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The First Responder Network (FirstNet) and Next-Generation Communications for Public Safety: Issues for Congress

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February 27, 2015

Congressional Research Service

7-5700

www.crs.gov

R42543

Summary

Congress included provisions in the Middle Class Tax Relief and Job Creation Act of 2012 (P.L. 112-96) for planning, building, and managing a new, nationwide, broadband network for public safety communications, by creating the First Responder Network Authority (FirstNet). The act assigned 10 MHz of additional radio frequency spectrum to accommodate the new network and required that the Federal Communications Commission (FCC) assign a license to FirstNet, comprising the newly assigned frequencies and 10 MHz previously assigned to states by the FCC for public safety use. In addition, the act has designated federal appropriations of over \$7 billion for the network and other public safety needs. These funds are provided through new revenue from the auction of spectrum licenses to the commercial sector.

The establishment of FirstNet is an important step toward reaching what has been a widely shared national goal since September 11, 2001: the provision of interoperable communications for first responders. The immediate goal for FirstNet, however, is to provide a broadband network to carry data, although it will provide an option for voice communications as well. Mission critical voice communications will, in many states, be available over Land Mobile Radio (LMR) networks operating on narrowband frequencies previously assigned by the FCC. States participating in FirstNet may need to continue to invest in and maintain their narrowband networks and will likely at the same time be required to fund some part of the build out of state Radio Area Networks proposed by FirstNet, as required in the act. The cost of construction of a nationwide network 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. The law anticipates that some of these costs will be covered by partnerships that permit access to FirstNet's spectrum, and shared use of infrastructure. How much of the benefit of these partnerships will accrue to FirstNet and how much will be available to the states for state-owned and operated networks in their jurisdictions is undetermined.

In addition to monitoring progress in building the new broadband network for public safety, Congress may want to consider ways to ensure that FirstNet will be self-sustaining and that the states will have adequate funds to participate in FirstNet and to maintain public safety communications networks.

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Introduction

The First Responder Network Authority (FirstNet) is a federal agency that includes private sector and other non-federal representation on its board of directors. FirstNet was created by Congress with provisions in Title VI of the Middle Class Tax Relief and Job Creation Act of 2012 (P.L. 112-96) to ensure the deployment and operation of a nationwide, broadband network for public safety communications. It is established as an “independent authority”¹ within the National Telecommunications and Information Administration (NTIA), part of the Department of Commerce.

In addition to establishing the structure and goals for FirstNet, Congress provided \$7 billion for costs related to planning and deploying the network, and a \$135 million grant program to assist states with plans to connect their state radio area networks to FirstNet.² These funds are provided from revenue realized through the auction of licenses for radio frequency spectrum, as designated in the act. The anticipated cost of building and operating a nationwide core broadband network and the interoperable radio networks that connect to it is significantly in excess of the amount appropriated; the act therefore provides for public-private partnerships with FirstNet and for fees to states and other users to ensure that FirstNet becomes self-sustaining. To attract private sector partners, FirstNet can offer access to its assets, including radio frequency spectrum capacity in return for financial payment or other support. FirstNet holds a license for 20 MHz³ of federal spectrum assigned by the Federal Communications Commission (FCC) for broadband use, as required by the act. The act allows states that meet specified requirements to lease spectrum from FirstNet and thereby negotiate their own partnerships to share spectrum in radio area networks for their state or region. The viability of these partnerships depends in part on the amount of spectrum that will be made available to the state.

There are many challenges for public safety leaders and policymakers in establishing the framework for a nationwide network that meets state, local, and tribal needs for robust, interoperable emergency communications. For example, emergency communications networks currently operate on separate networks using different technologies. Furthermore, each state has its own laws and procedures for building, managing, and funding its communications. Establishing a governance model that accommodates current investments and future needs of its state, local, and territorial clients, without compromising the coherence of a national network, is among the challenges facing FirstNet.

Although progress has been made since the FirstNet board first met officially in September 2012, their plans, as outlined in a September 2014 RFI, *Request for Information for Comprehensive Network Solution(s)*,⁴ are focused on providing the core service for a broadband network. Missing so far from the planning process is the inclusion of plans to incorporate state and local

¹ P.L. 112-96, Section 6204 (a).

² P.L. 112-96, Section 6202 (b) (2) (B).

³ For purposes of allocation and assignment, spectrum is segmented into bands of radio frequencies 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 designation can refer to an entire band, such as the 700 MHz band, or to specific frequencies within a band.

