.

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[44] Letter from Thomas E. Wheeler, President, CTIA, to Chairman Powell, April 3, 2002, [http://www.wow-com.com/new/press/].

[45] [http://dc.internet.com], "CTIA to Seek Spectrum Auction Delay," April 3, 2002.

[46] H.R. 4560 and S. 2454

[47] Letter from FCC Chairman Michael Powell to Members of Congress, April 4, 2002, [http://www.fcc.gov].

[48] Sets 36" and above - 50% of units to have DTV tuners by January 2004; 100% by January, 2005. Sets 25"-35" - 50% of units to have DTV tuners by January 2005; 100% by January, 2006. Sets 13"-24" - 100% of units to have DTV tuners by December 31, 2006.

[49] "Homeland Emergency Response Operational Enhancement Systems (HEROES) Network," November 8, 2001, White Paper provided to CRS by the CTIA (202-785-0081).

The CTIA concept paper envisions that federal and state public safety agencies would benefit from shared systems that allow for the pooling of spectrum resources, increased efficiency in spectrum use, and accelerated deployment of new technologies. The paper also argues for the elimination of "antiquated" analog systems that are perceived as a barrier to implementing technology that is interoperable. It suggests that spectrum currently used for analog frequencies would become available for auction if public safety systems were fully converted to digital technologies. Funds from this auction, according to the paper, would pay for the costs of relocating federal agencies to a common platform in the Upper 700 MHz band.

In arguing for a "seamless, digital communications system founded on interoperability, mobility, security and multi-user connectivity" the CTIA's concept paper proposes that such a network be created in the Upper 700 MHZ band by the White House Homeland Security Office. Homeland Security would coordinate the existing efforts of federal, state and local agencies, the NTIA, the FCC, and other organizations, such as PSWN.

Interference and Access: 800 MHz. Public safety currently uses 9.5 MHz of spectrum in the 800 MHz range at 806-821MHz and 851-869 Mhz. At the behest of the National Public Safety Planning Advisory Committee (NPSPAC), frequencies at 821-824 MHz and 866-869 MHz, referred to as the "NPSPAC channels," are reserved for special public safety uses, such as interoperability. These frequencies are in 115 MHz of spectrum reallocated by the FCC in 1970 for land mobile use in the 806-947 MHz band.

The allocation of this spectrum interleaves public safety and private commercial communications using narrow slices of spectrum. This close proximity of public and commercial utilization is widely believed to be the primary cause of interference for communications by public safety and other entities using 800 MHz channels. Across the United States, there have been numerous reports of police or fire units that have lost contact with their base commands when a wireless connection was broken.[50] The problem has become sufficiently troublesome that APCO has established a committee that operates nationwide to identify cases of interference (Project 39).

Nextel's Proposal. Although many wireless carriers have been involved in resolving problems of interference, a large number of the identified cases of interference were linked to operations of Nextel Communications, Inc. To address the problem, Nextel prepared a White Paper[51] regarding use of the 800 MHz band and submitted it to the FCC.

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[50] The FCC states that the interference is "well documented." *Notice of Proposed Rulemaking*, released March 15, 2002, WT Docket No 02-55, (FCC Rcd 02-81).

[51] "Promoting Public Safety Communications: Realigning the 800 MHz Land Mobile Radio Band to Rectify Commercial Public Radio - Public Safety Interference and Allocate Additional Spectrum to Meet Critical Public Safety Needs." Available at [http://www.fcc.gov/e-file/ecfs.html] under Nextel, docket numbers 00-258, 95-18, 99-81 or 99-87, dated November 21, 2001.

In the letter to the FCC that accompanied the White Paper,[52] Nextel specifically attributes interference problems to earlier actions by the FCC "authorizing public safety communications providers and [commercial] licensees to operate essentially incompatible systems on mixed, interleaved and adjacent 800 MHz channels . . . Intermodulation is the dominant cause of interference, with wideband noise and receiver overload playing a secondary role." In the White Paper, Nextel presented a plan for spectrum realignment that would place public safety and commercial mobile radio services (CMRS) in separate blocks of contiguous spectrum. Nextel argues that the root cause of interference is the manner in which the spectrum has been allocated and that changing the allocation will eliminate the problem.

The plan proposed that Nextel swap 16 MHz of spectrum it currently holds in the 700, 800, and 900 MHz bands in order to allow migration of current users from key parts of the 800 MHz band.[53] Public safety would be moved to spectrum in the 800 MHz range that is contiguous to channels 68-69, [54] gaining an additional 8 MHz of spectrum in the process. Nextel would occupy 6 MHz in the 800 MHz band currently used for public safety[55] that is adjacent to a 10 MHz block that Nextel already holds. This realignment would create 16 MHz for digital Specialized Mobile Radio licensed to Nextel.[56]

Under the Nextel plan, commercial licensees currently using the 800 MHz bands earmarked for public safety could continue operating on those frequencies with a secondary status, meaning they would have to stop broadcasting in times of high demand by public safety, or they could move to other frequencies. Spectrum in the 700 and 900 MHz [57] ranges presently licensed by Nextel would be reassigned to displaced licensees for Specialized Mobile Radio services and for Business and Industrial/Land Transportation radio (B/ILT). As compensation for the surrendered bandwidth in the 700 and 900 MHz ranges, Nextel would get 10 MHz of spectrum in the 2 GHz Mobile Satellite Service (MSS) band.

