

Funding Emergency Communications: Technology and Policy Considerations

Linda K. Moore
Specialist in Telecommunications Policy

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Summary

The United States has yet to find a solution that assures seamless communications among first responders and emergency personnel at the scene of a major disaster. Since September 11, 2001, when communications failures contributed to the tragedies of the day, Congress has passed several laws intended to create a nationwide emergency communications capability. The 111th Congress considered pivotal issues, such as radio frequency spectrum license allocation and funding programs for a Public Safety Broadband Network (PSBN), without finding a solution that satisfied the expectations of both public safety and commercial network operators. Congressional initiatives to advance public policies for Next Generation 911 services (NG9-1-1) also remained incomplete. The 112th Congress is under renewed pressure to come to a decision about the assignment of a block of radio frequency spectrum licenses referred to as the D Block, and to provide a plan for federal support of broadband networks for emergency communications. The cost of constructing new networks (wireless and wireline) is estimated by experts to be in the tens of billions of dollars over the long term, with similarly large sums needed for maintenance and operation. Identifying money for federal support in the current climate of budget constraints provides a challenge to policy makers. The greater challenge, however, may be to assure that funds are spent effectively toward the national goals that Congress sets.

After years of debate, a majority in the public safety community has agreed to implement common technologies using Internet Protocol (IP)-enabled networks and the wireless technology known as Long Term Evolution (LTE) to build the nationwide PSBN. IP-enabled networks are also considered essential to the introduction of NG9-1-1. The adoption of the Internet Protocol for emergency communications represents a significant advance in the technologies available for response and recovery operations. IP-enabled technologies are faster and smarter, capable of analyzing and directing communications as they move through networks. Achieving the transition to a leading-edge, broadband network powered by the next generation of IP technologies requires significant changes in operations and long-standing agency traditions, major investments in infrastructure and radios, and the development of enabling technologies.

The need appears increasingly urgent for timely decisions by policy makers on new infrastructure for emergency communications and spectrum allocation for public safety radios. Commercial deployment of wireless networks using LTE standards that might also support public safety use are out-pacing the planning efforts of public safety and government officials.

Legislation that has been introduced in the 112th Congress to address some of these issues includes the Public Safety Spectrum and Wireless Innovation Act (S. 28, Rockefeller), the Broadband for Public Safety Act of 2011 (S. 1040, Lieberman), the Broadband for First Responders Act (H.R. 607, King), and the Strengthening Public-safety and Enhancing Communications Through Reform, Utilization, and Modernization (SPECTRUM) Act (S. 911, Rockefeller, as amended), the Public Safety and Wireless Innovation Act (H.R. 2482, Dingell), and parts of Title II of the Budget Control Act of 2011 (S.Amdt. 581 of S. 1323, Reid).

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Goals and Challenges

For nearly a decade, Congress and successive Administrations have worked to improve emergency communications across the nation[1] Although the issue of interoperable communications for first responders[2] has drawn the most attention, there have also been several initiatives, including legislation, to upgrade the functionality of 911 call centers. Activities marking the tenth anniversary of September 11, 2001, increased pressure on Congress to provide a comprehensive solution for better emergency communications to meet both local public safety needs and national goals. The 112th Congress has examined—and is expected to continue to examine—assuring nationwide availability of state-of-the art communications capability for emergency response and recovery.[3]

If there is common agreement among most public safety and government officials, industry leaders, and policy makers for the need to act, a plan for action has not been agreed upon. The White House has supported allocating additional radio frequency spectrum and funding in support of a new, wireless public safety communications network.[4] This position has received widespread support among the public safety community and some commercial stakeholders, such as the Public Safety Alliance.[5] Proposed federal funding for this solution, however, has raised concerns about the cost to the government. The Federal Communications Commission (FCC) has proposed a public-private partnership that would use radio frequency spectrum to attract a commercial partner willing to share network infrastructure with public safety entities, reducing costs but also limiting the amount of spectrum capacity under the direct control of public safety agencies.[6] The FCC's plans have received support from the commercial sector and stakeholders and policy makers who believe that it will increase competition and lower costs to all users of wireless

[1] Some of the actions by Congress and by Federal agencies have been discussed previously in these and other CRS reports: CRS Report R40859, *Public Safety Communications and Spectrum Resources: Policy Issues for Congress* , by Linda K. Moore; CRS Report RL34054, *Public-Private Partnership for a Public Safety Network: Governance and Policy*, by Linda K. Moore; CRS Report RL33838, *Emergency Communications: Policy Options at a Crossroads*, by Linda K. Moore; and CRS Report RL32594, *Public Safety Communications Policy*, by Linda K. Moore.

[2] A frequently cited definition of interoperability has been provided by SAFECOM, an agency with the Department of Homeland Security: "In general, interoperability refers to the ability of public safety emergency responders to work seamlessly with other systems or products without any special effort. Wireless communications interoperability specifically refers to the ability of public safety officials to share information via voice and data signals on demand, in real time, when needed, and as authorized." See http://www.safecomprogram.gov/SAFECOM/interoperability/default.htm.

[3] Hearings in the 112th Congress include Senate, Committee on Science, Commerce and Transportation, "Safeguarding our Future: Building a Nationwide Network for First Responders," February 16, 2011; House, Committee on Homeland Security, "Public Safety Communications: Are the Needs of Our First Responders Being Met?," March 30, 2011, House, Committee on Energy and Commerce, Subcommittee on Communications and Technology, "Using Spectrum to Advance Public Safety, Promote Broadband, Create Jobs, and Reduce the Deficit," April 12, 2011; House, Committee on Energy and Commerce, Subcommittee on Communications and Technology, "Creating an Interoperable Public Safety Network," May 24, 2011, House, Committee on Energy and Commerce, Subcommittee on Communications and Technology, "Legislative Hearing to Address Spectrum and Public Safety Issues," July 15, 2011, House, Committee on Homeland Security, "Hearing on the Attacks of September 11: Where are We Today," September 8, 2011.

[4] The White House, Office of the Press Secretary, "President Obama Details Plan to Win the Future through Expanded Wireless Access" February 10, 2011, http://www.whitehouse.gov/the-press-office/2011/02/10/president-obama-details-plan-win-future-through-expanded-wireless-access.

[5] Public Safety Alliance, at http://www.psafirst.org/.

[6] FCC, *Connecting America: The National Broadband Plan*: http://www.broadband.gov/download-plan/.

networks.[7] The number and variety of conflicting interests have made it difficult for Congress to reach agreement. Of the bills introduced in the 112th Congress, as of the date of this report, only S. 911 has been reported favorably by committee.[8]

This report identifies areas where changes in existing policies and practices may facilitate achievement of the important goals for emergency communications that Congress and others have identified. Why these goals have become important, and recent planning efforts to achieve these goals, is discussed first. Next, possible barriers to achieving these goals are identified and described. The conclusion revisits key options presently under consideration by Congress.

Background: Planning to Meet Goals

Prior to September 11, 2001, planning for emergency communications rested largely with states and communities, with an emphasis on effective response by different types of service (police, fire, ambulance) at the local level. As radio technologies evolved, there was a growing awareness among first responders—long before 9/11—of the need for better coordination and communications interoperability.[9] Their concerns crystallized after a commercial aircraft crashed into a bridge crossing the Potomac River between Washington, DC, and Arlington County, Virginia, in January 1982.[10] As a result, new planning efforts for multi-jurisdictional and multi-disciplinary responses were put in place across the United States, with federal agencies often providing assistance through technical expertise and funding.

In 1996, a report was published by the Public Safety Wireless Advisory Committee (PSWAC), which the Federal Communications Commission and the National Telecommunications and Information Administration (NTIA) had created to provide Congress with recommendations on meeting the communications needs of first responders. The Committee's *Final Report*[11] was considered a landmark in planning and goal setting for public safety communications. Post-9/11, the concerns raised by PSWAC received new attention. In 2003, a National Task Force on Interoperability, with the support of the Department of Justice, revisited the PSWAC report findings, reiterating needs such as investment in infrastructure, more funding, better planning, more coordination and cooperation among agencies, and allocation of additional radio frequency spectrum.[12] In 2007, Congress created the Office of Emergency Communications (OEC) within the Department of Homeland Security (DHS) and tasked it with the preparation of a National Emergency Communications Plan (NECP), which was published in 2008.[13] Separately, Congress,

[7] The Connect Public Safety Now coalition is one example; see http://www.connectpublicsafetynow.org/issue.

[8] Ordered reported with an amendment in the nature of a substitute favorably by the Senate, Committee on Commerce, Science, and Transportation, Executive Session, June 8, 2011.

[9] According to *Interoperable Communications for First Responders*, an undated white paper from Frost & Sullivan, interoperable communications for first responders was first addressed in 1970, when the FIRESCOPE Incident Command System was developed in Southern California. The paper provides a brief history of the development of communications for first responders, http://www.wireless.att.com/businesscenter/en_US/pdf/InteroperableComm.pdf.

[10] Air Florida Flight 90 crashed into the 14th Street Bridge and then sank into the icy Potomac River on January 13, 1982, costing 74 lives; see http://www.airdisaster.com/special/special-af90.shtml. First responders arriving on the scene from the District, Arlington County, and other counties in the capital area were unable to communicate with each other or with federal authorities who also responded.

[11] *Final Report of the Public Safety Wireless Advisory Committee*, September 11, 1996, at http://www.ntia.doc.gov/osmhome/pubsafe/pswac_al.pdf.

[12] *Why Can't We Talk*, February 2003: http://www.ncjrs.gov/pdffiles1/nij/204348a.pdf.

[13] *National Emergency Communications Plan*, July 2008, http://www.dhs.gov/xlibrary/assets/
(continued...)

also in 2008, required the National E9-1-1 Implementation Coordination Office (ICO)[14] to prepare a national plan for migration to Next Generation 911 (NG9-1-1) and to identify possible actions for Congress to take in advancing goals identified through the planning process.[15] The FCC's 2010 *National Broadband Plan*[16] included goals for advancing "robust and secure public safety communications networks."[17] All of these planning efforts included a broad base of stakeholders in the process. The plans, separately compiled and administered, have provided much of the basis for current federal policy and technology strategies. The common thread is the stakeholders who have participated in the various planning committees; for example, key public safety associations are consistently represented on these committees.

The FCC's broadband plan advocated deploying IP-enabled technologies for NG9-1-1 and for wireless broadband networks for public safety radios. Planning efforts for both of these emergency communications have since been initiated by the FCC.[18]

Challenges and Barriers to Change

Although many of the plans developed by federal agencies over the last decade have encouraged statewide and regional planning, the evolutionary path for providing emergency communications has favored local planning over federal, regional, and even state authority. In general, the larger cities and more prosperous counties have taken the lead in deploying new communications systems. Cities and towns with populations of less than 100,000 and rural counties apparently may struggle with implementing modern communications systems. Lack of funds to build infrastructure may not be the only difficulty; often these communities do not have the needed personnel, such as grants administrators or information technology managers, and therefore rely on sharing resources with neighboring counties.

The Department of Homeland Security has advocated emergency communications planning from the bottom up, encouraging stakeholders to find their own solutions within frameworks established within DHS, evolving along a development continuum provided by the agency.[19] Although localism offers many benefits for communities, the relative autonomy in choosing technology has led to incompatible equipment and small-scale, inefficient markets for equipment and infrastructure. Emergency communications technology choices have tended to be proprietary, tailored to specific needs of micro-markets, and closed to commercial, mass-market solutions.[20]

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national_emergency_communications_plan.pdf.

[14] ICO was created by the Ensuring Needed Help Arrives Near Callers Employing (ENHANCE) 911 Act of 2004 (P.L. 108-494), to be jointly administered by the NTIA and the National Highway Traffic Safety Administration.

[15] *A National Plan for Migrating to IP-Enabled 9-1-1 Systems*, September 2009, http://www.e-911ico.gov/NationalNG911MigrationPlan_sept2009.pdf.

[16] FCC, *Connecting America: The National Broadband Plan*, http://www.broadband.gov/download-plan/.

[17] For example, see the FCC's Broadband Action Agenda at http://www.broadband.gov/plan/broadband-action-agenda.html.

[18] For example, see FCC, *Fourth Notice of Proposed Rulemaking,* adopted January 25, 2011, PS Docket No. 06-229, and *Notice of Inquiry,* for Next Generation 911, adopted December 21, 2010, PS Docket No. 10-25; a summary of other actions is at http://www.fcc.gov/pshs/broadband.html.

[19] The continuum diagram is at http://www.safecomprogram.gov/SAFECOM/Tools/Continuum/continuum.htm; additional descriptions at http://www.safecomprogram.gov/SAFECOM/oecguidancedocuments/continuum/default.htm.

[20] Research reports that have addressed these issues include *Sending Out an S.O.S.: Public Safety Communications* (continued...)

As a consequence, there is a notable gap between the level of technology available to the typical first responder or 911 call center operator and that used every day by the average American consumer.

Today, emergency communications systems are typically local in reach and limited in applications. According to most experts, the emergency communications grid of the not-too-distant future is likely to be local, national, and international in reach, with flexible and accessible applications that can be instantaneously tailored to meet the needs of any emergency situation. The emergency communications technologies of the future are expected to be developed for common IP-enabled platforms that can operate on any IP-enabled network. IP-enabled wireless devices using technologies such as Long Term Evolution (LTE) will deliver advanced services anywhere, any time.[21]

Implementation of the next generation of emergency communications technology may alter the patterns of the past 30 years of technology development and adoption for public safety radios and systems. The transition might be facilitated by changes in the management of public safety resources, addressing questions such as the following:

- Who will be responsible for governance?
- Where will decision making and planning reside?
- How will reliable cost estimates be established?
- What sources of revenue are available?
- How will radio frequency spectrum assets be managed?
- How will technology be developed and applied?

Policy Considerations for the Future

Current management of public safety resources—along with some comments about how these may be changed in the future—are discussed below in six sections: governance, decision making, cost estimates, sources of revenue, spectrum management, and technology. Current policies in these areas may be inadequate to achieve the desired levels of emergency capabilities for response and recovery in all regions of the country. Congress may therefore choose to consider these and other areas where policy recommendations or legislative actions may expedite improvements to emergency communications.

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Interoperability as a Collective Action Problem, by Jerry Brito; *Communicating During Emergencies: Toward Interoperability and Effective Information Management*, by Philip J. Weiser, University of Colorado Law Legal Studies Research Paper No. 07-7, and *Fundamental Reform in Public Safety Communications Policy*, by Jon M. Peha; all published in the Federal Communications Law Journal, Vol. 59, No. 3, 2007.

[21] Long Term Evolution is a Fourth Generation (4G) mobile technology, at http://www.4gamericas.org/index.cfm?fuseaction=page&sectionid=249.