⁴ First Net, *Request for Information for Comprehensive Network Solution(s)*, September 17, 2014, <http://www.firstnet.gov/sites/default/files/Request%20for%20Information%20for%20Comprehensive%20Network%20Solutions.pdf>.

narrowband (primarily voice) networks into FirstNet's Public Safety Broadband Network. Since September 11, 2001, state and local agencies have invested in improving the reliability and interoperability of Land Mobile Radio (LMR) communications. The 2014 National Emergency Communications Plan prepared by the Department of Homeland Security emphasizes the need to continue investment in these networks to provide communication for first responders until such time as FirstNet is deployed and capable of handling mission-critical voice communications.⁵

The responsibility for planning to upgrade existing voice networks for interoperability and integrate them with FirstNet appears to fall to the states. The states also must fund existing networks that provide mission critical voice communications while investing in connections to FirstNet's data network. As FirstNet moves from Requests for Information, to Requests for Proposals, to the awarding of a contract or contracts to deploy and operate its broadband network, it may become clear how the needed technical support and funding for state participation will be supplied.

Highlights of Progress Through 2014

The complexities of setting up FirstNet as a federal agency are generally accepted as a primary cause of slow progress in its initial months of operation.⁶ The pace of activity increased in 2014 and FirstNet was able to show measurable accomplishments by yearend. The planning vehicle that has been shared with the public is an executive summary of a "Roadmap,"⁷ adopted by the FirstNet board in March 2014.⁸ The Roadmap focuses on milestones needed to develop a definitive business plan and complete state-based plans. The milestones are

- Staff and resource the organization;
- Complete an open, transparent, and complete process for comprehensive network proposals based upon FirstNet LTE performance requirements, operating standards, and certified devices;
- Complete an open, transparent, and competitive process for network equipment and services proposals based on detailed technical requirements, resulting in multiple awards that could supplement or substitute for all or part of a comprehensive network proposal;
- In conjunction with each of the comprehensive network and network equipment and services processes, obtain proposals for covered leasing agreements that will provide value for our excess network capacity;

⁵ Department of Homeland Security, National Emergency Communications Plan, p7: "... the primary means to achieve mission critical voice communications." At http://www.dhs.gov/sites/default/files/publications/2014%20National%20Emergency%20Communications%20Plan_October%2029%202014.pdf

⁶ Hearing, House Committee on Energy and Commerce, Subcommittee on Communications and Technology, "Oversight of FirstNet and the Advancement of Public Safety Wireless Communications," testimony of Samuel Ginn, Chairman, FirstNet, November 21, 2013.

⁷ "FirstNet Program Roadmap Executive Summary," at http://firstnet.gov/sites/default/files/FirstNet%20Program%20Roadmap%20Executive%20Summary_03112014.pdf.

⁸ FirstNet News, "FirstNet Board of Directors Meets on Strategic Roadmap," March 11, 2014, <http://www.firstnet.gov/news/firstnet-board-directors-meets-strategic-roadmap>.

- Complete testing and validation of critical features and functionality of the network;
- Conduct state outreach and complete consultations⁹; and
- Review aggregated information to determine pricing for approval by the NTIA.

At the June 2014 meeting¹⁰ of the FirstNet board the following actions in support of the Roadmap were announced:

- The charter for the Public Safety Advisory Committee (PSAC) was formally adopted. By-laws for the PSAC, required by the act, were adopted at the organizing meeting of the First Net Board of Directors on September 25, 2012.¹¹ There are no requirements in the statute as to the composition of the committee.
- The process for compliance with the National Environmental Policy Act was approved.

In September 2014, the board approved resolutions “designed to generate valuable perspectives from public safety, industry, and the general public on important foundational issues regarding the development of the network.” At the same meeting, the board approved a FY2015 budget for FirstNet, not to exceed \$120 million. At a subsequent meeting,¹² the Finance Committee approved obligations of \$86.2 million, including up to \$42.5 million for a comprehensive Request for Proposal (RFP) and some network development activities; \$22.3 million on consultation, planning, and outreach activities; and up to \$21.4 million on FirstNet organizational infrastructure, project support, and administrative functions. Development of the RFP and consultation programs with states were identified as the “main thrusts” of activities for FY2015.

The Roadmap established four milestones to reach within a year. Actions taken are in brackets.

- Initiate public notice and comment on certain program procedures, policies, and statutory interpretations. [*Public Notice on Statutory Interpretations*, issued September 2014.]
- Release draft request for comprehensive network proposals for offeror comments. [*Comprehensive Network Request for Information and Statement of Objectives*,¹³ issued September 2014.]
- Release draft requests for certain network equipment and services proposals for offeror comments.