To implement this plan, Nextel has offered to contribute up to $500 million to help fund the costs of relocating public safety systems currently operating within the 800 MHz band. Nextel further proposes that the cellular operators and other license-holders that will be displaced should also "contribute substantially to the costs of

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[52] From Robert S. Foosaner, Senior Vice President and Chief Regulatory Officer, Nextel Communications, Inc., to Mr. Thomas Sugrue, Chief, Wireless Telecommunications Bureau, November 21, 2001.

[53] The bandwidths that would be realigned in the Nextel proposal are 806-824 MHz and 851-869 MHz, a total of 36 MHz.

[54] The proposed public safety bandwidths would be for paired spectrum at 806-816MHz and 851-861 MHz; channels 68-69 are at 794-806 MHz.

[55] 821-824 MHz and 866-869 MHz.

[56] 816-824 MHz and 861-869 MHz.

[57] 762-764 Mhz and 792-794 MHz; 896-901 MHz and 935-940.

relocating public safety licenses,"[58] since, Nextel asserts, they also will benefit from the proposed realignment.

Among the benefits for public safety that are cited by Nextel in its paper is that the realigned blocks of spectrum will provide enough contiguous spectrum to support low-speed data, high-speed data, and video, as recommended by the PSWN. Nextel's proposal received support from at least seven public safety agencies,[59] representatives of which wrote to the FCC (November 21, 2001) endorsing the proposal if it could be implemented at no cost to public safety agencies.

Business Users and SMR Operators. In order to achieve the realignment, Nextel has suggested that current occupants in the lower 800 MHz bandwidth for Specialized Mobile Radio and for Business and Industrial/Land Transportation may have to relocate. Among private wireless users that would be affected by such a move are businesses that use these frequencies for internal communications, such as to monitor off-site activities, or for applications such as automatic reading of utility meters. Users include manufacturers, railroads, pipelines and utilities. Also impacted would be network operators such as Motient Corporation and Southern LINC[60] that provide wireless voice and data communications networks to businesses; Motient is also one of two networks used by BlackBerry [61] for its message service. Motient and Southern LINC are among the companies opposing Nextel's plan.

Proposal from the National Association of Manufacturers. The National Association of Manufacturers (NAM)[62], along with MFARC[63], submitted an alternative relocation plan.[64] This plan provides for the consolidation of spectrum into wider bands, removing the problem of interleaving. It would also juxtapose B/ILT bandwidth with public safety bandwidth, segregating SMR uses such as Nextel's to reduce interference further.

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[58] Nextel letter to FCC, *op. cit.*

[59] Association of Public-Safety Communications Officials (APCO) International; International Association of Fire Chiefs; International Association of Chiefs of Police; Major Cities Chiefs Associations; National Sheriffs' Association; Major County Sheriffs' Association; National Public Safety Telecommunications Council.

[60] Southern Telecommunications Services, a division of Southern Company.

[61] A wireless handheld device manufactured by Research in Motion.

[62] The National Association of Manufacturers represents 14,000 members, including 10,000 small and mid-sized companies and 350 member associations serving manufacturers and employees in every industrial sector and all 50 states.

[63] MFARC is one of the FCC's certified frequency coordinators for private land mobile bands from 150MHz to 900 MHz. Now an independent entity, MFARC was originally the frequency coordinating arm for NAM.

[64] Letter from Jerry J. Jasinowski, President, NAM to Michael Powell, Chairman, FCC, December 21, 2001.

The NAM-MFARC proposal states that retuning within the 800 MHz band is possible and should be undertaken as the solution to end interference. Public safety users would move to 10 MHz of spectrum partly adjacent to channels 68-69.[65] This would provide public safety with the benefit of a contiguous bandwidth from 794 MHz to 811 MHz, facilitating the development of new technologies, and would slightly increase the total amount of spectrum for public safety use, although not by as much as with the Nextel proposal.

The Specialized Mobile Radio and Business and Industrial/Land Transportation license holders in the affected 800 MHz range would retune to other bands in the same range but would not have to choose between secondary status and relocation to 700MHz or 900 MHz frequencies, as Nextel proposes in its plan. In its letter, NAM states that "the cost to larger manufacturers of relocating . . . would be in the tens of millions of dollars." Sharing spectrum on a secondary basis "would cause major disruption and dislocation to thousands of manufacturing operations." The B/ILT applications in the 800 MHz range support operations for "productivity and worker safety." In some localities, the systems "form the backbone of mutual aid agreements with nearby police, fire and emergency medical services."

MRFAC also joined with the American Association of Railroads, American Petroleum Institute, Forest Industries Telecommunications, Industrial Communications and Aeronautical Radio, Inc (ARINC), among others, to protest Nextel's proposal in a letter to Michael Powell, Chairman of the FCC.[66] The letter repeated the concerns raised by NAM regarding the high cost and the disruptive impact on American industry that would result if the Nextel plan were implemented.