Governance and Grants

Governance is a broad term that can include a number of factors. At the federal level, governance is closely associated with evaluation of existing programs and the management of federal expenditures, including grants. A number of federal agencies have roles in guiding and monitoring some decisions of states and localities through grant administration. Currently, over 40 active programs, administered by nine different departments and multiple agencies within those departments, are providing grants for funding emergency communications, and guidance and governance for those grants.[22] Within DHS, the Office of Emergency Communications, the SAFECOM Program, and the Federal Emergency Management Administration (FEMA) are among the agencies that formulate policies, plan exercises, provide guidelines, and establish requirements.[23] Two major grants programs within the Department of Justice provide funds for emergency communications; these are the Community Oriented Policing Services (COPS) program and the Edward Byrne Memorial Justice Assistance Grant (JAG) program.[24] The NTIA administers grants made through the Broadband Technologies Opportunity Program (BTOP), some of which benefit public safety communications and 911 services.[25] The NTIA shared responsibility with the Department of Transportation, National Highway Traffic Safety Administration, for a 911 grant program[26] established by the ENHANCE 911 Act of 2004.[27] The only federal grant program exclusively for improving 911, its sole appropriations was less than $50 million provided through the Digital Transition and Public Safety Fund, created by the Deficit Reduction Act of 2005.[28]

It is estimated that as much as $13 billion in federal funding, possibly more, was spent on emergency communications from FY2001 through FY2010. This total does not take full account of earmarks and other forms of assistance not reported as grants. Little information about how this money was spent is readily available.[29]

Grant programs provide a mechanism for governance by affecting performance and behavior; financial audits and other reviews of expenditures provide oversight. For investments in public safety communications systems and equipment, oversight seems to be mostly within the communities whose first responders use the systems that have been purchased. Federal audits usually are not performed at a level of detail that identifies the specific uses of federal grants by the ultimate recipients of the funds.

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[22] Based on a summary of federal programs provided by SAFECOM, at http://www.safecomprogram.gov/NR/rdonlyres/132003E7-6C43-4E15-97D6-A2A4E5A2704F/0/GrantProgramsforSAFECOMWebsite.pdf.

[23] See **Appendix C**. Links to relevant SAFECOM and FEMA grant program documents are available at http://www.safecomprogram.gov/SAFECOM/grant/default.htm. Information on OEC grants is at http://www.dhs.gov/xopnbiz/grants/gc_1288707294166.shtm.

[24] Information on JAG programs is at http://www.ojp.usdoj.gov/BJA/grant/jag.html; a link to COPS programs is at http://www.cops.usdoj.gov/Default.asp?Item=46.

[25] Information on BTOP grants is reported in NTIA, *The Broadband Technology Opportunities Program*, "Overview of Grant Rewards," posted December 14, 2010, at http://www.ntia.doc.gov/reports/2010/NTIA_Report_on_BTOP_12142010.pdf.

[26] Update on 911 activities, letter to the President of the Senate from the NHTSA Administrator, December 16, 2010, http://www.911.gov/pdf/2010_%20Report_to_Congress-Biden_Letter.pdf.

[27] P.L. 108-498, Sec. 104, "Sec. 158, "(b) "(1); 118 STAT. 3987-3988.

[28] P.L. 109-171, Sec. 3004, 120 STAT. 22-23.

[29] CRS, Congressional Distribution Memorandum, "Federal Funding of State and Local Emergency Communications Projects," June 10, 2011.

Because new technologies that might benefit public safety communications are being developed and deployed almost exclusively within the commercial sector, one of the considerations for improving governance of emergency communications deployments might be how to manage partnerships between the commercial sector and state and local agencies. In a publicly traded corporation, governance is provided by the board of directors and senior management, who must satisfy the expectations of shareholders and financial markets as well as assure compliance with rules and regulations. A public-private partnership might therefore meld public and private methods of governance. This in turn might lead to a closer examination of the federal role in providing governance and funding. For example, to capture the full advantages from innovation and cost-saving economies of scale, some say transfers of new commercial technologies to public safety agencies should occur on an on-going basis, not as episodic one-time transactions. Federal grants, however, tend to provide for single projects, within a limited timeframe, and may lose some of this efficiency.

Other sources of funding in addition to federal grants are available for the building and operation of communications systems. Given the many potential sources of funds available to states and communities, it is debatable whether rules attached to federal grants can be used to drive a process that would coordinate the construction and operation of a seamless, nationwide network to serve first responders and other emergency personnel.

Decision Making and Planning Authority

As with federal grant programs for emergency communications, multiple federal agencies are involved in planning and decision-making guidance for state, local, tribal, and regional agencies. Although a number of federal programs provide support for state and local activities, there appears to be little coordination among these agencies in carrying out their separate programs.[30]

Federal Involvement

Congress has separately and specifically given authority to DHS and to the FCC to act on behalf of public safety. In the case of DHS, authority includes planning and implementing public safety communications solutions and setting requirements to coordinate and support specific goals, such as interoperability and a national communications capability.[31] Within DHS, the Office of Emergency Communications manages statewide planning and coordination for interoperable communications and administers compliance with the National Emergency Communications Plan.[32] FEMA participates in emergency communications planning as part of its state and regional efforts for hazard mitigation and response and recovery.[33]

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[30] At least two major reports from the Government Accountability Office have documented the lack of coordination: *Homeland Security: Federal Leadership and Intergovernmental Cooperation Required to Achieve First Responder Interoperable Communications*, GAO-04-963T, July 20, 2004 at http://www.gao.gov/new.items/d04963t.pdf, and *Emergency Communications: Vulnerabilities Remain and Limited Collaboration and Monitoring Hamper Federal Efforts*, GAO-09-604, June 2009 at http://www.gao.gov/new.items/d09604.pdf.

[31] Discussed in detail in **Appendix C**.

[32] Information about the Office of Emergency Communications is at http://www.dhs.gov/xabout/structure/gc_1189774174005.shtm.

[33] For additional information on FEMA programs, see CRS Report RL34537, *FEMA's Pre-Disaster Mitigation Program: Overview and Issues*, by Francis X. McCarthy and Natalie Keegan.

The FCC has several pertinent mandates from Congress, such as an obligation to "promote safety of life and property through the use of wire and radio communication,"[34] and requirements regarding the assignment of radio frequencies for public safety use. The FCC created a Public Safety and Homeland Security Bureau in 2006 to consolidate its many programs oriented toward public safety.[35] This bureau and the Wireless Telecommunications Bureau jointly administer the Public Safety Broadband Licensee, the chosen license-holder for the public safety broadband frequencies at 700 MHz.[36] The FCC also oversees the activities of 55 Regional Planning Committees that administer spectrum assignments for mission-critical voice networks in the 700 MHz band.[37]

Other federal agencies with decision-making responsibilities for public safety planning and investments include the NTIA and the National Institute of Standards and Technology (NIST). For example, the Public Safety Communications Research program is a joint effort between NIST's Office of Law Enforcement Standards and the NTIA.[38]

State and Local Involvement

Every state has one or more agencies that plan for public safety, homeland security, and emergency communications. Most states have a Statewide Interoperability Coordinator (SWIC)[39] to administer its Statewide Communication Interoperability Plan (SCIP). SCIPs are written to conform with federal guidelines and requirements, such as the NECP, and provide guidelines and goals. DHS describes SCIPs as "locally-driven, multi-jurisdictional, and multi-disciplinary statewide plans to enhance emergency communications."[40] State coordinators are encouraged to promote a "coordinated practitioner-driven approach" through a "collaborative statewide governance structure."[41] Not all grants are coordinated through the SCIP, however. Many earmarks and some grants have been awarded directly to an agency within a town, city, or county for a specific purpose identified by the recipient. A review of federal, state, and local grants programs seems to indicate that most purchasing decisions for emergency communications equipment occur at the county[42] level, often based on an approved equipment list provided by the state or by a regional buyers cooperative.[43]

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[34] 47 U.S.C. §151.

[35] See http://www.fcc.gov/pshs/about-us/.

[36] Spectrum is segmented into bands of radio frequencies and typically measured in cycles per second, or hertz. 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. The 700 MHz band includes radio frequencies from 698 MHz to 806 MHz. Current plans for the public safety broadband network would use frequencies already assigned to public safety, at 763-768MHz and 793-798 MHz.

[37] Frequencies at 769-795 MHz and 799-805 MHz.

[38] "Report from the Field: Advancing Public Safety Broadband Communications," posted December 30, 2010, at http://www2.ntia.doc.gov/node/695.

[39] See "Statewide Interoperability Coordinators" at http://www.dhs.gov/files/programs/gc_1286986920144.shtm.

[40] See "Statewide Communication Interoperability Plans" at http://www.dhs.gov/files/programs/gc_1225902750156.shtm.

[41] *Establishing Governance to Achieve Statewide Communications Interoperability* at http://www.safecomprogram.gov/NR/rdonlyres/24F10648-2642-42F3-8305-B29315F833BF/0/EstablishingGovernanceGuide.pdf

[42] Parishes and independent cities are considered counties for most statistical purposes. The Bureau of the Census identifies 3,143 counties and county-equivalents in the United States. Some states, however, have curtailed responsibilities for counties. Massachusetts, for example, has transferred governing authority from most counties to the (continued...)

Planning and decision making for emergency communications at the local and county level is often separated by function. Some actions may be coordinated through a planning board, or one office, such as the sheriff's office, will be designated for emergency planning. Federal and state programs may provide specific goals and a framework for coordination. It appears, however, that funds are disbursed and authority is typically dispersed according to the administrative structure of the county, city, or town. There is a great deal of variation across the country but, generally, state officials manage communications for statewide systems, such as the state highway patrol, and local officials manage local public safety services.

Commercial Involvement

In its *National Broadband Plan* and other documents, the FCC has advocated some form of public-private partnership between public safety agencies and wireless carriers that would include sharing responsibility for planning and decision making. The decision by the FCC to advocate a shared network for wireless communications was centered on two conclusions: (1) that a network with national coverage would best meet public safety needs for robust communications capabilities, information, and interoperability; and (2) that sharing spectrum and network facilities with commercial users would benefit public safety through economies of scale in building, equipping, and operating the network, by providing access to additional spectrum in times of large-scale emergencies, and by offering new sources of funding, among other benefits. Arguments in favor of building a network exclusively for public safety revolve around the shortcomings of current commercial wireless services such as poor availability, inadequate coverage in rural areas, lack of security features, and absence of priority access. Also, public safety representatives have frequently expressed concerns in testimony before Congress about sharing authority with a commercial partner.[44]

Final decisions by policy makers about the number, location, and type of network (local, state, regional, national) are likely to have a significant impact on commercial participation in a public safety broadband network or networks. Although most public safety representatives object to any sharing arrangement that would allow commercial partners to dictate access to capacity, in general they have advocated leveraging public safety spectrum resources through agreements with commercial partners. The scope of these agreements is undecided. Some agencies envision a national network governed primarily by the Public Safety Broadband Licensee; some prefer linking state and regional networks, with regional boards taking the lead; others assume the

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state or to townships.

[43] The Congressional Research Service is researching state, county, and local reports on expenditures for emergency communications equipment and has collected this information for 20 states.

[44] Hearings with testimony on the PSBN include Senate, Committee on Science, Commerce and Transportation, "Safeguarding our Future: Building a Nationwide Network for First Responders," February 16, 2011; House of Representatives, Committee on Homeland Security, "Public Safety Communications: Are the Needs of Our First Responders Being Met?," March 30, 2011, and House of Representatives, Committee on Energy and Commerce, Subcommittee on Communications and Technology, "Using Spectrum to Advance Public Safety, Promote Broadband, Create Jobs, and Reduce the Deficit," April 12, 2011; House of Representatives, Committee on Energy and Commerce, Subcommittee on Communications and Technology, "Creating an Interoperable Public Safety Network," May 24, 2011.

solution will be a system of multiple local, county, and state systems similar to what is in place for existing public safety radio systems.[45]

To maximize the benefits of commercial involvement, the National Emergency Number Association (NENA) in 2009 proposed consolidating the Public Safety Broadband License with the D Block, to be auctioned to commercial operators who would be required to develop public safety enterprises to provide the needed network.[46]

Role of the Emergency Response Interoperability Center and the Public Safety Spectrum Trust

As part of its initial planning for a Public Safety Broadband Network (PSBN),[47] to facilitate interaction between the public and private sectors, the FCC required the creation of a not-for-profit corporation, the Public Safety Broadband Licensee (PSBL) to hold the license for spectrum assigned for public safety broadband. This corporation is presently governed by its Board, the composition of which is largely determined by the FCC, with the participation and oversight of two FCC bureaus. As originally envisioned by the FCC, the PSBL would be contractually bound to work with one or more commercial partners to develop a broadband network for public safety use. The FCC awarded the administration of the PSBL to the Public Safety Spectrum Trust (PSST). [48] To work with the PSBL, the commercial sector, and other stakeholders, the FCC created the Emergency Response Interoperability Center (ERIC) within the FCC Public Safety and Homeland Security Bureau in April 2010.[49] ERIC was tasked with implementing standards for national interoperability and developing technical and operational procedures for the public safety wireless broadband network in the 700 MHz band.[50]

The national license currently assigned to the PSST for a broadband network is for 10 MHz within the 700 MHz band.[51] Until plans are finalized for the PSBN, the FCC has provided conditional waivers for some agencies that wish to move forward with broadband network deployment. Agencies in eight states, five counties or regions, and eight cities received waivers, which required them to meet network requirements as specified by the FCC. The FCC then approved agreements for 20 of the waiver recipients to lease spectrum from the PSST to cover their planned areas of operation.[52] Transferring spectrum management rights to these jurisdictions

[45] The range of positions among public safety officials and their expectations from the federal government cited here were reiterated at a hearing on March 30, 2011. House of Representatives, Committee on Homeland Security, "Public Safety Communications: Are the Needs of Our First Responders Being Met?"

[46] House of Representatives, Committee on Energy and Commerce, Subcommittee on Communications, Technology and the Internet, "A National Interoperable Broadband Network for Public Safety: Recent Developments," September 24, 2009, written testimony of Brian Fontes, CEO, NENA, at http://republicans.energycommerce.house.gov/Media/file/Hearings/Telecom/090924%20D-Block%20hearing/Testimony/NENA.pdf.

[47] Discussed in **Appendix B**.

[48] FCC, *Order,* P.S. Docket 06-229, released November 19, 2007, at http://fjallfoss.fcc.gov/edocs_public/attachmatch/FCC-07-199A1.pdf.

[49] FCC, *Order*, PS Docket No. 06-229, released April 23, 2010, at http://fjallfoss.fcc.gov/edocs_public/attachmatch/FCC-10-67A1.pdf.

[50] See http://www.fcc.gov/pshs/eric.html.

[51] The license covers 10 MHz at 763-768MHz and 793-798 MHz and guard bands, to mitigate interference, at 768-769 MHz and 798-799 MHz.

[52] The states are Alabama, Hawaii, Iowa, Mississippi, New Jersey, New Mexico, and Oregon; the regions are Adams County-Denver Airport (CO), Bay Area (CA), Mesa-TOPAZ (AZ), San Antonio (TX), and Wisconsin Counties; the (continued...)

effectively assigned much of the decision-making authority and funding responsibility to them as well.

Based on FCC plans, however, ERIC and the PSST will do most of the planning for the PSBN; future grants intended for the PSBN would have to be used in accordance with the network plans developed by the FCC through ERIC. The FCC, therefore, would be the lead agency for grants guidance, governance, planning, and some decision making for the PSBN. The level of decision-making power that the FCC will be able to wield depends largely on the outcome of its negotiations with the PSST and other public safety stakeholders, possibly bolstered or constrained by congressional action.