⁹ According to information supplied by the NTIA to CRS on January 12, 2015, FirstNet is conducting consultations that are broader than just the states and the Roadmap has been modified to reflect this action.

¹⁰ FirstNet News, “FirstNet Moves Forward on Strategic Program Roadmap in Open Board Meeting,” June 3, 2014, <http://www.firstnet.gov/news/firstnet-moves-forward-strategic-program-roadmap-open-board-meeting>.

¹¹ Board Resolution 1, By-Laws, http://www.ntia.doc.gov/files/ntia/publications/firstnet_resolution_no_1_on_bylaws_adopted_9.25.12.pdf.

¹² FirstNet News, “FirstNet Finance Committee Gives Go-Ahead to Fund Key RFP, Consultation Activities in FY15,” <http://www.firstnet.gov/news/firstnet-finance-committee-gives-go-ahead-fund-key-rfp-consultation-activities-fy15>.

¹³ *Request for Information for Comprehensive Network Solution(s)*, September 17, 2014, <http://www.firstnet.gov/sites/default/files/Request%20for%20Information%20for%20Comprehensive%20Network%20Solutions.pdf>; posted on FedBizOpps.gov, <https://www.fbo.gov/index?s=opportunity&mode=form&id=291b788f075a806550ca9c19955793a8&tab=core&tabmode=list&=>.

- Begin formal state consultations. [The first consultation was held with the State of Maryland, July 2014.¹⁴]

Announced Plans for 2015

The FirstNet planning process is still evolving and subject to change as the procurement process moves forward. An update of the Roadmap and other activities, including a tentative timeline for 2015, was provided on September 17, 2014, in presentations by FirstNet officials.¹⁵

The published timeline for 2015 shows two parallel tracks that are expected to converge by yearend. Track One shows the ongoing state consultation process. The second, separate, track shows the iterative progress from the RFI to a final Request for Proposal and the awarding of a contract or contracts for the deployment of FirstNet. An important goal for 2015 is to complete the first round of consultations between FirstNet and each state, as well as consultations with tribal authorities, territories, and the District of Columbia. Completion of a full cycle of consultations is currently cited as a pre-condition before moving into the final stages of contract discussions with potential partners.

As currently envisioned, after the contract or contracts are awarded, the winning bidders will provide individual proposals for each state for the deployment and operation of FirstNet's broadband service within that state. These proposals are to reflect the information gathered during the state consultation process occurring in Track One. Negotiations between each state and FirstNet may lead to contract modifications. The finalized contract terms for each state are then likely to be submitted for final review by the state. The submission of the final proposals to state governments will probably trigger the required 90-day decision period for each governor to accept FirstNet's proposal or to opt-out, in expectation of separately building a Radio Area Network. The act's opt-out requirements are discussed below.

State Participation: The Opt-Out Provision

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) to administer its Statewide Communication Interoperability Plan (SCIP).¹⁶ SCIPs are written to conform with federal guidelines and requirements, such as the National Emergency Communications Plan. FirstNet is required to consult with regional, state, tribal, and local authorities regarding decisions such as those concerning the costs of the policies it formulates, as required in the law, including expenditures for the core network, placement of towers, coverage areas, security, and priority access for local users. Consultation will be through a state-selected coordinator as specified in the act.¹⁷ Appointment of an individual or governmental body as the

¹⁴ FirstNet News, "FirstNet Holds First State Plan Consultation Meeting Maryland," July 29, 2014, <http://www.firstnet.gov/news/firstnet-holds-first-state-plan-consultation-meeting-maryland>.

¹⁵ "Strategic Roadmap Management Update," http://www.firstnet.gov/sites/default/files/firstnet-strategic-roadmap-management-update_0.pdf

¹⁶ See "Statewide Interoperability Coordinators" at http://www.dhs.gov/files/programs/gc_1286986920144.shtm.

¹⁷ P.L. 112-96, Section 6206 (c) (2) (B).

Single Point of Contact (SPOC) is also required as a condition of state participation and eligibility to receive grants established by the act.¹⁸

States may decide to use the existing SWIC as the required single point-of-contact or may choose to appoint a separate coordinator. Each state and other participants have successfully appointed a coordinator to work directly with FirstNet.¹⁹ The coordinator (SPOC) is responsible for managing FirstNet activities in his or her state. Often this includes revising the existing SCIP to include broadband communications.