Coalition for Constructive Public Safety Solutions. A detailed proposal from an industry coalition offered a different approach, and guidelines for needed legislation. Building industry consensus, Southern LINC, Alltell Corporation, and FIRST Cellular joined Cingular Wireless, AT&T Wireless and Nokia, a major supplier of mobile phones and networks. The keystone of the plan is to use all of the Upper 700 MHz spectrum (channels 60-69) for public safety. Some of this would be allocated specifically for homeland security, priority access for wireless communications in an emergency, and critical infrastructure. Frequencies used by public safety agencies in the 800 MHz range would be vacated, with current users moving to 700 MHz frequencies. The vacated spectrum would be auctioned for commercial use, with the proceeds used to help pay for the relocation of public safety agencies from the 800 MHz band. Under this plan, Nextel would swap a total of 16 MHz in the 700, 800 and 900 MHz bands. Nextel would also receive an additional 16 MHz without going through the auction process; in return, the wireless carrier would contribute to the relocation costs incurred by the public safety agencies.

The proposal further recommended that broadcasters currently occupying channels 60-69 be required to vacate this spectrum not later than December 31, 2006. The proposal notes that this provision would require Congress to respond with enabling legislation. Reportedly, Congress also would need to designate the Upper

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[65] 806-811MHz and 851-861 MHz.

[66] Letter of December 20, 2001 referred to as the "ARINC Letter."

700 MHz band for public safety, provide for the reallocation of the 800 MHz bandwidth vacated by public safety and provide that the auction revenues generated under the plan be made available for relocation costs. The coalition was among those organizations petitioning for delay of the planned auction of Upper 700 MHz spectrum.[67]

The FCC Response. In its *Notice of Proposed Rulemaking*[68] — which appeared several months after the Nextel and NAM proposals and other letters were received, but before the Coalition proposal — the FCC responded by reiterating and amplifying the problems of interference broached in Nextel's letter and White Paper. It noted that both the NAM and Nextel proposals would require vacating five "NPSPAC channels" used for interoperablity at 866-869 MHz and that 1,320 public safety and NPSPAC licensed stations would have to be relocated. The Nextel proposal would also require 2,100 B/ILT and 1,100 SMR licensees to relocate; the NAM proposal would require some, but "significantly fewer," licensees to relocate.

In the notice, the FCC concludes "tentatively . . . that increasing levels of harmful interference to public safety communications on the 800 MHz band must be remedied." It invites comment on how to restructure the band "resolving interference with minimum disruption to existing services." The FCC further notes that a restructuring might increase the amount of spectrum available for public safety and asks for comments that supply "quantitative information on public safety agencies' needs for additional spectrum." It refers to the PSWAC 1996 report that included an assessment of spectrum needs for public safety but concludes that this information needs to be updated.

After an analysis of the proposals submitted by Nextel and NAM , the FCC gives an example of an alternative restructuring plan that might be used. The FCC suggests that the problems of interference caused by interleaving could be eliminated by removing public safety communications from those bands. Seventy public safety channels would be placed in contiguous spectrum from 809.75-811.50 MHz. One hundred B/ILT channels would be relocated to 811.5-814.0 MHZ and 80 SMR channels would be moved to a 814-816 MHz block. It seeks comment on whether, if Public Safety, B/ILT, or SMR stations are relocated to new frequencies, there might be an opportunity to use spectrum more efficiently, for example by acquiring narrowband digital equipment to replace broadband.

Improving spectrum efficiency is one possible benefit of relocation within or from the 800 MHz range. The FCC also views relocation as an opportunity to provide additional channels for interoperability. In a discussion of relocation costs, the FCC reviewed several different approaches that have been used in previous instances and asks for comments on the matter. Notably, the question is posed as to whether — assuming some spectrum is recovered as a result of the relocation — the funds from auctioning recovered spectrum might be applied to the costs of relocation; alternatively, the FCC could require that winning bidders assume the costs of

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[67] Communications Daily, page 7, April 29, 2002.

[68] *op. cit.* (FCC Rcd 02-81).

relocating public safety stations as a prerequisite for receiving the license.

Critical Infrastructure Industries. By suggesting that Business and Industrial/Land Transportation licensees be moved from the 800 MHz range to the 900 MHz range, the Nextel proposal also brought new attention to bear on another proposal before the FCC: a request to merge separate Business and Industrial/Land Transportation allocations into a single pool accessible to both services.[69] A related issue is the possible designation of a portion of the 900 MHz band for use by Critical Infrastructure Industries (CII). Critical infrastructure has been defined as "electric, gas and water utilities, petroleum and natural gas pipelines and railroads."[70] The FCC has asked for comment on these two matters in the same notice and with the same time frame as its request for input regarding 800 MHz spectrum use.