Given the apparent expectations of many stakeholders that there will be commercial participation in building and operating a nationwide network for public safety broadband communications, it might be useful to develop specific guidelines for these partnerships at the beginning of the network planning process. For example, it is not clear whether the PSBL will take the lead in negotiations and contractual agreements with commercial partners or whether decisions regarding these agreements will be left largely to states, or localities, as has been the case in the past.

Although the FCC would appear to have authority over the process of planning and decision making for the PSBN, it may come under pressure from stakeholders, including Congress, to share responsibilities. Collaborative decision making among a large number of stakeholders may dilute efforts for an efficient, cost-effective, interoperable network, some say, without necessarily representing the interests—or meeting the needs—of its users.

Cost Estimates

Building the network requires capital expenditures for infrastructure and operations centers, wireless towers, radios, and other communications equipment. Covering on-going expenses requires additional funding for software upgrades, maintenance, network operations, training to use new equipment, and other recurring costs. For wireless communications, an important infrastructure component is the network that links radio towers to communications backbones. These networks, which usually operate over fiber-optic cable or microwave connections, are typically referred to as backhaul.

In 1996, the Public Safety Wireless Advisory Committee reported that the estimated value of the installed base of nonfederal public safety communications networks was $25 billion, with a useful life of 15 years.[53] Most of the networks in place at the time operated on analog frequencies.

In recent years, the National Emergency Management Association (NEMA) has reported on interoperable communications expenditures in at least two of its biennial reports.[54] These reports

(...continued)

cities are Boston (MA), Charlotte (NC), Chesapeake (VA), Los Angeles (CA), New York City (NY), Pembroke Pines (FL), Seattle (WA), and Washington (DC). Of these, Alabama was not issued a spectrum lease as it was not ready to proceed.

[53] *Final Report of the Public Safety Wireless Advisory Committee*, September 11, 1996, Appendix C–ISC Final Report, p. 285, at http://www.ntia.doc.gov/osmhome/pubsafe/pswac_al.pdf.

[54] National Emergency Management Association, biennial reports available at http://www.nemaweb.org. The reports do not always provide the number of states responding to specific questions.

provide summaries of responses to questionnaires sent to NEMA's members. In 2006, NEMA reported that states estimated that it would cost a total of $7 billion to achieve state-wide interoperability for national coverage or to reach levels required by each state's homeland security strategy. The average expenditure, per state, for states providing estimates of their projected costs, was reported to be $160 million.[55] In 2008, NEMA reported that the states' estimates of the cost of providing interoperable communications nationwide had risen to a total of $12 billion since the 2006 report. Obstacles to achieving interoperability that were cited in the report include rapidly changing technologies that require repeated and costly investments; lack of cooperation among jurisdictions; and a lack of expertise and resources for proper planning.[56] The 2010 Biennial Report carried no information about interoperable communications.

Wireless Networks

In 2008, when the FCC proposed a public-private partnership to build a public safety broadband network, the cost was estimated in public comments filed with the FCC at from $18 billion to as much as $40 billion.[57] These projected costs did not include radios. The network would have been largely built by the purchaser of a commercial spectrum license, known as the D Block, allocated for that purpose. The planned auction of the D Block failed.[58]

In 2010, the FCC again proposed to auction the D Block, under new rules that would include sharing infrastructure with a separately funded and managed Public Safety Broadband Network.[59] Although the FCC did not provide details of how the D Block would be auctioned, it did prepare estimates of the cost to public safety if infrastructure was shared. These estimates were based on assumptions that include (1) 95% of the towers used in the PSBN would be shared with commercial operators; (2) backhaul would be shared and paid for separately; (3) the new network would be data and video only; and (4) LTE would be the wireless technology used. The FCC concluded that the "total present value of the capital expenses and ongoing costs for the network over the next ten years is approximately $12-16 billion." Of this, $6.5 billion would be for capital expenditures. The cost of radios is not included.[60] The FCC also provided an estimate for building a stand-alone public safety network. Instead of $6.3 billion in capital expenditures for building and equipping tower sites, a stand-alone network would cost $12.6 billion. Additional

[55] *NEMA 2006 Biennial Report*, p. 26.

[56] *NEMA 2008 Biennial Report*, p. 17.

[57] Cyren Call Communications Corporation, in *ex parte* comments filed with the FCC on June 4, 2007, set the cumulative capital expenditure for building a public-private network at $18 billion, of which roughly a third of the cost would be for enhancements for public safety use. An estimate from Northrop-Grumman Corporation placed the cost at $30 billion, when service applications are included (statement by Mark S. Adams, Chief Architect Networks and Communications, at WCA 2007, Washington, DC, June 14, 2007). These estimates do not include the cost of radios. An estimated range of $20 billion to $40 billion for network infrastructure was discussed at a hearing held by the House of Representatives, Committee on Energy and Commerce, Subcommittee on Communications, Technology, and the Internet, "A National, Interoperable Broadband Network for Public Safety: Recent Developments," September 24, 2009.

[58] Additional information is provided in **Appendix B**, "Proposals for Spectrum Assignment."

[59] See **Appendix B**. The D Block frequencies at 758-763 MHz and 788-793 MHz are adjacent to the PSBL.

[60] FCC, *A Broadband Network Cost Model: A Basis for Public Funding Essential to Bringing Nationwide Interoperable Communications to America's First Responders*, OBI Technical Paper No. 2, May 2010, http://download.broadband.gov/plan/fcc-omnibus-broadband-initiative-%28obi%29-technical-paper-broadband-network-cost-model-basis-for-public-funding-essential-to-bringing-nationwide-interoperable-communications-to-americas-first-responders.pdf.

investments of $3.1 billion would be required for backhaul and operations centers, bringing the total estimated investment to $15.7 billion.[61] The total present value for both capital expenses and operating costs over ten years for a stand-alone network might be $34.4 billion to $47.5 billion.[62] Both the incentive-based and stand-alone network cost estimates are based on 44,800 cell sites. Costs might be reduced if pre-existing public safety sites for cellular network connections can be used and might be increased if networks are operated by multiple jurisdictions, leading to inefficient redundancies.

Network Size Impacts Cost

Communications capabilities generally available for the emergency response community tend to be more costly than commercial solutions. Although some of the added cost can be attributed to unique requirements such as operability in extreme weather conditions, much of the higher cost comes from limited production runs in an industry otherwise characterized by aggressive policies to achieve economies of scale.

To take advantage of economies of scale and provide efficiency in investment, operating costs, and spectrum use, among other benefits, the Governing Board of the National Public Safety Telecommunications Council (NPSTC)[63] has recommended the adoption of a national network with a small number of core networks for public safety broadband.[64] In its conceptual model, NPSTC has placed seven distributed core networks within the continental United States to provide national coverage and necessary system redundancy.[65] NPSTC has stated that this national network architecture approach would be less costly than any of the "network of networks" architectures that have been proposed by numerous public safety officials. According to NPSTC,[66] the cost of the extra capital needed to build a network of networks would be "unnecessarily expensive." One nationwide network "will cost the least amount to manage, maintain, and upgrade." NPSTC also observed that "recurring costs to manage and refresh a network, over the long term, will be the largest cost component regardless of configuration." According to NPSTC, coordinating the funding and installation of system upgrades across multiple networks would be difficult and inconsistencies could lead to operability and interoperability problems.

Network Capacity Impacts Cost

A cost analysis based on research done at Carnegie Mellon University provides alternative scenarios using different assumptions about the type of public safety communications network to be built.[67] For example, three scenarios are considered for a public-safety-only network built on

[61] Ibid., Exhibit 6.

[62] Ibid., Exhibit 7.

[63] NPSTC is a federation of associations whose mission is to improve public safety communications and interoperability through collaborative leadership, http://www.npstc.org/index.jsp.

[64] NPSTC Position Paper, http://www.npstc.org/documents/NPSTC%20Position%20BB%20Network%2020110310.pdf.

[65] NPSTC, National Broadband Network Conceptual Design, March 3, 2011, http://www.npstc.org/documents/20110301%20EPC-RAN%20Drawings%20FINAL%20w%20notes.pdf.

[66] Quotes are from NPSTC Position Paper, *op.cit.*

[67] "Quantifying the Costs of a Nationwide Public Safety Wireless Network," by Ryan Hallahan and Jon M. Peha, authors' version at http://www.andrew.cmu.edu/user/rhallaha/papers/quantifying_costs_of_PS_network.pdf. Also (continued...)

10 MHz of spectrum and for a public-private-partnership network using 20 MHz of spectrum. The three operational scenarios are (1) voice only; (2) data only; and (3) voice and data.

The estimates are derived from assumptions about network traffic, capacity, and technical parameters that lead to an estimate of the number of cell sites needed for each type of network. Costs are estimated based on the cost of building and operating the expected number of cell sites needed for each scenario. Deployment costs are those associated with the installation and operation of cell sites and do not include other network components such as mobile switching centers. The estimates use values of $500,000 per cell site for deployment and $75,000 per cell site, annually, for operating costs. The cost of buying, maintaining, or upgrading radios is not included. Also, the estimates for a public-safety-only network are based on 10 MHz of available spectrum; no analysis was done for a public-safety-only network using 20 MHz. The cost analysis yielded an estimated investment of $11.1 billion to deploy a voice and data network on 10 MHz of public safety spectrum. The comparable estimate for a public-private network on 20 MHz is $9.7 billion. The White House has, in some documents, assumed an investment of $10 billion is needed to deploy a wireless broadband network for public safety using 20 MHz of dedicated spectrum.[68]

Table 1. Network Scenarios and Estimated Costs

(In millions of dollars)

Network Scenario	Public Safety Only	Public-Private-Partnership
Voice Traffic Only		
Total Number of Cell Sites	*3,700*	*10,300*
Upfront Deployment Cost in Millions	$1,900	$5,200
Operating Cost in Millions/Year	$280	$770
10 Year Total Cost in Millions	$3,400	$9,400
Data Traffic Only		
Total Number of Cell Sites	*18,200*	*19,000*
Upfront Deployment Cost in Millions	$9,100	$9,500
Operating Cost in Millions/Year	$1,400	$1,400
10 Year Total Cost in Millions	$16,600	$17,300
Voice and Data Traffic		
Total Number of Cell Sites	*22,200*	*19,400*
Upfront Deployment Cost in Millions	$11,100	$9,700
Operating Cost in Millions/Year	$1,700	$1,500
10 Year Total Cost in Millions	$20,300	$17,700

(...continued)

published in Telecommunications Policy, October 2010.

[68] "The Benefits of Transitioning to a Nationwide Wireless Broadband Network for Public Safety," The White House, released by the Office of the Vice President, June 2011, http://www.whitehouse.gov/sites/default/files/uploads/publicsafetyreport.pdf.

Source "Quantifying the Costs of a Nationwide Public Safety Wireless Network" by Ryan Hallahan and Jon M. Peha, authors' version.'

Network Infrastructure: Wireless Backhaul and NG9-1-1

Wireless communications over the airwaves come to earth through towers and switches that link them to telecommunications and Internet networks. As telecommunications technology evolves from voice traffic over the Public Switched Telephone Network (PSTN) to data traffic over the Internet and Internet-like networks, the nature of network support for wireless traffic is also changing. To take advantage of IP-enabled technology, some states and communities have built their own links to backbone networks to supplement or replace network access through commercial carriers. Other communities have built their own networks because commercial carriers were not providing service to their area. Where these networks are in place or are being developed, IP-enabled public safety technologies are often making the transition to these networks. The networks can be designed to support NG9-1-1, emergency alerts, and wireless network backhaul, as well as the broadband communications needs of government agencies and the general public.

Studies published by the Department of Transportation in 2008 estimated the cost of providing 911 services for several scenarios over a life cycle extending from 2009 through 2028. One group of assumptions would maintain the existing 911 infrastructure. Cost estimates for two different scenarios supporting that assumption set cumulative investments in "acquisition and implementation" at $9.3 billion and $13.1 billion, depending on the assumptions and the weight given to them. Similarly, cumulative "operations and maintenance" costs were estimated at $46.4 billion and $65.8 billion.

Another set of assumptions was developed to estimate costs for building a new NG9-1-1 network as a stand-alone network. The estimates were $8.7 billion and $9.1 billion in cumulative investment, and $51.1 billion and $49.2 billion in operating costs.[69] The estimates for new, NG9-1-1 systems do not take into account how much those costs might be reduced by sharing infrastructure. Most states, however, do plan on sharing network infrastructure among multiple users. A number of BTOP grants, for example, have been made for the construction of multi-purpose broadband networks that include 911 services and backhaul for first responder radios.

Radios

In addition to cooperation for sharing network resources, the FCC has anticipated that commercial partners would lead, and fund, the development costs of the radio technologies that will operate within the frequencies assigned to the Public Safety Broadband License and the D Block. The participation of commercial carriers in developing and deploying crucial radio components is expected to put the cost of public safety radios in the same price range as commercial high-end mobile devices ($500). By contrast, interoperable radios for the narrowband networks at 700 MHz cost $3,000 and up, each. The latest radios developed for public safety by DHS, designed to operate on multiple bands, are estimated to cost between $4,000 to $6,000.[70]

[69] U.S. Department of Transportation, Intelligent Transportation Systems, "Next Generation 9-1-1 System Initiative: Final Analysis of Cost, Value, and Risk," March 8, 2009, pp 57-58 and 62-64, at http://www.its.dot.gov/ng911/pdf/USDOT_NG911_4-A2_FINAL_FinalCostValueRiskAnalysis_v1-0.pdf.

[70] Department of Homeland Security, S&T Snapshots, Command, Control, and Interoperability, "The Beginning of the (continued...)

Among the many unresolved debates surrounding the development of a broadband wireless network for public safety use is the feasibility of expecting the new network to carry both data and voice traffic. Commercial LTE networks will in the immediate future use existing voice-data networks (primarily third-generation networks, 3G) to provide the voice component for LTE (4G) devices. This is not considered a viable option by most public safety officials, as the 3G networks do not support a number of features considered essential for public safety voice communications. Many of these features are dependent on radio-to-radio (off-network) communications that today require assigning channels for exclusive use. Some radio communications experts argue that LTE-based solutions for public safety's needs can be developed and adapted rapidly. Others believe that the process of integrating voice and data will be difficult and slow, taking perhaps decades. Some public safety officials believe it is not possible for all their needs to be met by a single, unified network and that separate radios and networks for separate functions are the solution.[71]

Competition and Cost

The FCC has concluded that proprietary technologies have hampered the effective development of public safety radios and curtailed interoperability, based on findings provided to Congress in response to an inquiry from the House Committee on Energy and Commerce in 2010.[72] In April 2011, the Committee wrote to the FCC with a list of questions about the selection of equipment vendors by those agencies that have received waivers to begin building parts of the PSBN. Questions related to policy issues raised in this report include the possible impact of proprietary broadband technologies on

> network and device equipment costs borne by public safety relative to commercial costs;
>
> the ability for public safety to benefit from innovation in wireless technologies;
>
> the likelihood of terminated product lines or new mandatory releases that result in unique costs to public safety relative to commercial technologies;
>
> public safety interoperability at the application, devices, and network levels among networks provisioned by different vendors;
>
> the ability of public safety users to enter into partnerships with commercial wireless providers;
>
> competition in the public safety communications equipment market; and

(...continued)

End of the Single-Band Radio for Public Safety," October 20, 2009, at http://www.dhs.gov/files/programs/gc_1258141690101.shtm. In testimony on March 30, 2011, Mr. Gregory Simay, At-Large Director, Los Angeles Regional Interoperable Communication System estimated the cost of a broadband network radio at over $7,000, House of Representatives, Committee on Homeland Security, "Public Safety Communications: Are the Needs of Our First Responders Being Met?"