The governor of each state is to be notified by FirstNet when it has completed its requests for proposals regarding construction, operation, maintenance, and improvement of a nationwide network. The governor or his designee will receive the details of the proposed plans and notification of the amount of funding available to the state if it participates in the FirstNet program.²⁰

The act only identifies two options for a state: join FirstNet or build a statewide radio access network subject to the provisions of the act. The act does not include specific provisions for a state that chooses to build its own radio access network without opting out of FirstNet, although providing such an option may be within FirstNet's charter. A state might, for example, choose to build its own data management center or mobile access routers while also sharing FirstNet's infrastructure for regional and national coverage. The act also is silent on whether states may choose to opt out of the broadband network entirely, choosing neither to join FirstNet nor to build a broadband network on the frequencies assigned to FirstNet.²¹ Some states may prefer to concentrate their resources on improving mission-critical voice networks and acquire broadband access from a commercial provider or through other means.

A state that chooses to build its own radio access network must submit an alternative plan for construction, operation, maintenance, and improvement of the radio access network within the state. The state must demonstrate to the FCC, which the law requires to review the plan, that its planned radio access network would comply with minimum technical requirements and be interoperable with FirstNet. The state has 90 days to agree to participate or to notify FirstNet, the NTIA, and the FCC of its intent to deploy its own part of the radio access network, and an additional 180 days to provide its plan to the FCC.²²

If the FCC does not approve the plan, the state might be obliged to participate in FirstNet.²³ If a state's plan is approved it will be eligible to apply for a grant, administered by the NTIA, that will be funded from the Network Construction Fund created by the act. The amount available may be less than what would have been provided if the state had opted in to the FirstNet program,

¹⁸ P.L. 112-96, Section 6302 (d).

¹⁹ Hearing, House Committee on Energy and Commerce, Subcommittee on Communications and Technology, "Oversight of FirstNet and the Advancement of Public Safety Wireless Communications," testimony of Samuel Ginn, Chairman, FirstNet, November 21, 2013. List of state contacts at <http://www.firstnet.gov/sites/default/files/spoc-list-directory-20150113.pdf>.

²⁰ P.L. 112-96, Section 6302 (e) (1).

²¹ A discussion of courses a state might choose appears in a blog post on medium.com: Bill Schrier, "FirstNet: More Choices than Just Opt-In/out," February 7, 2015, <https://medium.com/@BillSchrier/firstnet-more-choices-than-just-opt-in-out-cb47b306b62c>.

²² P.L. 112-96, Section 6302 (e) (2) and (3).

²³ P.L. 112-96, Section 6302 (e) (3) (C) (iv).

because the grant will be applied only toward building the radio access network and may be subject to matching grant requirements. Approval of the grant is contingent on meeting additional requirements established by the NTIA, including sustainability, timeliness, cost-effectiveness, security, coverage, and services that are comparable to FirstNet.²⁴ The state would be required to pay a user fee for access to FirstNet's core network.²⁵ It would not be permitted to enter commercial markets or lease access to its network except through a public-private partnership. Any revenue to the state from a partnership must be used only for costs associated with its broadband network.²⁶

Some industry observers have expressed concern about the impact on the success of the nationwide broadband network if many states choose to build their own radio access networks. The cost to FirstNet of building the nationwide network may go up, for example, if anticipated economies of scale are diminished. It may be more difficult for FirstNet to negotiate the partnerships that are expected to provide much of the needed funding for the network. A state that has its plans approved by the FCC may not be able to meet stipulated requirements when its network is built; absent any action by the FCC to enforce technical requirements, the goal of seamless interoperability across all broadband systems may be jeopardized. States operating within and outside the FirstNet deployment plan may, over time, have difficulty in finding the funds to complete radio access network build-outs, leaving significant gaps in what is intended to be nationwide coverage.

On the other hand, there are many benefits for independent action by individual states and regional partnerships of two or more states. For example, LTE networks are relying increasingly on small cell architectures²⁷ that are organized around local nodes. This configuration might correspond with local jurisdictions, potentially providing better interoperability with the core network, while reducing capital investment in infrastructure. One advantage for states building their own radio access networks on FirstNet spectrum is that they may be granted spectrum rights to part of the public safety license held by FirstNet. Control of this valuable resource strengthens the state's position in negotiating partnerships to provide communications services and to control expenditures within their states. Although the act requires states to use any revenue from partnerships only to cover costs associated with the state's network, the states will be able to make their own decisions about priorities, with more confidence that revenues will be available when needed.