The FCC had previously resisted a request to designate spectrum specifically for critical infrastructure.[71] The FCC responded that this would not be efficient use of spectrum.[72] Key issues surrounding the use of spectrum by CII have been recently addressed by the NTIA[73] and also studied by the FCC as required by Congress.[74]

Multiple Address Systems at 900 MHz. Multiple Address Systems (MAS) is a radio communication service located in the 900 MHz band. The FCC has designated 20 channels in the 932-941 MHz band exclusively for the use of public safety and federal government agencies as well as some private internal uses, licensed on a site-by-site basis. Also, bands at 928/952/956 MHz are designated for sharing between private and public users.[75] Present proposals regarding reallocation in the 800 MHz and 900 MHz bands, summarized above, do not discuss relocating any MAS channels.

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[69] "Petition for Rulemaking of the Personal Communications Industry Association," ("PCIA Petition"), filed November 14, 2001. The FCC created "pool categories" for B/ILT and SMR licenses in the 800MHz and 900 MHz ranges. "Intercategory sharing" was permitted in the 800MHz range — but was discontinued — and is still permitted in the 900 MHz range. A licensee unable to find a needed frequency in its designated category, or pool, can apply to the FCC for a frequency in another pool. The PCIA Petition requests that Business and Industrial/Light Transportation be placed in a single pool to create contiguous spectrum and to eliminate the costly and time-consuming waiver request process.

[70] "UTC Proposal," see preceding footnote.

[71] On August 14, 1998, the American Petroleum Institute, the American Association of Railroads and the Telecommunications Council (now known as the United Telecom Council) filed a Petition for Rulemaking (RM-9405) asking for such a set aside; this is known as the "UTC Proposal."

[72] *Report and Order and Further Notice of Proposed Rulemaking,* 15 FCC Rcd 22709.

[73] Department of Commerce, National Telecommunications and Information Administration, *Current and Future Spectrum Use by the Energy, Water and Railroad Industries*, January 2002.

[74] "Department of Commerce, Justice, and State, the Judiciary, and Related Agencies Appropriations Act, 2001," P.L. 106-553, Title II.

[75] *Memorandum Opinion and Order*, Released May 29, 2001, WT Docket No. 97-81.

Full Broadband Capabilities: 4.9 GHz. In response to pressure from public safety organizations and other concerned parties, the FCC has designated 50 MHz of spectrum at 4.9 GHz[76] for fully-interoperable broadband applications for public safety, including short-range broadband Wireless Local Networks (WLANs). Many mission-critical applications are envisioned. PAN/VAN systems can provide customized, hands-free link between a portable, wireless base station and devices that might be integrated into helmets or suits, such as headsets, portable computers, video cameras, thermal imagers, sensors and 3D locators. WLAN on-scene/incident command networks can carry real-time multimedia wireless communications. Wireless fixed "hot spot" locations can support highspeed transfers of data, image and video files.

In the report[77] announcing its decision to allocate spectrum at 4.9 MHz to public safety instead of auctioning it for commercial use, the FCC explored pertinent issues and requested comments on various policy and technical decisions. Policy issues identified by the FCC include: eligibility for using the spectrum, allowing some access to commercial wireless service providers, steps to promote spectral efficiency, and international harmonization.

As its minimum criterion, the FCC plans to define eligible public safety users of the 4.9 MHz band in line with the Balanced Budget Act of 1997.[78] It also is seeking comment as to whether to expand the list of those eligible to access the band to include providers of "public safety radio services." These are defined as "services, including private internal radio services, used by state and local governments and non-government entities, and including emergency road services provided by not-for-profit organizations that are (i) used to protect the safety of life, health, or property; and (ii) are not made commercially available to the public."[79] Users of these services are exempt from the FCC's auction authority; included in this group are utilities, railroads, metropolitan transit systems, pipelines and private ambulance services.

Although the FCC does not license federal use of spectrum, it has provided for interoperability among local state, and federal users for the spectrum licensed for public safety. It has proposed to continue this policy in managing the 4.9 GHz band. The FCC is also considering allowing commercial licensees to use the band in support of public safety. It has stated that this could further its goal of promoting spectral efficiency by identifying "innovative and non-traditional means" for using

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[76] 4940 MHz-4990 MHz; fixed and mobile (excluding aeronautical mobile).

[77] *Second Report and Order and Notice of Proposed Rulemaking*, Released February 27, 2002, WT Docket No. 00-32 (FCC Rcd 02-47).

[78] 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." See 47 USC § 337 (f)(1).

[79] See 47 USC § 309 (j)(2)

the band. It is also seeking comment as to whether commercial users might be given access to the band on a secondary basis. This could accommodate commercial uses such as high-speed wireless Internet services.