[71] Obstacles to developing an integrated voice-data device for first responders are discussed in "LTE Support for Mission Critical Voice for Public Safety," by Andrew M. Seybold, Public Safety Advocate e-newsletter, June 19, 2011, at http://andrewseybold.com/2532-lte-support-for-mission-critical-voice-for-public-safety.

[72] Dated July 20, 2010, http://energycommerce.house.gov/documents/20100726/Letter.FCC.07.26.2010.pdf.

> the FCC's National Broadband Plan finding that encouraged incentive-based partnerships with a variety of commercial operators.[73]

The FCC responded to this letter in mostly general terms, citing, for example that the waiver process is in its early stages.[74] The FCC response noted that issues similar to those raised by the Committee letter are being examined in the *Interoperability Further Notice of Proposed Rulemaking*.[75] The FCC's primary focus has been to develop rules to ensure technical interoperability nationwide for the public safety broadband network, even if proprietary technologies are used. The FCC reply noted that, of the 20 waiver recipients, only two had selected a vendor, and another eight were in the process of identifying and selecting a vendor. The FCC does not require waiver recipients to use competitive bidding because it does not oversee the procurement practices of state and local governments.

Network Access

The FCC has based its planning and cost projections on the assumption that there will be a nationwide network administered by a single license-holder. Meanwhile, states and localities have continued to apply to the FCC for waivers that would permit them to obtain sub-licenses from the PSST and commence building their own networks. Any IP-enabled network, however, can support virtual private networks in wired or wireless infrastructure. The most important consideration for assured access, therefore, is not network ownership but network availability, permitting the uninterrupted transfer of communications to an operational link when part of a network fails. Sharing infrastructure between public safety and commercial license-holders, as proposed by the FCC, would lower costs and increase national availability by providing access to commercial networks. A nationwide public safety network, with a small number of operational cores operated by and for public safety agencies, as proposed by NPSTC, would increase network availability and facilitate cost-saving measures for participating public safety agencies. Turning over network construction and operations to the commercial sector, as NENA has proposed, might lower costs even further but might also limit public safety access, unless strict rules for meeting capacity needs are in place. If multiple jurisdictions build their own public safety broadband networks, not only might the total cost of providing capacity increase significantly but also available capacity might be diminished because of the added complexity of coordinating interoperable access. The choice of design for the network, therefore, may have an impact on the amount of funding and the length of time needed to construct an interoperable network that can be accessed nationwide.

Once governance and decision-making authority can be conclusively decided, it may be possible to provide the nation not just with a plan, but with a network design that provides a more solid basis for cost estimates and for plans for funding. States and localities, for example, might benefit from a better sense of their future financial obligations in the construction and operation of a broadband network that is to provide access to public safety agencies across the country.

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[73] Dated April 11, 2011, http://republicans.energycommerce.house.gov/Media/file/Letters/112th/042011FCC.pdf.

[74] Dated May 19, 2011. The FCC has allowed some public safety agencies to begin building broadband networks by waiving some of their existing rules concerning spectrum allocation. FCC, *Order*, released December 10, 2010, PS Docket No. 06-229.

[75] FCC, Public Notice, "Public Safety and Homeland Security Bureau Seeks Comment on Increasing Public Safety Interoperability by Promoting Competition for Public Safety Communications Technology," PS Docket No. 10-168, released August 19, 2010, http://fjallfoss.fcc.gov/edocs_public/attachmatch/DA-10-1556A1.pdf.

Public safety agencies have multiple obligations to build or upgrade, and equip, other networks. The costs of building and maintaining a new data network, therefore, are some fraction of total obligations to assure emergency communications capabilities. Based on information about the cost of existing systems and estimates of future costs, the construction of this new network represents a significant investment for all participants.

Financial Resources

Although there are many ways that the federal government might encourage improvements in emergency communications, such as tax incentives or cash awards in technology contests, most federal financial support has come from grants and congressionally directed funding. Other sources of funding for emergency communications include appropriations from state and local budgets, financing from government bonds, grants from private foundations, lease-purchase agreements with equipment suppliers, and sources of recurring revenue such as fines, user fees, surcharges, and state and local sales and property taxes. At the local level, funds are often collected through bake sales, fish fries, fund-raising drives, and other community-supported efforts.

Testimony at congressional hearings and other public statements by public safety officials indicate that many public safety agencies envisage setting up a partnership with commercial network operators that would provide some form of revenue. How this would be accomplished has been left vague. Possible models to generate revenue from public safety spectrum assets include issuing secondary licenses to commercial partners, and network management techniques that use advanced technologies to share spectrum.

The final decision as to how spectrum access might be divided up across an estimated 65,000 public safety agencies[76] has not yet been made by the stakeholders. Some municipalities and states may seek commercial partnerships that will provide access to public safety spectrum in return for financial consideration. Resources provided by the commercial sector might include access to their infrastructure and cash payments for spectrum leases. The value to commercial operators of spectrum access would likely depend on the geographical coverage being offered by the public safety licensee. Paradoxically, the areas where the spectrum is likely to have the most value, such as urban areas, are also the areas where public safety agencies are most likely to need spectrum capacity for their own use. Leased or shared spectrum in small or isolated communities may have little commercial value.

The monetary value of spectrum licenses might also be captured for public safety communications expenses by using the proceeds from commercial license auctions. Several proposals, including proposed legislation,[77] would designate all or part of the proceeds of some auctions to funding public safety communications investments and operating costs. These proceeds would be deposited in a special fund; grants administrators would be allowed to borrow against anticipated future revenue so that grants could be provided immediately.

Congress has twice in the past acted to create special funds to receive and distribute revenue from spectrum auctions for specific purposes. These funds represent a departure from existing law,

[76] Estimate reported in *Progress Report to Congress on Emergency Communications*, 2011, DHS, Office of Emergency Communications, p. 7.

[77] S. 28 (Rockefeller), S. 1040 (Lieberman), S. 911, as amended (Rockefeller), and H.R. 607 (King).

which requires that auction proceeds be credited directly to the Treasury as income.[78] The Deficit Reduction Act of 2005 (P.L. 109-171, Title III) required the auctioning of licenses for spectrum used by television broadcasters for analog transmissions. It established the Digital Television Transition and Public Safety Fund to receive this auction revenue and use some of the proceeds for the transition to digital television, public safety communications, and other programs. The Commercial Spectrum Enhancement Act (P.L. 108-494, Title II) established a Spectrum Relocation Fund to hold the proceeds of certain spectrum auctions for the specific purpose of reimbursing federal entities for the costs of moving to new frequency assignments.

Current law prohibits the FCC from considering potential spectrum revenue in planning auctions of spectrum licenses,[79] yet high auction yields may be necessary to sustain the proposed grant programs. Furthermore, although auctions of spectrum licenses are an effective solution for implementing today's wireless technologies, spectrum management policies might change to accommodate the technologies of tomorrow, with less reliance on auctions as a policy tool. It may be that additional congressional oversight is required to assure that the maximum national value is obtained from national spectrum assets.

Using revenue generated by the sale of radio frequency spectrum to fund wireless networks might increase the proportion of federal money available for one-time investments in infrastructure and therefore the federal role in decision making. This, however, might require transferring authority from states and communities to federal agencies, leading to a greater level of federal participation than is currently the case. States and localities might be hard pressed to muster the resources needed to participate. Additional funding sources, such as private sector investment, may need to be considered as plans for the proposed network move forward, some say.

Managing Radio Frequency Spectrum

Decisions about the assignment and management of the spectrum resources available to public safety agencies often provide the boundaries for making other decisions, such as choices for technology, governance, and funding. For example, within the 700 MHz band, 24 MHz has been assigned for public safety use, of which 10 MHz is currently designated for a new broadband network.[80] Networks primarily for mission-critical voice communications are being constructed separately on 12 MHz of public safety's allotment within the 700 MHz band. Construction of these voice networks, referred to as narrowband networks, is being coordinated largely between states and counties, with counties and major cities typically taking responsibility for building on the spectrum assigned to them for that purpose.

Figure 1 represents part of the upper 700 MHz band, indicating the frequencies assigned for public safety and adjacent commercial licenses. The accompanying legend provides the key to the type of license and the amount of spectrum associated with that spectrum. For example, reading from the left, the first band represents 11 MHz of the C Block, which is for commercial purposes. The C Block allocation is in two 11-MHz assignments, at 746-757 MHz and at 776-787MHz. The D Block has two assignments of 5 MHz each; these are contiguous with the two assignments for the Public Safety Broadband License. The D Block frequencies have not yet been auctioned or

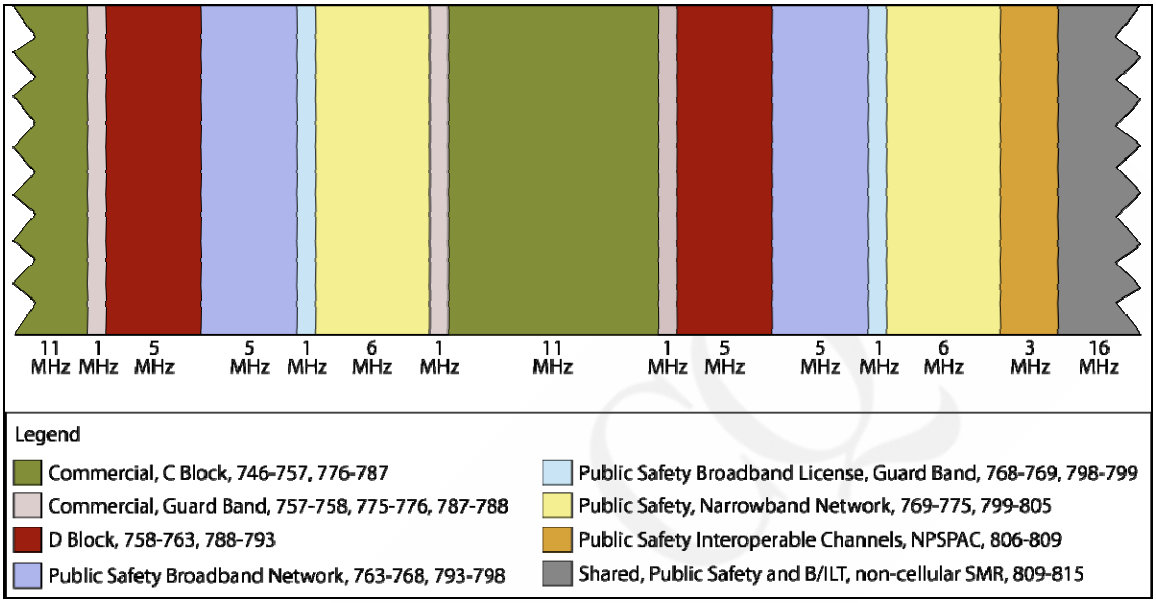
[78] 47 U.S.C. 309 (j) (8) (A).

[79] 47 U.S.C. 309 (j) (7) (B).

[80] 2 MHz has also been assigned to the PSBL as guard bands, to protect against radio traffic interference.

otherwise assigned. Assigning the 10 MHz D Block for the Public Safety Broadband Network would increase the broadband network's coverage to 20 MHz. Not all spectrum blocks in the 700 MHz band are shown in **Figure 1**; other commercial licenses are in Bands A and B in the lower part of the band.

Figure 1. Public Safety and the D Block



Source: Federal Communications Commission, Revised 700 MHz Band Plan for Commercial Services.

Public safety officials, commercial network experts, and the FCC are generally in agreement that LTE technology should be required for the new PSBN. Part of the challenge for network developers will be to coordinate the development of public safety requirements for LTE with commercial LTE standards development.

Coordinating development of 700 MHz band standards among network participants provides an opportunity to maximize the benefits inherent in IP-enabled networks for the safety of the general public. For example, it is possible to create smart phone applications that can link personal mobile devices to emergency command centers, integrating information from those devices into an action plan for response and recovery. The *first* first responders—the people at the site of a disaster—can be enabled to participate proactively in the response. The feasibility of using crowd-sourced communications to provide information to emergency management command centers is being tested by a program undertaken jointly by the Los Angeles County Homeland Security Advisory Council and the Annenberg Innovation Lab:[81] the CrisisConnection Project.

The CrisisConnection Project, as described by Professor Gabriel Kahn, a faculty associate at the Innovation Lab who is leading the development team,[82] will encourage businesses and others in

[81] According to its website, the Annenberg Innovation Lab, based within the Annenberg School for Communication and Journalism at the University of Southern California, fosters innovation through collaborative projects with other University departments, public institutions and the private sector; see http://www.annenberglab.com/about.

[82] As described in an e-mail to Congressional Research Service on April 18, 2011. The team consists of computer science students from the Viterbi School of Engineering at the University of Southern California.

the Los Angeles area to download a smart phone app or register a cell phone number. When a disaster strikes, a user can snap a photo of damage, such as a downed power line from a storm or a collapsed building in an earthquake. A geo-location function then pinpoints where and when the photo was taken. That information is uploaded onto a network. A mapping function places the photo on a map accessible from the web. Other information, such as the names of people who were able to exit a building before it collapsed or whether a city street is still receiving its water supply, can also be uploaded. All the information is aggregated onto one map.

Fully implemented, the data might help emergency situation managers determine where to most effectively deploy emergency medical service personnel, firefighters, HazMat teams, utility repair crews, or other response and recovery personnel, as appropriate. As a situation stabilizes, evaluations about evacuation routes, shelters, and other post-disaster services could be expedited and information disseminated through emergency alert systems. The site can be used to support local 911 call center operators and link to NG9-1-1 networks for broader coverage.

The scope of such life-saving measures would be greatly facilitated by effective network-to-network wireless communications. For example, federal policy regarding access to the LTE networks being built in the 700 MHz band might include requirements to leverage these spectrum assets for a nationwide emergency communications grid that meets the safety needs of the public at large.

One the goals of effective spectrum management is to create opportunities for the development of innovative technologies. Wireless technology transforms air into desirable services, providing an engine for economic growth and development. The evolution of public safety communications has lagged behind the commercial sector and the military in receiving the benefits of recent innovations. By providing access to desirable spectrum in the 700 MHz for public safety purposes, Congress has provided an opportunity not only for increased network capacity but also for increased innovation in emergency communications technologies.

Technology

Separately, public safety agencies across the country are investing in public safety communications infrastructure for other technologies on other frequency assignments. In addition to the proposed LTE data network at 700 MHz, there are other networks operated by public safety agencies on dedicated spectrum: narrowband networks on frequencies below 512 MHz; a separate narrowband network using spectrum at 700-800 MHz; and ultra-wideband, short-range networks at 4.9 GHz.[83] Public safety also uses unlicensed spectrum for local voice and data networks. These networks and other communications solutions have been built separately, use different technologies, and support different radios.