The possibility of using the 4.9 GHz band for international harmonization has also been taken into consideration by the FCC. Among the benefits of harmonization are interoperability and economies of scale and scope in the design and manufacture of equipment. Global harmonization of spectrum for public protection and disaster relief is on the agenda for consideration at the 2003 World Radio Conference.[80]

Future Technologies: Ultra-wide Band. On February 14, 2002, the FCC promulgated rules that permit limited deployment of ultra-wideband (UWB) wireless technologies for public safety and some other uses in higher spectrum frequencies.[81] UWB sends ultra low power pulses over a broad range of the spectrum whereas traditional wireless technology operates on a specific frequency. The comparatively new and untested nature of the technology has raised concerns about interference with other wireless transmissions. Initially, certain types of products using UWB will be allowed to operate at frequencies primarily in the 3.1 GHz to10.6 GHz range. The limited applications are based on standards developed by the NTIA with the objective of protecting various government operations from interference; the FCC will review these standards in the next six to 12 months and possibly explore more flexible requirements that will permit wider usage of UWB.[82]

Federal concerns about interference from UWB have centered on satellite systems, notably the Global Positioning System (GPS), and aviation safety for air navigation. The commercial wireless industry has also expressed concern about interference, both with wireless calls and with GPS-assisted technology being implemented for wireless enhanced 911 (E911).[83] The Association of Public-Safety Communications Officials (APCO) wrote the FCC to express concern over UWB.[84] Possible interference in bands below 6 GHZ present an "unacceptable risk" to public safety operations, the letter reads. "Within buildings, low-power public safety radios (all of which operate below 1 GHz) may be susceptible to signal degradation caused by increased noise levels produced by UWB devices." Additional interference to communications in the 800 MHz band was a particular concern. The

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[80] International agreements that coordinate and enable global telecommunications are negotiated under the aegis of the International Telecommunication Union (ITU), a specialized agency of the United Nations. Negotiations on spectrum allocation and terrestrial and wireless uses of radio frequencies are conducted primarily at the ITU's World Radio Conferences.

[81] *op. cit.* (FCC Rcd 02-48)

[82] FCC press release February 12, 2002, [http://www.fcc.gov].

[83] Wireless carriers and public safety answering points (PSAPs) are installing new technology to provide automatic number identification and automatic location identification for wireless calls, similar to that already available for landline calls. See also, CRS Report RS21028, "Wireless Enhanced 911 (E911): Issues Update."

[84] Letter dated January 16, 2002, as reported in FCC Report, January 25, 2002, "FCC News In Brief."

letter also reiterated wireless carriers concerns regarding the possible impact on the proper functioning of some wireless enhanced 911 systems.

The Department of Transportation reportedly requested that, to avoid interference, the lower limit for UWB be set at 6.1 GHz, while the Department of Defense (DOD) had suggested 4.1 GHz as the threshold.[85] While the Department of Transportation and the National Aeronautical and Space Administration (NASA) reportedly continue to oppose the FCC's decision at a time when air safety has become a national priority,[86] the DOD concluded that the "FCC's technical restrictions on UWB devices would be sufficient to protect military systems."[87]

Initial applications of UWB for public safety include ground penetration and through-wall imaging systems; commercial use of these technologies, such as for mining and construction will also be permitted. Other potential commercial applications include consumer appliances that use short-distance wireless communications such as presently used for cordless phones.

The three types of UWB devices that will be permitted under the current FCC rules are: 1) imaging systems using Ground Penetrating Radars (GPRs), wall, through-wall, medical imaging, and surveillance devises, 2) vehicular radar systems, and 3) communication and measurement systems.[88] For imaging systems — GPRs can detect or obtain images of buried objects by directing energy into the ground. Wall imaging systems similarly locate objects within a "wall", which could be a building, bridge or mine, for example. Permitted users for these two imaging applications are law enforcement, fire and rescue organizations, scientific research organizations, commercial mining companies, and construction companies. Through-wall imaging systems can detect location or movement on the opposite side of a structure. Use is restricted to law enforcement and fire and rescue. UWB medical imaging systems can be used under the supervision of a licensed health care practitioner. The FCC is also classifying UWB surveillance systems as imaging technology for the purposes of regulation. These systems, that depend on the transmission of radio frequencies to detect movement within a defined perimeter, may be used by public utilities and other industries as well as by law enforcement and fire and rescue.

The FCC provides for the operation of vehicular radar systems on ground transportation vehicles using directional antennae with controlled emissions. This ruling enables the automobile industry to continue with the development of vehicular radio systems in the 24GHz band. Also known as short-range radar (SRR), the technology can help drivers avoid collisions and prevent certain accidents such as

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[85] Mobile Communications Report, Feb 18, 2002 "Commission Approves UWB Order, Agrees to Revisit Limits"

[86] RCR Wireless News, February 18, 2002, "Government, Carriers Decry UWB Order"

[87] Steven Price, Deputy Assistant Director for Spectrum and Communications, Department of Defense, quoted in Satellite Week, February 18, 2002, "Commission Approves UWB Order, Agrees to Revisit Limits."

[88] FCC press release, *op. cit.*

backing over a child while exiting a garage; the technology can also be used to improve airbag activation and suspension systems.[89]

UWB communications and measurement systems permitted by the FCC under the new ruling include high-speed home and business networks and industry applications such as storage tank measurement. In general this application is limited by the FCC to indoors operations and peer-to-peer communications on handheld devices.

Homeland Security

The language of the Administration's proposal for the creation of a Department of Homeland Security (HLS) is incorporated into H.R. 5005. As stated in the bill, the primary mission of HLS is to (1) prevent terrorist attacks within the United States; (2) reduce the vulnerability of the United States to terrorism; and (3) minimize the damage, and assist in the recovery, from terrorist attacks that occur within the United States. To this end, a cabinet level position of Secretary of Homeland Security is to be created, with key responsibilities assigned to under secretaries. Emergency preparedness and response is the primary area of HLS responsibilities, as outlined in the bill, that could impact policies related to public safety spectrum. The Under Secretary for Emergency Preparedness would be responsible for ensuring that comprehensive programs were developed for interoperable communications technology and the acquisition of this technology by emergency response providers.[90]

Bills before Congress include:

H.R. 5005 (Armey). "Homeland Security Act of 2002." Introduced June 24, 2002 in response to President Bush's proposal for a Department of Homeland Security. House amendments to the bill were sent to the Select Committee for Homeland Security. The bill was marked up on July 19, 2002.

S. 2452 (Lieberman). "National Homeland Security and Combating Terrorism Act of 2002." Introduced May 2, 2002. The amended bill is expected to reach the Senate floor before recess.

H.R. 4660 (Thornberry). "National Homeland Security and Combating Terrorism Act of 2002." Introduced May 2, 2002. Companion bill to S. 2452.

The progress of these bills and related initiatives are being covered by CRS in reports and briefings. CRS has created special teams to respond to questions from Congress regarding issues related to the proposed new department.

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[89] See, for example, "Multifunction Automotive Radar Network (RadarNet)" at [http://radarnet.org/publications/]

[90] More detailed discussions of H.R. 5005 and other proposed legislation appear in, " The Department of Homeland Security: State and Local Preparedness," CRS Report RL 31490, July 9, 2002 and CRS Report RL 31493, "Homeland Security: Department Organization and Management," July 9, 2002.

Both the House and Senate versions of the bills would transfer agencies and administrations, in part or in whole, to the Department of Homeland Security. Many federal initiatives for first responders, and emergency communications and related information technology would be transferred with their agencies. The Administration, therefore, has directed the agencies that would be affected to halt all information technology projects with budgets of $500,000 or more pending review to eliminate duplication. Ten agencies reportedly have been contacted by the Budget Director, including the Transportation Security Administration, Coast Guard, Secret Service, Customs, FEMA and affected departments at Treasury, State and Justice.[91]

Other Congressional Activity

Hearings. Many important hearings are being held in Congress about different aspects of Homeland Security; some of these include testimony or comments recognizing the need for better support of public safety communications. Two hearings in June 2002 addressed issues specific to spectrum use for public safety.

The House Committee of Energy and Commerce, Subcommittee on Telecommunications and the Internet, convened to evaluate the FCC's implementation of ultra-wideband technology and related issues.[92] A statement[93] by the Chairman of the Committee on Energy and Commerce, W.J. (Billy) Tauzin set the tone for the hearing. Congressman Tauzin observed that "the manner in which ultra-wideband technology is fostered or stifled by government policy has implications both for future technologies and for our nation's spectrum management process." The Chairman was critical of the FCC's approach to regulating UWB both in his opening remarks and in his questioning of the panel. The use of UWB in public safety is in the preliminary stages but the technology can, for example, provide assistance to first responders for search and rescue efforts.

The Senate held a commerce committee hearing[94] on spectrum management that is widely considered to be a first step toward reworking spectrum policy. Topics of concern expressed at the hearing covered the spectrum needs of the Department of Defense, commercial wireless carriers spectrum requirements to advance third-generation technology,[95] the need for better preparation for international negotiations,

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[91] "Bush Aide Orders Homeland Security Technology Plans Combined," Bloomberg News, July 19, 2002, [http://www.bloomberg.com].

[92] "The FCC's UWB Proceeding: An Examination of the Government's Spectrum Management Process," June 4, 2002.

[93] Prepared statement available at [http://energycommerce.house.gov/107hear...g569/The_Honorable_Billy_Tauzinprint.htm].

[94] Senate Committee on Commerce, Science, and Transportation, "Spectrum Management: Improving the Management of Government and Commercial Spectrum Domestically and Internationally," June 11, 2002.

[95] Third-generation commercial wireless uses high speeds to deliver content-rich services, including Internet connections. See CRS Report RS 20993, "Wireless Technology and (continued...)

the role of technology, and the role of federal agencies in guiding spectrum management.

A hearing before the Senate Commerce Committee in March 2002 focused on the responses of public safety agencies and telecommunications companies on and after September 11, 2001.[96] At the hearing, the issues addressed in this report were referred to but not explored in detail.

Legislative Initiatives. Authorization of appropriations for pilot programs for interoperable wireless communications at the state level is provided in a bill introduced by Senator Ron Wyden (S. 2037) that is expected to be signed into law this year.[97] An initial hearing[98] on the role of technology in meeting the crisis of September 11, identified interoperability, spectrum capacity and wireless interference as key problems.