The commercial sector, meanwhile, has begun the transition to operating almost exclusively on IP-enabled networks such as LTE. Wireless carriers around the world are installing LTE networks for consumers and planning for the next generation of LTE: LTE Advanced.[84] LTE Advanced technologies will be able to operate across noncontiguous spectrum bands, thereby increasing

[83] Ultrawide band provides broadband capacity but is only effective for short-range communications, for example, in deploying bomb-detection robots or monitoring sensors and cameras in a burning building. In the commercial sector it is widely used to provide wireless connectivity in homes.

[84] Also known as 3GPP Release 10, see http://www.3gpp.org/LTE-Advanced.

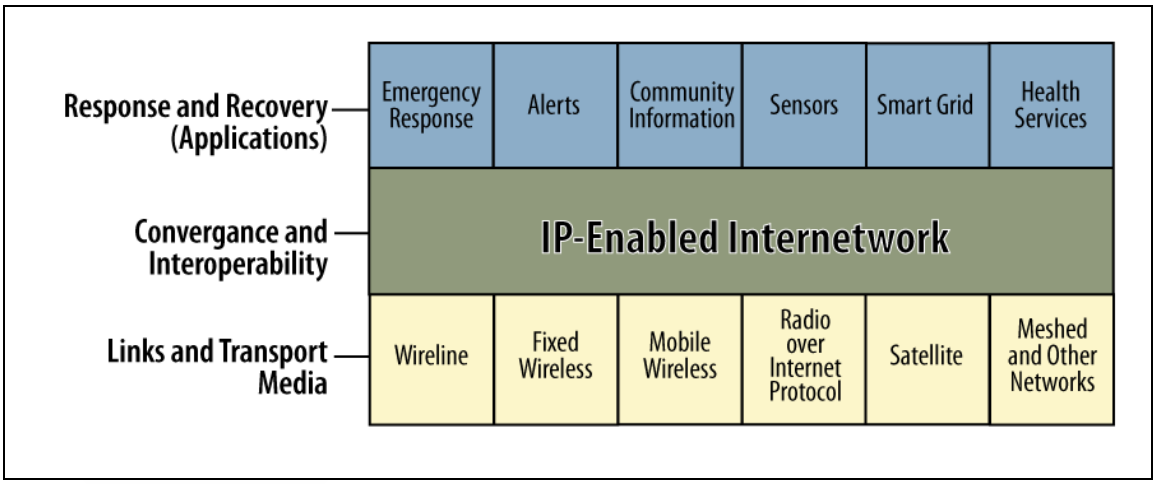
channel widths for greater capacity and performance. Most experts agree that LTE Advanced will facilitate the transition to new technologies by making it easier and less expensive to phase out older infrastructure.

Many experts in advanced communications technology believe that the push to IP-enabled technologies is likely to bring about the convergence of commercial, military, and emergency response (federal and nonfederal) technologies on common, interoperable platforms. In this view, compatible communications devices will be differentiated by applications developed by stakeholders to meet their mission needs. Infrastructure, spectrum, and mobile devices will be sharable, and it is envisaged that sharing will be encouraged.

Networks

The military is linking many of its communications through IP-enabled networks,[85] similar to plans by the public safety community for investment in first responder LTE devices and NG9-1-1. The Department of Defense (DOD) has used the term internetwork to refer to the IP-enabled networks that drive its Global Information Grid (GIG) for network communications.[86] The internetwork, also known as the Convergence Layer, provides analysis and organization of communications activity to facilitate transport. The communications layer that provides the entry and distribution links to services supported by the internetwork is referred to as the Link and Transport Layer by DOD. An Emergency Communications Grid, similar to the military's GIG, might use a common IP-enabled network structure to connect with any type of IP-enabled system, network, or device to support a wide range of services. (See **Figure 2**.)

Figure 2. Emergency Communications Grid



Source: Based on *Department of Defense Global Information Grid Architectural Vision; vision for a net-centric, service-oriented, DoD enterprise*, prepared by the DOD CIO, June 2007.

DOD's internetwork is the equivalent of public safety wireless backhaul, NG9-1-1 network connectivity, or any other network connection that serves the public interest. The Emergency

[85] *Department of Defense Global Information Grid Architectural Vision; vision for a net-centric, service-oriented, DoD enterprise,* prepared by the DOD CIO, June 2007, http://cio-nii.defense.gov/docs/GIGArchVision.pdf.

[86] Ibid., Figure 8, p. 22.

Communications Grid shown in **Figure 2** can also send out emergency alerts to endangered populations,[87] capture information from sensors, manage the Smart Grid to prevent power outages, and support other response and recovery actions. In nonemergency mode, the shared internetwork serves as the conduit for the daily workload of communications. The Emergency Communications Grid represents a unified approach to assuring access and interoperability among all types of communications devices and applications, but it is not envisioned as a single network. The internetwork would be a convergence of many IP-enabled networks that support all the necessary devices and provide the needed links to the Response and Recovery level.

Radios

The United States Army is adapting commercial wireless technologies to operate with military networks, expanding the range of available devices and applications.[88] It has initiated a project, Multi-Access Cellular Extension (MACE), to capture innovation in the commercial marketplace because the "commercial marketplace continuously introduces new technologies, replete with greater capabilities and faster data rates, which could prove beneficial to the military." The vision for MACE is intended to unify commercial technologies with military needs.

The developers of MACE contend that it will support cellular communications over smart phones as well as links through cellular base stations to tactical systems. In demonstration pilots, mesh networking[89] is to be used to test seamless operation in WiFi/cellular environments even when a cellular base station is not available.[90]

One example of a smart phone app being tested in a MACE demonstration is the mapping of Improvised Explosive Device locations. Similar to the CrisisConnection project described in the preceding section, the smart phone camera would take a picture at the site of an explosion and, using location technology, pinpoint it on a map of the area. This information would be used in planning routes to be taken through the area.[91]

The MACE strategy, and other Army Research and Technology initiatives that are augmenting commercial solutions to work in the military environment, may also be applied for public safety response and recovery efforts. The developers of MACE have identified a number of parallels between tactical military deployments and first responder deployments. For example, military

[87] FEMA and the FCC have announced the introduction of the Personal Localized Alerting Network (PLAN) that can deliver geo-targeted text alerts to enabled smart phones. PLAN is the implementation of the Commercial Mobile Alert Service as required by the Warning, Alert, and Response Network Act (WARN Act), P.L. 109-347, Sec. 603 (a). FCC Fact Sheet, http://transition.fcc.gov/cgb/consumerfacts/cmas.pdf.

[88] U.S. Army Research, Development and Engineering Command, U.S. Army Communication-Electronics Research , Development and Engineering Center, Multi-Access Cellular Extension Demonstration Project.

[89] Mesh networks operate over linked radio nodes facilitated in part by a mesh router. The nodes can form ad hoc networks, as needed, and operate without cell towers. The mesh network serving the City of Minneapolis is widely credited with expediting response and recovery, and saving lives after a bridge spanning the Mississippi collapsed into the river on August 1, 2007. More recently, Japan's mesh networks helped maintain communications after the earthquake and subsequent tsunami in mid-March 2011.

[90] House of Representatives, Committee on Armed Services, Subcommittee on Emerging Threats and Capabilities, "Department of Defense Science and Technology Budget Request," March 1, 2011, written statement of Dr. Marilyn Freeman, Deputy Assistant Secretary of the Army for Research and Technology.

[91] "Can You Hear Me Now? Vice Chief of Staff Attends Army Communications Demonstration," by Sharon Rushen, RDECOM CERDEC Public Affairs, March 10, 2011, at http://www.cerdec.army.mil/news/comms_demo.asp.

divisions and public safety personnel both need robust communications technology to provide: situational awareness, chain-of-command and network management functions, authentication and access control, and data security—at a low cost.

Migration to Commercial Technologies

The military model may not be readily transferable to public safety, however. The approach being taken by the U.S. military is to set up structures that incorporate commercial technologies and innovation into existing tactical systems. Public safety communications do not have a similar system on which to build. The new narrowband and broadband networks for public safety will, according to testimony, be incompatible with each other and with other networks for the foreseeable future. Only a small part of the existing public safety infrastructure is expected to be usable in the development of new networks at 700 MHz. The military is planning to use commercial technologies to expand the capabilities of its existing communications base, public safety agencies, on the other hand, may need to use commercial infrastructure as well as technologies. Using commercial infrastructure to support public safety apps would emulate MACE's plan for melding commercial and military technologies to capture the benefits from innovation and cost-efficiencies.

There is a generally recognized need to move to technologies that use Internet protocols in order to improve service and reduce operating costs. Because IP-enabled technologies are radically different from those of most of the emergency communications systems currently in place, the transition provides opportunities to surmount existing barriers to change. Just as access to the Internet has revolutionized business and social cultures worldwide, access to IP-enabled networks is likely to reshape the command-and-control hierarchy of first responders, and the ways they use and pay for communications systems.

Public safety communications may be closed off from vital new technologies unless solutions are found to incorporate and foster change. Communications technology for public safety, as for the military, needs to be regularly refreshed by innovations and cost-saving efficiencies developed by a competitive commercial sector, according to some experts.

Conclusion

Since 9/11, the technologies that might provide effective and efficient communications for public safety needs have evolved more quickly than the organizational structures of the agencies that plan for, use, and manage these technologies. The rapid transition to broadband communications, for example, has widened the gap between practice and expectation; how public safety agencies have managed their communications assets in the past may not be a good model for how they should be managed in the future.

The differing needs and budgets of communities, counties, states, and the federal government may lead to disagreement as to where decision-making and planning authority should reside. As local and state systems expand into regional and national networks, some of the decisions about investment and resource allocation may have to be centralized, in order to capture important economies of scale.

Policy and legislative debates on emergency communications during the 111th Congress centered on funding for infrastructure and access to radio frequency spectrum. Spectrum is a valuable

resource that can be allocated for noncommercial use or licensed and sold to generate revenue for the Treasury. Because spectrum license auctions generate new revenue that can be applied to deficit reduction, debates over spectrum allocation are likely to be far-ranging. The broader and more problematic policy issues for the 112th Congress include questions regarding technology transfer, cost containment, and sustainable funding.

There are a number of possible paths forward for federal policy. One approach might be to return to the pre-9/11 era, when the federal government left most planning and purchasing decisions to state and local governments, and federal and nonfederal network managers negotiated reciprocity agreements, separately and independent of each other.

Proposed bills currently before Congress take a different approach. They would depend on federal grant guidance and rule-making to bring about needed changes. The bills would help to move public safety agencies away from the incremental development of narrowband voice networks to next-generation IP-enabled networks that fully support voice, data, and video transmissions. They all would assign the D Block license to the Public Safety Broadband Licensee for a new broadband network. S. 28, S. 1040, and H.R. 607 would give the FCC a central role in decision-making and planning for network construction. S. 1040 and H.R. 607 would include DHS in planning efforts and assign to it the responsibility for program grants. S. 911, as amended, is one of several bills that would give grant-making authority to the NTIA. Funding for the grants would come from auctioning spectrum licenses; loans to grants programs could be substantial, based on expected auction proceeds. S. 911, as amended, H.R. 2482, S. 1459, and H.R. 12 would create a new not-for-profit corporation that would plan for and develop a nationwide network.

The FCC has proposed using its spectrum allocation authority to leverage a public-private partnership that would collaborate in providing public safety and consumer services. The FCC's objective is similar to DOD initiatives, such as MACE, intended to manage the convergence of commercial and military innovation in communications technology.

The NENA proposal for a commercial network supporting public safety enterprises would likely have fostered the costs savings and other benefits such as those described for MACE but did not address public safety community concerns such as an unwillingness to cede authority and concerns about network availability and reliability.

To summarize, current proposals and discussions offer two different categories of management structure and philosophy.

- Collaborative efforts among existing public safety and federal agencies, with the details of the relative responsibilities of multiple stakeholders not yet decided.
- Corporate governance with clearly defined responsibilities to meet the needs of public safety stakeholders/customers.

Funding options include

- Federal funding, either through direct appropriations or through revenues received from spectrum auction proceeds that are diverted from the U.S. Treasury to a fund from which sums are appropriated for the public safety broadband network, as designated by Congress.
- Payments from the commercial sector, either in cash or in kind, for access to public safety networks and spectrum capacity.

- Borrowing, from the federal government or the private sector.
- Private sector investment.

Without a strong governance structure, it appears that providing federal grants may not guarantee that federal goals will be achieved. Assuming clear delineation of structure, responsibility, and accountability, a corporate structure might be in a better position to attract funding from commercial investors than a collaborative structure governed by a combination of federal, state, and possibly other government agencies. A not-for-profit corporation created for the purpose of serving public safety communications needs might provide a strong governance structure for meeting those goals but might become overly dependent on federal government financing and support. Such a corporation might be considered a moral hazard if commitments from the federal government were seen as protecting the company from the consequences of poor decisions and from the need to be competitive.

A federal corporation structured to attract private investment might, however, be a viable means for surmounting the barriers to building a public safety network such as those described in this report.[92]

[92] Possible organizational structures to facilitate the building of a public safety network are discussed in CRS Report RL34054, *Public-Private Partnership for a Public Safety Network: Governance and Policy*, by Linda K. Moore, pp6-7.

Appendix A. Legislation in the 112th Congress to Improve Emergency Communications

Bills in the 112th Congress seeking to overcome the barriers to providing state-of-the-art wireless technology for emergency communications include: the Public Safety Spectrum and Wireless Innovation Act (S. 28, Rockefeller), the Broadband for Public Safety Act of 2011 (S. 1040, Lieberman), the Strengthening Public-safety and Enhancing Communications Through Reform, Utilization, and Modernization (SPECTRUM) Act (S. 911, Rockefeller, as amended), the Public Safety and Wireless Innovation Act (H.R. 2482, Dingell), the Broadband for First Responders Act (H.R. 607, King), and the American Jobs Act of 2011 (S. 1549, Reid and H.R. 12, Larson). The House Committee on Energy and Commerce presented a draft discussion bill for consideration at a subcommittee on July 15, 2011.[93] Other proposals to improve communications capacity and capability that would address issues such as technology transfer and cost containment are also being considered.

Public Safety Spectrum and Wireless Innovation Act, S. 28

Under this proposal, governance of a public safety broadband network would be shared by several agencies. S. 28 would require the formation of an advisory board with which the FCC would consult.[94] Annual appropriations through 2018 would be authorized for the Emergency Response Interoperability Center to carry out its responsibilities as established in the bill.[95] The NTIA would be responsible for administering the grants program for network construction, in consultation with the FCC, which would define project requirements.[96] The FCC would administer a separate maintenance and operation reimbursement fund. It would require annual status reports from license-holders.[97] The Comptroller General would be required to perform audits of the construction fund and the maintenance and operation fund.[98]

S. 28 would empower the FCC to take "all actions necessary" to ensure the deployment of the public safety broadband network.[99] It would determine whether spectrum licenses would be national, regional, or statewide, which would influence sharing of decision-making powers,[100] and would authorize partnerships with commercial interest to build a state's public safety broadband network.[101] It would set standards for, authorize, and to some extent supervise requests for proposals to build networks.[102] The bill would establish specific requirements concerning network

[93] House, Committee on Energy and Commerce, Subcommittee on Communications and Technology, "Legislative Hearing to Address Spectrum and Public Safety Issues," July 15, 2011. Available at http://republicans.energycommerce.house.gov/Media/file/Hearings/Telecom/071511/DiscussionDraft.pdf.

[94] S. 28, Sec. 107.

[95] S. 28, Sec. 105 (f).

[96] S. 28, Sec. 202 (a), (b) and (d).

[97] S. 28, Sec. 105 (b) (1) (G).

[98] S. 28, Sec. 209.

[99] S. 28, Sec. 101.

[100] S. 28, Sec. 102 (b) (3).

[101] S. 28, Sec. 105 (b) (1) (D).

[102] S. 28, Sec. 105 (c).

build-out in rural areas,[103] and requirements for assistance from the General Services Administration.[104]

Sources of revenue would come from the proceeds of commercial spectrum auctions, as described in the bill,[105] and from fees or other income from secondary users of public safety spectrum.[106] Auction proceeds up to $11 billion would be divided between a Construction Fund and a Maintenance and Operation Fund, established by the act.[107] Proceeds above $11 billion would go to "growth-enhancing" infrastructure projects.[108] An antidiversion prohibition would require that any funds for public safety programs made available through provisions of the act would be spent in accordance with FCC guidelines.[109]

S. 28 would direct the FCC to reallocate the D Block to public safety use[110] and to determine the assignment of licenses.[111] It would set up rules to govern the authorization of secondary access, if any, for those licenses.[112] The FCC would also establish rules for public safety to access commercial spectrum and infrastructure, including roaming and priority access.[113] It would determine whether the public safety licenses now designated for narrowband network use might be used for broadband technologies and set the requirements for this usage.[114] Within five years of the enactment of the act, the FCC would be required to report to Congress on how public safety agencies are using public safety spectrum allocations and whether more spectrum should be made available.[115]

The FCC would set technical and operational rules for the network[116] and, with NIST, develop standards necessary to ensure interoperability, security, and functionality.[117] The bill would require a GAO report on incorporating satellite communications into the broadband network.[118]

To capture spectrum license auction revenues, S. 28 would extend the auction authority from the end of FY2012 to FY2020. In addition to specifically requiring an auction of at least 25 MHz of spectrum from frequencies between 1675 and 1710 MHz and spectrum between 2155 and 2180 MHz, the bill would give authority to the FCC to organize and conduct voluntary auctions.[119] The FCC has specifically requested this authority primarily so that it may provide financial incentives

[103] S. 28, Sec. 105 (d).
[104] S. 28, Sec. 207 and Sec. 208.
[105] S. 28, Sec. 204.
[106] S. 28, Sec. 104 (a) (5).
[107] S. 28, Sec. 201 (a).
[108] S. 28, Sec. 204 (b).
[109] S. 28, Sec. 210.
[110] S. 28, Sec. 102 (a).
[111] S. 28, Sec. 102 (b).
[112] S. 28, Sec. 104.
[113] S. 28, Sec. 106.
[114] S. 28, Sec. 103.
[115] S. 28, Sec. 205.
[116] S. 28, Sec. 105.
[117] S. 28, Sec. 105 (e).
[118] S. 28, Sec. 206.
[119] S. 28, Sec, 204.

to television broadcasters as part of a plan to repurpose some of the broadcaster spectrum holdings.

SPECTRUM Act, S. 911 as amended, and H.R. 2482

As amended by a substitute amendment and other amendments, S. 911 and its companion bill, H.R. 2482, would create a private, non-profit Public Safety Broadband Corporation to provide governance for a nationwide interoperable network for public safety communications.[120] The board of directors of the corporation would include the Secretaries of Commerce and Homeland Security, the Attorney General, and the Director of the Office of Management and Budget, or their designees. Eleven nonfederal members would also sit on the board.[121]

The corporation would be tasked with deploying and operating the nationwide network according to provisions established in the bills.

The bills would create a Public Safety Trust Fund that would receive proceeds of auctions of commercial spectrum licenses, including federal spectrum repurposed for commercial use, as described in the bill.[122] The Public Safety Broadband Corporation would receive grants through the fund. The bills would require a grant to the corporation of $11.75 billion, of which at least $10.5 billion would be available for the radio network and at least $1.25 billion would be available to develop the standards and technology for the network's evolved packet core.[123] A State and Local Implementation Fund of $250 million would be created to distribute grants from the fund for the purpose of connecting to the nationwide network.[124] The Corporation would be required to develop its own revenue streams through assessing and collecting fees for network use by third parties.[125]

The bills would direct the FCC to reallocate the D Block to public safety use and to assign it and the existing public safety broadband license to the newly created corporation.[126] The bills would also authorize the FCC to allow narrowband spectrum to be used flexibly, including for public safety broadband communications.[127]

The Public Safety Trust Fund would be required to provide grants to NIST for research and development for various purposes as required by the bills, including for public safety needs.[128] The fund would also be used for wireless communications research to be undertaken by the National Science Foundations and the Defense Advanced Research Projects Agency (DARPA).[129]

[120] H.R. 2482, Sec. 202.

[121] H.R. 2482, Sec. 203.

[122] H.R. 2482, Sec. 401 (a).

[123] H.R. 2482, Sec. 401 (b) (4).

[124] H.R. 2482, Sec. 401 (b) (3).

[125] H.R. 2482, Sec. 208.

[126] H.R. 2482, Sec. 101.

[127] H.R. 2482, Sec. 102.

[128] H.R. 2482, Sec. 401 (b) (5).

[129] H.R. 2482, Sec. 401 (b) (6).

To capture spectrum license auction revenues, the bills would extend the auction authority from the end of FY2012 to FY2021.[130] The bills would also authorize the FCC to conduct incentive auctions.[131] At least 5%, but no more than $1 billion of auction proceeds, would be available for an Incentive Auction Relocation Fund. These funds would be available to facilitate the voluntary relinquishment of spectrum licenses. The bills also identify radio frequencies that are to be made available for auction and would require the NTIA to make available at least 15 MHz of contiguous government-occupied spectrum between the 1675 to 1710 MHz band within one year of enactment of the bill.[132]

American Jobs Act of 2011, Subtitle H (S. 1549 and H.R. 12)

S. 1549 and its companion bill, H.R. 12, would create a private, non-profit Public Safety Broadband Corporation to provide governance for a nationwide interoperable network for public safety communications.[133] The board of directors of the corporation would include the Secretaries of Commerce and Homeland Security, the Attorney General, and the Director of the Office of Management and Budget, or their designees. Eleven nonfederal members would also sit on the board.[134]

The corporation would be tasked with deploying and operating the nationwide network according to provisions established in the bills.[135]

The bills would create a Public Safety Trust Fund that would receive proceeds of auctions of commercial spectrum licenses, including federal spectrum repurposed for commercial use, as described in the bill.[136] The Public Safety Broadband Corporation would receive grants through the fund.[137] The bills would require funding for the corporation of $6.45 billion, after submission of a five-year budget to be approved by the Secretary of Commerce, in consultation with the Secretary of Homeland Security, the Director of the Office of Management and Budget, and the Attorney General of the United States.[138] A State and Local Implementation Fund of $200 million would be created to distribute grants from the fund for the purpose of connecting to the nationwide network.[139] The Corporation would be required to develop its own revenue streams through assessing and collecting fees for network use by third parties.[140]

[130] H.R. 2482, Sec. 301.
[131] H.R. 2482, Sec. 303.
[132] H.R. 2482, Sec. 302.
[133] S. 1549, Sec 284.
[134] S. 1549, Sec 285.
[135] S. 1549, Sec 288.
[136] S. 1459, Sec. 297 (a).
[137] S. 1459, Sec. 297 (b).
[138] S. 1459, Sec. 297 (b) (4).
[139] S. 1459, Sec. 297 (b) (3).
[140] S. 1459, Sec. 290.

The bills would direct the FCC to reallocate the D Block for use by public safety entities.[141] The bills would also authorize the FCC to allow narrowband spectrum to be used flexibly, including for public safety broadband communications.[142]

Up to $300 million would be made available for a Wireless Innovation Fund that might go to NIST for public safety research and development. The Director of the Office of Management and Budget would be required to approve the spend plan. If less that $300 million is provided to NIST, the remainder would go to the Public Safety Broadband Corporation.[143]

To capture spectrum license auction revenues, the bills would make the FCC's auction authority permanent.[144] The bills would also authorize the FCC to conduct incentive auctions if consistent with the public interest.[145] No more than $1 billion of auction proceeds would be available for an Incentive Auction Relocation Fund for incentive auctions.[146] The bill would require the NTIA to make available at least 15 MHz of contiguous government-occupied spectrum between the 1675 to 1710 MHz band within one year of enactment of the bill.[147] Additional frequencies are also identified for possible auction.[148]

Broadband for Public Safety Act of 2011, S. 1040

Under S. 1040, governance would come primarily from grants administration. DHS would administer grants programs set up through the creation of a Construction Fund.[149] DHS would also administer a Maintenance and Operation Fund.[150] The Comptroller General would be required to perform audits.[151] The FCC would retain its power to establish the roles and responsibilities of the PSBL.[152] The bill would expand the Board of Directors of the PSBL, mandating the appointment of representatives from over 40 associations listed in the bill and allowing for the election of additional members.[153]

S. 1040 would require each state to provide information about its plans for deployment of the new network;[154] the plans would be submitted to DHS and the FCC for joint review and approval.[155] Grants could be applied to improvements and new infrastructure to meet public safety requirements for networks in the 700 MHz band, the 800 MHz band, or the 4.9 GHz band.[156] The

[141] S. 1549 (Sec 281).
[142] S. 1549 (Sec 282).
[143] S. 1549, Sec. 297 (b) (5).
[144] S. 1459, Sec. 275.
[145] S. 1459, Sec. 273.
[146] S. 1459, Sec. 297 (b) (2).
[147] S. 1459, Sec. 277 (a)
[148] S. 1459, Sec. 277 (b)
[149] S. 1040, Sec. 203 (a).
[150] S. 1040, Sec. 204.
[151] S. 1040, Sec. 205.
[152] S. 1040, Sec. 106.
[153] S. 1040, Sec. 106 (1) and (2).
[154] S. 1040, Sec. 105 (a).
[155] S. 1040, Sec. 105 (b).
[156] S. 1040, Sec. 203 (b) (1) and (2).

OEC would advise construction grant recipients on best practices and would provide guidance of project implementation.[157]

The Construction Fund and the Maintenance and Operation Fund would receive proceeds from spectrum license auctions, as designated in the bill.[158] The first $5.5 billion from designated auctions would be deposited in the Construction Fund.[159] Auction proceeds in excess of $5.5 billion, up to $11 billion, would go to the Maintenance and Operation Fund.[160] Auction revenues above $11 billion would be applied to deficit reduction.[161] Any unspent money in the Construction Fund would be transferred to the Maintenance and Operation Fund at the conclusion of the construction phase; the end of the construction phase would be determined by DHS.[162] Any revenue from sharing, leasing, or sublicensing access to the public safety spectrum licenses or infrastructure would be deposited in the Maintenance and Operation Fund.[163]

The FCC would be directed to reallocate the D Block for public safety use and assign the license to the PSBL.[164] The PSBL would be permitted to authorize providers of public safety services to construct and operate wireless broadband public safety networks on its spectrum holdings.[165] The FCC would be required to authorize shared use, sublicensing, or leasing, provided that public safety services receive priority access to the network.[166] Spectrum allocated for public safety use at 4.9 GHz would be opened to restricted sharing with commercial users.[167] The FCC, in consultation with NIST, DHS, and others, would also set rules for interoperability between public safety and commercial networks and for roaming.[168] Upon enactment of the bill, the FCC would be required to end the renewal of public safety licenses between 170 MHz and 512 MHz except under circumstances specified in the bill.[169] Within three years, the GAO would be required to submit a report to Congress identifying public safety spectrum holdings that could be reassigned through auction and the likely cost of such a migration.[170] The FCC would be required to submit a report to Congress on how public safety agencies are using public safety spectrum allocations and whether more spectrum should be made available.[171] Within five years, the FCC and other stakeholders would be required to provide a recommendation to Congress regarding the transfer of communications systems below 512 MHz to public safety licenses in the 700 MHz and 800 MHz bands.[172] Funding for this migration might be made available from the Maintenance and

[157] S. 1040, Sec. 203 (e).
[158] S. 1040, Sec. 202 (b).
[159] S. 1040, Sec. 202 (b) (1).
[160] S. 1040, Sec. 202 (b) (2).
[161] S. 1040, Sec. 201 (b) (3).
[162] S. 1040, Sec. 202 (c).
[163] S. 1040, Sec. 103 (a) (3) (C).
[164] S. 1040, Sec. 102.
[165] S. 1040, Sec. 103 (a) (1).
[166] S. 1040, Sec.103 (a) (3) (A).
[167] S. 1040, Sec. 207 (c).
[168] S. 1040, Sec. 103 (a) (4).
[169] S. 1040, Sec. 207 (b)
[170] S. 1040, Sec. 207 (d).
[171] S. 1040, Sec. 207 (d) (2).
[172] S. 1040, Sec. 207 (b) (2).

Operation Fund.[173] The bill would mandate that all federal law enforcement agency communications not operating on commercial networks transfer to frequencies in the 700 MHz and 800 MHz bands, within ten years of the date of enactment of the bill.[174]

The bill specifies minimum requirements to be established by the FCC for the broadband network.[175] DHS, in consultation with NIST, shall establish standards to meet the public safety requirements developed by the FCC.[176] The FCC, in consultation with DHS and the NTIA, would be required to issue a report and order on the use of IP-enabled networks to achieve interoperability.[177]

To capture spectrum license auction revenues, S. 1040 would extend the auction authority from the end of FY2012 to FY2020.[178] An auction of at least 15 MHz of contiguous spectrum from frequencies between 1675 – 1710 MHz would be required within a year of enactment of the bill.[179] Additional frequencies are identified for auction not later than January 31, 2014.[180]

Broadband for First Responders Act, H.R. 607

H.R. 607 would expand the Board of Directors of the PSBL, mandating the appointment of representatives from 40 associations listed in the bill and allowing for the election of additional members.[181] The licensee would be required to submit a report to Congress on network plans.[182] The Comptroller General would be required to perform audits.[183]

The FCC would establish the rules for public safety service providers to construct and operate a network on determination by the PSBL that this action would expedite network deployment.[184] DHS would administer grants programs set up through the creation of a Construction Fund and a Maintenance and Operation Fund.[185]

The act would create a Construction Fund and a Maintenance and Operation Fund to receive proceeds from spectrum license auctions.[186] The first $5.5 billion from designated auctions would be deposited in the Construction Fund, with the balance going to the Maintenance and Operation

[173] S. 1040, Sec. 207 (b) (3).
[174] S. 1040, Sec. 207 (a).
[175] S. 1040, Sec. 103 (a) (2).
[176] S. 1040, Sec. 104.
[177] S. 1040, Sec. 208.
[178] S. 1040, Sec. 206 (c).
[179] S. 1040, Sec. 206 (a).
[180] S. 1040, Sec. 206 (b).
[181] H.R. 607, Sec. 104.
[182] H.R. 607, Sec. 102 (b) ‘(b) ‘(2) ‘(C).
[183] H.R. 607, Sec. 205.
[184] H.R. 607, Sec. 102 (b) ‘(b) ‘(2) ‘(A).
[185] H.R. 607, Sec. 202 (a) (1) (A); Sec. 203; and Sec. 204.
[186] H.R. 607, Sec. 202 (b).