As originally introduced by Senator Wyden, the bill would create a pool of technology experts and industry leaders (National Emergency Technology Guard or NET Guard) who would be prepared to provide resources in a national emergency, working with FEMA, funded at $5,000,000. The bill also would fund seven state pilots to develop interoperable systems, at $5 million each, chosen in consultation with the Public Safety Wireless Network, under the auspices of the United States Fire Administration. In addition, the National Institute of Standards and Technology (NIST) would receive $35,000,000 to support programs for innovative technologies relating to security and emergency response. The bill also calls for a report to the Congress regarding policy options and with recommendations to ensure that emergency officials and first responders have access to effective and reliable communications capabilities. The preparation of this report would be under the direction of the National Communications System (NCS).[99] NCS is comprised of 22 federal agencies that work to coordinate telecommunications needs for federal

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[95] (...continued)
Spectrum Demand: Third Generation (3G) and Beyond," updated July 1, 2002.

[96] Senate Committee on Commerce, Science, and Transportation, Communications Subcommittee, "Hearing on the Nation's Wireline and Wireless Communications Infrastructure in Light of September 11th," March 6, 2002.

[97] "IT National Guard Bill Passes Senate," INT Media Group, July 19, 2002,

[98] Senate Committee on Commerce, Science, and Transportation, Subcommittee on Science, Technology & Space, "Hearing on the Response of the Technology Sector in Times of Crisis," December 5, 2001.

[99] The National Communications System of the Department of Defense (NCS) was established by Executive Order in 1984 "to assist the President, the National Security Council, the Director of the Office of Science and Technology Policy and the Director of the Office of Management and Budget in: (1) the exercise of the telecommunications functions and responsibilities, and (2) the coordination of the planning for and provision of national security and emergency preparedness communications. . ." It consults with the National Security Telecommunications Advisory Committee, among others, on issues related to national security and emergency preparedness telecommunications [http://www.ncs.gov].

response to national security and emergency preparedness. The report would include evaluation of the possibility of: priority access to existing commercial wireless systems; reserved spectrum for national emergencies; and specialized public safety communications network.

The bill, significantly amended, was approved by the Senate on July 19, 2002. Among the noteworthy changes through amendments is the elimination of assignments to specific agencies (NIST, FEMA, NCS *et al.*). Specific authority or responsibility is assigned instead to "an appropriate department, agency or office" designated by the President. The amendment further eliminates the $35 million in funding for NIST and the research programs it would have developed in accordance with the original language of the bill. A similar version was passed by the House as part of the Homeland Security amendments introduced by the Science Committee.

A proposed amendment to H.R. 5005 that addresses the need for research and development was passed by the Science Committee on July 10, 2002 and sent to the Select Homeland Security Committee for consideration.[100] The committee markup creates an additional under secretary in the Department of Homeland Security to oversee science and technology. The committee also voted to provide for a "Coordination Council" to set R&D priorities and for a Homeland Security Institute, a step recommended by the National Academies.[101] Homeland Security bills under consideration in both chambers have incorporated this amendment.

Concerns about spectrum management, especially as regards spectrum used for public safety, prompted the introduction of H. R. 4560, the "Auction Reform Act of 2002," on April 24, 2002. The primary objective of the bill was to postpone auctions for the Upper and Lower 700 MHz bands originally scheduled by the FCC for June 19, 2002. (See discussion of issues under Interoperability: Upper 700 MHz Band.) Shepherded by members Dingell and Tauzin, the bill was introduced in the Senate in May and placed on the calendar on May 17, 2002. On May 2, 2002, Senator John Ensign had introduced a related bill, S. 2454. On May 8, 2002, Senator Ted Stevens introduced S. 2481 that mandates the contested auctions be held no later than September 2002. The Senate acted quickly and compromise legislation became Public Law 107-195 on June 19, 2002. The law requires a partial auction in the "Lower 700" bandwidth (Auction No. 44),of two "blocks" of spectrum for C-block[102] and D-block[103] licenses. The law gives the FCC more leeway in setting auction dates for spectrum for commercial use, repealing the September 2002 deadlines. At the same time, it instructs the FCC not to "commence or conduct auctions 31 and 44," except for the specified spectrum blocks, but to complete the auctions prior to the date its auction authority expires in 2007. Further, the new law requires the FCC to submit to Congress, by June 19, 2003, a report that specifies when the auctions

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[100] See [http://www.house.gov/science/press/107/107-245.htm].

[101] "Making the Nation Safer: The Role of Science and Technology in Combating Terrorism," Academy Press, National Research Council, Washington, DC, 2002. Available online at [http://www.nap.edu/terror/index.html].

[102] 710-716 MHz and 740-746 MHz.

[103] 716-722 MHz.

will be scheduled and explains the steps the FCC has taken that justify the scheduling of the auctions.

Legislation (H.R. 3397) had been introduced previously to mandate the timely clearing of Upper 700 MHz spectrum in the channels designated for public safety. Introduced by Representative Jane Harman, the objective of this bill is specifically to give the FCC the power to require involuntary clearing of these frequencies. No hearing has been held.