Fund.[187] Appropriations of up to $5.5 billion would be authorized to supplement auction revenue, if needed to reach a total of $11 billion.[188]

H.R. 607 would direct the FCC to reallocate the D Block to public safety use and permit access to the public safety broadband spectrum and infrastructure to other providers.[189] The bill would require a public safety agency statement of requirements that would enable nationwide interoperability and roaming across any communications system that used public safety spectrum, as defined in the law.[190] The bill would mandate the transition from narrowband systems below 512 MHz to networks operating on public safety frequencies in the 700 MHz and 800 MHz bands.[191] The FCC and other stakeholders would be required to provide a detailed plan for the transition.[192]

The FCC would set technical and operational rules for the network[193] and, with NIST and others, set requirements to ensure interoperability, security, and functionality. [194] DHS, with NIST, would take the lead in developing standards to meet these and other requirements.[195] The FCC, in consultation with DHS and the NTIA, would be required to issue a report and order on the use of IP-enabled networks to assist interoperability.[196]

To capture spectrum license auction revenues, H.R. 607 would extend the auction authority from the end of FY2012 to FY2020.[197] The GAO would be required to submit a report identifying the frequencies below 512 MHz used by public safety agencies that should be reassigned for auction as commercial licenses.[198] The bill would require the recovery of spectrum at 420-440 MHz and 450-470 MHz for auction and encourage the FCC to reconfigure spectrum to increase the value of these bands.[199] Some of this spectrum is currently assigned for amateur radio use.

Spectrum Innovation Act of 2011, Draft Discussion Bill, House Committee on Energy and Commerce

The draft discussion bill, as circulated at a subcommittee hearing on July 15, 2011,[200] might require the FCC to contract with an Administrator for a National Communications Plan to be

[187] H.R. 607, Sec. 202 (b) (1) and (2).

[188] H.R. 607, Sec. 202 (e).

[189] H.R. 607, Sec. 102 (a) and (b) ‘(b) (2) (A).

[190] H.R. 607, Sec. 103 (a).

[191] H.R. 607, Sec. 207 (a).

[192] H.R. 607, Sec. 207 (c).

[193] H.R. 607, Sec. 102 (b) ‘(b) ‘(2) ‘(B).

[194] H.R. 607, Sec.103 (a).

[195] H.R. 607, Sec. 103 (b).

[196] H.R. 607, Sec. 210.

[197] H.R. 607, Sec. 208.

[198] H.R. 607, Sec. 207 (b).

[199] H.R. 607, Dec. 207 (d).

[200] House, Committee on Energy and Commerce, Subcommittee on Communications and Technology, “Legislative Hearing to Address Spectrum and Public Safety Issues,” July 15, 201a. Available at http://republicans.energycommerce.house.gov/Media/file/Hearings/Telecom/071511/DiscussionDraft.pdf.

developed by a planning board in accordance with requirements in the bill. Federal members on the board might be limited to one each from four agencies: the FCC, NTIA, DHS, and NIST. Qualifications for nine non-federal members are specified in the draft discussion bill. Minimum requirements for the plan are proposed.

The approved plan might be implemented by the FCC. States, under the direction and guidance of the FCC and of the National Communications Plan Administrator, might be required to contract for the construction and operation of a broadband network on the broadband spectrum assigned to them according to statutes in the bill.

Some auction proceeds (amount not designated in publicly available draft) might be transferred to a Public Safety Broadband Communications Implementation Fund created for the purposes described in the bill. The FCC might be empowered to make grants to states for the construction and operation of broadband networks, subject to requirements proposed in the discussion draft.

The Public Safety Broadband License for 763-768 MHz and 793-798 MHz might be assigned for the exclusive use of each state. No further action on the D Block is proposed in the draft discussion bill considered in committee on July 15, 2011.

The FCC might set technical requirements, in addition to those proposed in the bill. The public safety broadband networks built by the states might be required to be integrated with 911 call centers.

To capture spectrum license auction revenues, the draft discussion bill might extend the authority of the FCC from the end of FY2012 to FY2021. Frequencies used by the federal government are identified for possible auction. The FCC might be given the authority to establish incentive auctions; statutory protections regarding TV broadcasters participating in or affected by incentive auctions are proposed. Other provisions regarding auctions might be applied.

Appendix B. Proposals for Spectrum Assignment

The Federal Communications Commission (FCC)[201] is the only federal agency to propose a national network for public safety communications infrastructure and to take action to plan, implement, and fund it. The FCC has proposed a public-private partnership to build a broadband network to benefit public safety. [202] Its proposal would incorporate obligations into auction rules for a commercial network operator that would provide for a shared, national network using public safety and commercial frequencies at 700 MHz. Planning for the network would be conducted on a nationwide basis. To create the partnership, the FCC provided for two national licenses of 10 MHz each. One license was assigned to a Public Safety Broadband Licensee (PSBL). The 10-MHz license held by the PSBL is part of the 24 MHz originally assigned to public safety. The other license—designated the Upper Block D, or D Block—was scheduled for auction in 2008 to a commercial provider. At the auction, the FCC's requirements could not be met by any bidder. The failure to find a commercial partner to work with the public safety license-holder effectively reset the planning process to zero. The FCC decided to include an assessment of public safety broadband needs as part of its preparation of a national broadband plan, as required by the American Recovery and Reinvestment Act.[203] With a public notice released September 28, 2009,[204] the FCC sought information about current and potential future use of broadband in public safety communications.

As stated above, after the auction of the D Block failed in early 2008, the FCC issued a new request for comments on how to restructure the auction to provide a network that would meet public safety needs. This led to a host of new suggestions on how to use the spectrum. The FCC's choices, however, are constrained by provisions of the Deficit Reduction Act of 2005 that require it to auction the D Block. Many of the options proposed to the FCC might therefore require Congress to amend the act or to introduce other enabling legislation.

Comments filed with the FCC[205] have opened debates about alternative courses of action. Although there are a number of different proposals, each in some way addresses the question of whether it will be public safety representatives or commercial owners and network operators that control the decision-making process. The following is a summary of proposals under discussion and possible agency or legislative actions that might be needed to implement them.[206] Other options may be proposed or developed.

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[201] The FCC manages spectrum access for commercial and other nonfederal uses. The National Telecommunications and Information Administration is responsible for overseeing spectrum used by federal agencies.

[202] FCC, *Second Report and Orde*r, July 31, 2007, WT Docket No. 96-86 and *Third Further Notice of Proposed Rulemaking*, released September 25, 2008, PS Docket No 06-229, http://fjallfoss.fcc.gov/edocs_public/attachmatch/FCC-08-230A1.pdf. Additional comments have been sought through other mechanisms and the docket remains open.

[203] P.L. 111-5, Division B, Title VI, Sec. 6001 (k) (1), 123 STAT. 515.

[204] FCC, NBP Public Notice # 8, *Additional Comment Sought on Public Safety, Homeland Security, and Cybersecurity Elements of National Broadband Plan*, DA 09-2133, released September 08, 2009, GN Docket Nos. 09-47, 09-51, 09-137, at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-09-2133A1.pdf.

[205] PS Docket No. 06-229.

[206] Proposals for building a new network and assigning spectrum were the topic of a hearing held by the House Committee on Energy and Commerce, Subcommittee on Communications, Technology, and the Internet, "A National, Interoperable Broadband Network for Public Safety: Recent Developments," September 24, 2009.

Auction the D Block to Commercial Interests

- Agree to new rules for a D Block auction that satisfy the key goals laid out by the FCC for a shared network that benefits both public safety users and commercial interests. The D Block might be auctioned as a single, national license or as many licenses assigned to specific geographic areas. The FCC has the authority to structure such an auction under the Communications Act of 1934, as amended, including the amendments provided by the Deficit Reduction Act of 2005. This approach was recommended by the FCC.
- Auction the D Block without any obligations to share with public safety. Public safety agencies could eventually add broadband applications to communications systems built in the 24 MHz of frequencies originally assigned to them. The FCC has the authority to facilitate this decision.
- Auction the D Block without any obligations to share with public safety and "give" the auction proceeds to public safety, possibly by transferring it to an existing grants program. One program that has been mentioned is the Public Safety Interoperable Communication (PSIC) grant program set up by a provision in the Deficit Reduction Act of 2005. Congress might choose to amend the provisions for grants in the Deficit Reduction Act of 2005 or it might choose to create new legislation specifically for the distribution of the D Block auction proceeds. In either case, the cost of new authorizations would be scored by the Congressional Budget Office. Except where Congress has provided for exceptions, the Communications Act of 1934 states that, as a general rule, auction proceeds are deposited in the U.S. Treasury.[207]

Assign the D Block to Public Safety Licensees

- Assign the D Block to the Public Safety Broadband Licensee to administer as part of plans for a nationwide, interoperable broadband network for public safety. Because the Deficit Reduction Act of 2005 included the D Block frequencies among those that the FCC was required to auction, it appears that Congress must amend the law in order for this particular option to be exercised.
- Assign the D Block to the Public Safety Broadband Licensee for administration and provide federal grants to state, local or regional agencies to build and operate the network. This approach, which would include spectrum license auctions as a source of revenue, has been endorsed by the Obama Administration and is included in its 2012 Budget.[208]
- Assign the D Block to state, local, or regional network managers. These would negotiate with commercial partners on how to build, operate, and fund a shared network. This action would require agreement among the participants on how to assure nationwide interoperability of the separate networks. The Public Safety Broadband Licensee would provide matching sub-licenses for its spectrum holdings in those areas.

[207] 47 U.S.C. 309 (j) (8) (A).

[208] Office of Management and Budget, *The Federal Budget: Fiscal Year 2012*, Appendix: Other Federal Agencies, Federal Communications Commission (p. 1227 *et seq.)*.

- Combine the D Block with the existing public safety broadband license and award the license to a new not-for-profit corporation set up for the purpose of building and administering the public safety broadband network. Funding sources for the network would be a mix of federal and private sector investment.

Auction the D Block and the Public Safety Broadband Network Licenses

- Combine the 10-MHz D Block with the 10-MHz Public Safety Broadband License and auction the newly created 20-MHz block, with sharing requirements similar to some of those considered by the FCC for the D Block auction. Funds from the auction proceeds might go to public safety through a program established for that purpose. In addition to legislation that would establish the funding program, Congress might need to amend language in the Balanced Budget Act of 1997 that directed the FCC to assign 24 MHz from the 700 MHz band to public safety.

Appendix C. Congressional Efforts on Behalf of Public Safety Communications

Many of the statutes passed since 2001 have provided guidelines and set performance goals for public safety communications while delegating decisions about implementation to federal agencies and state officials. Although Congress has appropriated money for public safety communications, it has not directly addressed the question of investment in network infrastructure, leaving it largely to federal agencies to set priorities for how public safety grants can be used. Grants for emergency communications have been used to purchase equipment that facilitates interoperability, for planning, and for training.

Congress first addressed the issue of emergency communications interoperability in the Balanced Budget Act of 1997 by providing additional radio frequency spectrum that would allow for interoperable networks. Provisions intended to improve interoperable functions in public safety networks were included in the Homeland Security Act of 2002 (P.L. 107-296). Two years later, responding to recommendations of the National Commission on Terrorist Attacks Upon the United States (9/11 Commission), Congress included a section in the Intelligence Reform and Terrorism Prevention Act of 2004 (P.L. 108-458) that expanded its requirements for action in improving interoperability and public safety communications. Also in response to a recommendation by the 9/11 Commission, Congress set a firm deadline for the release of radio frequency spectrum needed for public safety radios, as part of the Deficit Reduction Act of 2005 (P.L. 109-171). These laws provided the base from which the Department of Homeland Security (DHS) might develop a national public safety communications capability as required by the Homeland Security Appropriations Act, 2007 (P.L. 109-295). Title VI, Subtitle D of the act, referred to as the 21st Century Emergency Communications Act of 2006, placed new requirements on DHS. Additional requirements were included in the Implementing Recommendations of the 9/11 Commission Act of 2007 (P.L. 110-53).

Balanced Budget Act of 1997

The initial allocation to public safety of frequencies in the 700 MHz band was required by Congress in the Balanced Budget Act of 1997 (P.L. 105-33),[209] which directed the Federal Communications Commission (FCC) to designate 24 MHz of spectrum capacity for public safety. To carry out the process of assigning this newly allocated spectrum asset, the FCC created the Public Safety National Coordination Committee (NCC) as a Federal Advisory Committee. Active from 1999 through 2003, the NCC had a Steering Committee from government, the public safety community, and the telecommunications industry. The NCC developed technical and operational recommendations for the 700 MHz band, including plans for interoperable channels. The existing governance for these channels is through Regional Planning Committees (RPCs),[210] established and loosely coordinated by the FCC, with the participation of the National Public Safety Telecommunications Council (NPSTC), a group consisting primarily of public safety associations. The RPCs are responsible for submitting 700 MHz band plans to the FCC for approval, and for managing these plans.

[209] 47 U.S.C. §309 (j) (14).

[210] Additional information at http://www.fcc.gov/pshs/public-safety-spectrum/700-MHz/regional-planning.html.

The Homeland Security Act of 2002 and Actions by the Department

Provisions of the Homeland Security Act instructed DHS to address some of the issues concerning public safety communications in emergency preparedness and response and in providing critical infrastructure. Telecommunications for first responders is mentioned in several sections, with specific emphasis on technology for interoperability.[211]

The newly created DHS placed responsibility for interoperable communications within the Directorate for Science and Technology, reasoning that the focus of DHS efforts would be on standards and on encouraging research and development for communications technology. Responsibility to coordinate and rationalize federal networks, and to support interoperability, had previously been assigned to the Wireless Public SAFEty Interoperable COMmunications Program—called Project SAFECOM—by the Office of Management and Budget as an e-government initiative. With the support of the George W. Bush Administration, SAFECOM was placed in the Science and Technology directorate and became the lead agency for coordinating federal programs for interoperability.[212] The Secretary of Homeland Security assigned the responsibility of preparing a national strategy for communications interoperability to the Office of Interoperability and Compatibility (OIC), which DHS created, an organizational move that was later ratified by Congress in the Intelligence Reform and Terrorism Prevention Act.[213] SAFECOM continued to operate as an entity within the OIC, which assumed the leadership role.

Intelligence Reform and Terrorism Prevention Act

Acting on recommendations made in 2004 by the 9/11 Commission, Congress included several sections regarding improvements in communications capacity—including clarifications to the Homeland Security Act—in the Intelligence Reform and Terrorism Prevention Act (P.L. 108-458).

The Commission's analysis of communications difficulties on September 11, 2001, was summarized in the following recommendation.