The Senate Committee on Environment and Public Works reported a bill in November 2001, introduced by Senator James Jeffords. The bill, S. 1631, directs FEMA, in cooperation with the FCC, NIST and the Secretary of Defense to study how to meet the urgent communications needs of emergency response personnel and the resources needed to develop an "effective nationwide communications system." The bill specifically requires a review of "use of the digital spectrum or analog spectrum as a key component." A hearing on the topic was held by the Senate Committee on November 1, 2001.

The choice of using analog or digital technology to broadcast on radio frequencies in designated spectrum bandwidths has been touched upon in this report.[104] The choice of analog or digital is largely a question of prioritizing; often the trade-off is between low-cost analog equipment, compatible with other installed systems, and more costly, spectrally efficient — often interoperable — digital equipment. Regarding a nationwide system, public policy has paid scant attention to the architecture of an integrated nationwide communications system. The various agency and committee efforts, such as PSWN's reports, fall short of addressing the concept in its totality. A nationwide system might require linking FEMA's emergency offices (notably the operation of the Emergency Alert System), the nation's primary Public Safety Answering Points (PSAPs, about 5,500, many of them locally operated and funded), other emergency call centers, mapping systems such as GIS[105], and a plethora of local, state, tribal and federal emergency response centers. The complexity of such a network resembles that of the interlinked networks which support the nation's banking system. It would require similar levels of redundancy, back-up sites, and connectivity to critical databases and diagnostic systems.

Issues Before Congress

Going forward, interest in Congress regarding public safety appears to center on the formation of a Department of Homeland Security. In earlier budget proposals from President Bush, funding for interoperability was set at $1.4 billion. The amount, while significant, is substantially less than what many experts say is needed to achieve stated goals for public safety communications infrastructure. PSWN, for example, estimated in 1998 that over $18 billion was needed to replace out-dated

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[104] Other recent CRS reports that discuss analog vs. digital technology are: RS 20993, "Wireless Technology and Spectrum Demand: Third Generation (3G) and Beyond;" RS21222, "Implementing Wireless Enhanced 911 (E911): Issues for Public Safety Answering Points (PSAPs);" and RS 21028, "Wireless Enhanced E911: Issues Update."

[105] Geographic Information Systems, administered in part by FEMA.

infrastructure technology. While critical, interoperability is not the only public safety wireless technology priority, according to reports by PSWN cited earlier in this report. Potential questions before Congress surrounding the appropriation of funds might include the efficacy of the funding; the manner of funding; the recipient of the funds; the possibility that other public safety needs (e.g., 911 call center support) are not addressed; the choice of agencies to receive the funds; and the connection to defense programs and spending plans. Decisions regarding the reorganization of programs and agencies to create the Department of Homeland Security may also impact Congressional response to key issues regarding public safety.

Some concerns have been expressed regarding the fragmented nature of the public safety information and communications network. Experts decry the absence of a network overlay that assures end-to-end communications across the country. Concerns include the absence of redundancy in public safety networks and the lack of back-up locations for emergency communications.

Introduction of legislation on spectrum policy reform may await General Accounting Office (GAO) reports on spectrum issues and related government practice. The first report, "History and Current Issues Related to Radio Spectrum Management,"[106] was released on June 11, 2002 with a second, more detailed, report promised for later this year. The expectation is that legislation will be introduced before the 107th Congress adjourns. Senator Conrad Burns reportedly announced at the 2002 annual convention of the National Association of Broadcasters that he will introduce such a bill. Additional legislation may be introduced by other members of the Senate panel who requested the GAO report.[107] A Senate hearing on the subject occurred on June 11, 2002.

Spectrum-Related Legislation Before the 107th Congress (Excluding Appropriations Bills and Department of Homeland Security)

H.R. 3397 (Harman). Homeland Emergency Response Operations Act, or the HERO Act. Amends the Communications Act of 1934 regarding public safety channels in the Upper 700 MHz band (channels, 63,64,68, and 69). Extensions are not to be permitted for the public safety bands and the FCC is to "take all actions necessary" so that the spectrum will be available for public safety services no later than January 1, 2007. Introduced December 4, 2001; referred to the Committee on Energy and Commerce.

S. 2037 (Wyden). Science and Technology Emergency Mobilization Act. Mobilizes technology and science experts to respond quickly to emergencies such as terrorist attacks. Among the areas that would be addressed are wireless telecommunications infrastructure. Introduced March 20, 2002; referred to the Committee on Commerce, Science and Transportation. The bill was reported out of

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[106] Statement of Peter F. Guerrero, Director Physical Infrastructure Issues, General Accounting Office, June 11, 2002, GAO-02-814T [http://www.gao.gov].

[107] Reuters wire service, *op.cit.*

committee with substantial amendments and placed on Senate Legislative Calendar. The Senate approved the bill on July 19, 2002

S. 1631 (Jeffords). To amend the Robert T. Stafford Relief and Emergency Assistance Act (see P.L. 106-580). The Director of FEMA would be required to conduct a study of resources needed to develop an effective nationwide communications system for emergency response personnel. The report on the study to be submitted to Congress would include a review of the use of digital or analog spectrum as a key component of meeting urgent communications needs of first responders.