> Congress should support pending legislation which provides for the expedited and increased assignment of radio spectrum for public safety purposes. Furthermore, high-risk urban areas such as New York City and Washington, D.C., should establish signal corps units to ensure communications connectivity between and among civilian authorities, local first responders, and the National Guard. Federal funding of such units should be given high priority by Congress.[214]

Congress addressed both the context and the specifics of the recommendation for signal corps capabilities. The Intelligence Reform and Terrorism Prevention Act amended the Homeland Security Act to specify that DHS give priority to the rapid establishment of interoperable capacity in urban and other areas determined to be at high risk from terrorist attack. The Secretary of Homeland Security was required to work with the Federal Communications Commission (FCC),

[211] Notably, P.L. 107-296, Sec. 232, 116 STAT. 2159 and Sec. 502, 116 STAT. 2213.

[212] "Homeland Security Starting Over With SAFECOM," *Government Computer News*, June 9, 2003.

[213] P.L. 108-458, Title VII, Subtitle C, Sec. 7303 (a) (2), 118 STAT. 3843-3844.

[214] *The 9/11 Commission Report: Final Report of the National Commission on Terrorist Attacks Upon the United States*, Washington: GPO, 2004, p. 397.

the Secretary of Defense, and the appropriate state and local authorities to provide technical guidance, training, and other assistance as appropriate. Minimum capabilities were to be established for "all levels of government agencies," first responders, and others, including the ability to communicate with each other.[215] The act further required the Secretary of Homeland Security to establish at least two trial programs in high-threat areas. The process of development for these programs was to contribute to the creation and implementation of a national model strategic plan. The purpose was to foster interagency communications at all levels of the response effort. Building on the concept of using the Army Signal Corps as a model, the law directed the Secretary to consult with the Secretary of Defense in the development of the test projects, including review of standards, equipment, and protocols.[216]

Congress also raised the bar for performance and accountability, setting program goals for the Department of Homeland Security. Briefly, the goals were to:

- Establish a comprehensive, national approach for achieving interoperability;
- Coordinate with other federal agencies;
- Develop appropriate minimum capabilities for interoperability;
- Accelerate development of voluntary standards;
- Encourage open architecture and commercial products;
- Assist other agencies with research and development;
- Prioritize, within DHS, research, development, testing and related programs;
- Establish coordinated guidance for federal grant programs;
- Provide technical assistance; and
- Develop and disseminate best practices.

The act included a requirement that any request for funding from DHS for interoperable communications "for emergency response providers" be accompanied by an Interoperable Communications Plan, approved by the Secretary. Criteria for the plan were also provided in the act.[217]

The act also provided a sense of Congress that the next Congress—the 109th—should pass legislation supporting the Commission's recommendation to expedite the release of spectrum. This was addressed in the Deficit Reduction Act of 2005 (P.L. 109-171).

Deficit Reduction Act of 2005 and the Public Safety Interoperability Grant Program

Provisions in the Deficit Reduction Act of 2005 planned for the release of spectrum by February 18, 2009,[218] and created a fund to receive spectrum auction proceeds and disburse

[215] P.L. 108-458, Title VII, Subtitle C, Sec. 7303, 118 STAT. 3843 *et seq*.

[216] P.L. 108-458, Title VII, Subtitle C, Sec. 7304, 118 STAT. 3847-3848.

[217] P.L. 108-458, Title VII, Subtitle C, Sec. 7303 118 STAT. 3843 *et seq*.

[218] P.L. 109-171, Sec. 3002 (a) (1) (B). The deadline was later extended through June 12, 2009, by the DTV Delay Act, (continued...)

designated sums to the Treasury and for other purposes,[219] including a grant program of up to $1 billion for public safety agencies. The fund's disbursements were to be administered by the NTIA.[220] At the time, the Congressional Budget Office projected that the grants program for public safety would receive $100 million in FY2007, $370 million in FY2008, $310 million in FY2009 and $220 million in FY2010.[221] However, the 109th Congress, in its closing hours, passed a bill with a provision requiring that the grants program receive "no less than" $1 billion to be awarded "no later than" September 30, 2007.[222] Language in Implementing Recommendations of the 9/11 Commission Act of 2007 (P.L. 110-53) required some changes in the grant program and reaffirmed the 2007 fiscal year deadline.[223]

In February 2007, the NTIA transferred the management of the public safety grant program to DHS, signing a memorandum of understanding (MOU) with the Office of Grants and Training.[224] The MOU included an overview of how the Public Safety Interoperable Communications (PSIC) Grant Program, as it is called, is to be administered. The overview was reiterated and explained in testimony.[225] Both the MOU and the testimony indicate that the priority was to fund needs identified through Tactical Interoperable Communications Plans and Statewide Interoperable Plans developed in conjunction with SAFECOM.

On July 18, 2007, the Secretaries of Commerce and Homeland Security jointly announced the details of the PSIC grant program.[226] The program, as announced, was to provide $968,385,000 in funding for all 50 states, the District of Columbia, and U.S. Territories.[227] The announcement of the top-level, statewide allocations met the September 30 deadline set by Congress. The states were required to submit brief descriptions of envisioned projects and how grant requirements and guidelines would be met. One of the requirements was that states must have a Statewide Communication Interoperability Plan (SCIP) that has been approved by DHS's Office of Emergency Communications. Actual expenditure amounts are reported as states tap their allocations. Under current law, the states and eligible territories have until the end of FY2011, with a possible extension to 2012, to use the funds made available to them.[228]

(...continued)

P.L. 111-4, Sec. 2 (a) (1).

[219] P.L. 109-171, Sec. 3004, 120 STAT. 22-23.

[220] P.L. 109-171, Sec. 3006, 120 STAT. 24-25.

[221] Congressional Budget Office Cost Estimate, S. 1932, Deficit Reduction Act of 2005, January 27, 2006, p. 21, http://www.cbo.gov/showdoc.cfm?index=7028&sequence=0.

[222] P.L. 109-459, Sec. 2.

[223] P.L. 110-53, Implementing Recommendations of the 9/11 Commission Act of 2007, Title XXII, Sec. 2201, 121 STAT. 537 *et seq*.

[224] MOU at http://www.ntia.doc.gov/otiahome/psic/PSICMOU_Executed_2-16-2007.pdf.

[225] Testimony of Corey Gruber, Acting Assistant Secretary for Grants and Planning, Office of Grants and Training, Department of Homeland Security at hearing on "Public Safety Interoperable Communications Grants: Are the Departments of Homeland Security and Commerce Effectively Coordinating to Meet our Nation's Emergency Communications Needs?" House of Representatives, Homeland Security Committee, Subcommittee on Emergency Communications, Preparedness, and Response, March 14, 2007.

[226] Press releases at http://www.dhs.gov/xnews/releases/pr_1184783934669.shtm and http://www.ntia.doc.gov/ntiahome/press/2007/PSIC_071807.pdf.

[227] See http://www.dhs.gov/xgovt/grants/gc_1184774852768.shtm. The NTIA website main page has a section devoted to PSIC at http://www.ntia.doc.gov.

[228] FEMA, Grants Program Directorate, Information Bulletin No. 337, November 23, 2009, at http://www.ntia.doc.gov/psic/IJ/wv.pdf.

In 2010, an audit by the Office of the Inspector General (OIG), Department of Commerce, provided PSIC grant amounts and drawdowns by state through March 31, 2010. At that time the drawdowns amounted to 31% of the $968.4 million made available through the PSIC program.[229] The OIG has undertaken audits of PSIC grants in nine states that provide some information on how the grant money is being used.[230]

The Homeland Security Appropriations Act, 2007

The destruction caused by Hurricanes Katrina and Rita in August-September 2005 reinforced the recognition of the need for providing interoperable, interchangeable communications systems for public safety and also revealed the potential weaknesses in existing systems to withstand or recover from catastrophic events. Testimony at numerous hearings following the hurricanes suggested that DHS was responding minimally to congressional mandates for action, most notably as expressed in the language of the Intelligence Reform and Terrorism Prevention Act. Bills subsequently introduced in both the House and the Senate proposed strengthening emergency communications leadership and expanding the scope of the efforts for improvement. Some of these proposals were included in Title VI of the Homeland Security Appropriations Act, 2007 (P.L. 109-295). Title VI—the Post-Katrina Emergency Management Reform Act of 2006—reorganized the Federal Emergency Management Agency (FEMA), gave the agency new powers, and clarified its functions and authorities within DHS.[231]

The act also addressed public safety communications in Title VI, Subtitle D—the 21st Century Emergency Communications Act of 2006. This section created an Office of Emergency Communications (OEC) and the position of Director, reporting to the Assistant Secretary for Cybersecurity and Communications. The Director was required to take numerous steps to coordinate emergency communications planning, preparedness, and response, particularly at the state and regional level. These efforts were to include coordination with Regional Administrators appointed by the FEMA Administrator to head ten Regional Offices. To assist these efforts, Congress required the creation of Regional Emergency Communications Coordination (RECC) Working Groups.[232]

Other responsibilities assigned to the Director included conducting outreach programs, providing technical assistance, coordinating regional working groups, promoting the development of standard operating procedures and best practices, establishing nonproprietary standards for interoperability, developing a national communications plan, working to assure operability and interoperability of communications systems for emergency response, and reviewing grants. Required elements of the National Emergency Communications Plan (NECP) included establishing requirements for assessments and reports, and an evaluation of the feasibility of developing a mobile communications capability modeled on the Army Signal Corps. The

[229] NTIA, *Second Annual Assessment of the Public Safety Interoperable Communications Grant Program*, Final Report No. OIG-11-001-A, October 7, 2010, at http://www.oig.doc.gov/oig/reports/2010/OIG-11-001-A.pdf.

[230] See http://www.oig.doc.gov/Pages/National-Telecommunications-and-Information-Administration.aspx?YearStart=01/01/2010&YearEnd=12/31/2010 and http://www.oig.doc.gov/Pages/National-Telecommunications-and-Information-Administration.aspx?YearStart=01/01/2009&YearEnd=12/31/2009. The states are Texas, Florida, Massachusetts, California, Pennsylvania, Louisiana, Nevada, New York, and Arkansas.

[231] Information on the FEMA reorganization is provided in CRS Report RL33729, *Federal Emergency Management Policy Changes After Hurricane Katrina: A Summary of Statutory Provisions*, coordinated by Keith Bea.

[232] P.L. 109-295, Title VI, Sec. 671(b), 'Title XVIII, 'Sec. 1805, 120 STAT. 1439.

feasibility study was to be done by DHS on its own or in cooperation with the Department of Defense. Congress also required assessments of emergency communications capabilities, including an inventory that identified radio frequencies used by federal departments and agencies.[233] The completed National Emergency Communications Plan set goals for improving emergency communications and interoperability but did not address developing a network infrastructure for public safety communications or for using the 700 MHz spectrum for that purpose.[234]

To support its vision of interoperability as a system of systems, DHS sponsored an Emergency Response Council (ERC) composed of several dozen agencies, associations, and other entities involved in public safety and emergency response planning. [235] In 2007 the ERC provided a set of agreements on a Nationwide Plan for Interoperable Communications. The ERC published 12 guiding principles deemed essential to their key goals of forging partnerships, designing interoperable systems, educating policymakers, and allocating resources.[236] To date, the council's role has been primarily to establish a base for advocacy and communication among representatives of public safety agencies and associations.

Regional Emergency Communication Coordination

In P.L. 109-295, Congress directed the OEC to coordinate with the Regional Emergency Communication Coordination (RECC) Working Groups established by FEMA.[237] These groups were to provide a platform for coordinating emergency communications plans among states and were intended to include representatives from many sectors with responsibility for public safety and security. Plans for forming RECCs were announced in December 2007. In 2008 organization charts were developed, graphing how the RECCs were structured and where they would fit in the existing chain-of-command of the Federal Emergency Management Agency (FEMA). A National RECC Coordinator was appointed and plans were announced to appoint administrators for each of the regions.

A key proposal for the RECC structure is to "Establish and use the RECC's as a single Federal emergency communications coordination point for Federal interaction with the State, local and tribal governments."[238] Congress placed an emphasis on assisting first responders in its statement of RECC goals but did not limit the RECCs' ability to set more inclusive goals. Although the RECCs might be an effective conduit for interaction to develop policies and plan for shared infrastructure, they are currently used primarily as a forum for FEMA's Disaster Operations Directorate to relay guidelines and orders. Based on the role of RECCs as assigned by the

[233] P.L. 109-295, Title VI, Sec. 671(b), 'Title XVIII, 'Sec. 1803, 120 STAT. 1437-1438.

[234] DHS, National Emergency Communications Plan, July 2008, http://www.dhs.gov/xlibrary/assets/national_emergency_communications_plan.pdf.

[235] "Our vision was developed at the 2003 SAFECOM/AGILE Joint Program Planning Meeting in San Diego, CA.", Emergency Response Council, *Agreements on a Nationwide Plan for Interoperable Communications*, Summer 2007, footnote 1.

[236] *Op. cit., Agreements on a Nationwide Plan for Interoperable Communications.*

[237] P.L. 109-295, Title VI, Sec. 671(b), "Title XVIII, "Sec. 1805, 120 STAT. 1439.

[238] Presentation by Brian Carney, National RECC Coordinator, Disaster Operations Directorate, Federal Emergency Management Agency, Department of Homeland Security, "Regional Emergency Communications Coordination Working Groups (RECCWG)" at National Public Safety Telecommunications Council (NPSTC), Seattle, Washington, September 15, 2008, http://www.npstc.org/meetings/GB_Carney_RECC%20Briefing_090208_NPSTC.ppt.

National Emergency Communications Plan, their focus will be on assisting first responders to prepare for disaster response. Leadership will be provided by FEMA and governance will be through the chain-of-command of the agencies' directorates.

The formation of the regional working groups, the RECCs, responded in part to requests from the public safety community to expand interoperable communications planning to include the second tier of emergency workers. Nonfederal members of the RECC are to include first responders, state and local officials and emergency managers, and public safety answering points (911 call centers). Additionally, RECC working groups are to coordinate with a variety of communications providers (such as wireless carriers and cable operators), hospitals, utilities, emergency evacuation transit services, ambulance services, amateur radio operators, and others as appropriate.

National Emergency Communications Plan

In compliance with requirements of the Homeland Security Appropriations Act, 2007, the Department of Homeland Security issued the National Emergency Communications Plan (NECP) in July 2008.[239]

The NECP sets three goals for levels of interoperability[240]

- By 2010, 90% of all areas designated within the Urban Areas Security Initiative (UASI) will demonstrate response-level emergency communications, as defined in grant programs, within one hour for routine events involving multiple jurisdictions and agencies.
- By 2011, 75% of non-UASI will have achieved the goal set for UASIs.
- By 2013, 75% of all jurisdictions will be able to demonstrate response-level emergency communications within three hours for a significant incident as outlined in national planning scenarios.

These jurisdictional goals are to be knit together into a national communications capability through program efforts such as FEMA's Regional Emergency Communications Coordination (RECC) Working Group. The three goals are bolstered by seven objectives for improving emergency communications for first responders, dealing largely with organization and coordination.[241] Each of these objectives has "Supporting Initiatives" and milestones.

[239] DHS, National Emergency Communications Plan, July 2008: http://www.dhs.gov/xlibrary/assets/national_emergency_communications_plan.pdf.

[240] National Emergency Communications Plan, "Executive Summary," p. ES-1.

[241] Ibid., "Executive Summary," p. ES-2.

Author Contact Information

Linda K. Moore
Specialist in Telecommunications Policy
lmoore@crs.loc.gov, 7-5853