Although there are potential benefits for states to participate in FirstNet, there are also a number of risks, especially if FirstNet fails to deliver promised benefits. States may have to pay for features that they term essential but are not provided through the FirstNet comprehensive network plan. The success of FirstNet as an accepted planning authority and leader may depend on whether it makes a compelling business case in the requests for proposals required by the act.

²⁴ P.L. 112-96, Section 6302 (e) (3) (D).

²⁵ P.L. 112-96, Section 6302 (f).

²⁶ P.L. 112-96, Section 6302 (g).

²⁷ Small cells are low-powered radio access nodes that are used to boost capacity and manage network interference and connectivity. They can support LTE cellular networks in configurations that include or emulate other standards for Wide Area Networks (WAN).

Additional Provisions in the Spectrum Act to Improve Public Safety Communications

A national program to provide nationwide coverage for public safety communications is to be developed and managed by a new federal entity, the First Responder Network Authority, or FirstNet. FirstNet has been established by the act and given broad powers to ensure that the nationwide public safety broadband network is built, maintained, and kept up-to-date as technology evolves. In consultation with federal, state, local, and tribal authorities, FirstNet will develop proposals to construct and manage the network with partners from the private sector, among others. Following is a discussion of major provisions in the act that pertain to public safety communications, including provisions to improve the nation's 911 emergency call system.

Among federal agencies designated by the act to provide consultation and support are the Federal Communications Commission (FCC), the National Telecommunications and Information Administration (NTIA), the National Institute of Standards and Technology (NIST), and the Office of Emergency Communications (OEC). The FCC manages commercial and non-federal spectrum use, including spectrum allocated to public safety. The NTIA manages federal spectrum resources and, along with NIST, is an agency within the Department of Commerce. OEC is part of the Office of Cybersecurity and Communications, Department of Homeland Security.

Spectrum Assignment

Radio frequency spectrum is an essential resource for wireless communications. The energy in electronic telecommunications transmissions converts airwaves into signals to deliver voice, text, and images. These signal frequencies are allocated for specific purposes, such as television broadcasting or WiFi,²⁸ and assigned to specific users through licenses. Allocating sufficient spectrum for wireless emergency communications has long been a concern for Congress. The Balanced Budget Act of 1997 (P.L. 105-33), for example, directed the FCC to allocate 24 MHz²⁹ of spectrum in the 700 MHz band for public safety use.³⁰

With the passage of the Spectrum Act, some existing public safety licenses in the 700 MHz band³¹ and an additional license for commercial use (known as the D Block)³² — together totaling 22 MHz — have been re-designated by Congress for a federal license. As required by the act, the initial, 10-year license to use these frequencies was assigned by the FCC to FirstNet. It is renewable for an additional 10 years, on condition that FirstNet has met its duties and obligations under the act.³³

²⁸ WiFi, for wireless fidelity, operates on unlicensed frequencies that are not assigned to a specific owner but instead are available to support any device approved by the FCC.

²⁹ 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.

³⁰ 47 U.S.C. §309 (j) (14).

³¹ 763-768 MHz, 793-798 MHz, 768-769 MHz and 798-799 MHz.

³² 758-763 MHz and 788-793 MHz; P.L. 112-96, Section 6001, (2).

³³ P.L. 112-96, Section 6201.

A total of 34 MHz of spectrum capacity will therefore be available for public safety networks within the 700 MHz band: the 22 MHz designated for broadband, and 12 MHz allocated for narrowband communications, primarily voice.³⁴ Additionally, there are public safety networks on adjacent frequencies within the 800 MHz band. Time and technological advances may someday bring these spectrum assets together, but at present there are three distinct public safety network technologies in use or planned within the 700 MHz and 800 MHz bands. These are: broadband communications at 700 MHz; interoperable narrowband communications at 700 MHz; and narrowband communications at 800 MHz. Some of the narrowband networks at 700 MHz and 800 MHz can share infrastructure and radios but older narrowband networks at 800 MHz are often not easily integrated with narrowband networks being built on 700 MHz frequencies.

All of the 700 MHz band spectrum allocated for public safety use can support broadband networks. At present, however, there is no tested technology to deliver voice communications over LTE broadband that meets first responder requirements. New technology that provides push-to-talk voice connections over LTE is likely to be available through FirstNet by the end of 2016.³⁵ The act also gives the FCC the authority to “... allow the narrowband spectrum to be used in a flexible manner, including usage for public safety broadband communications....” subject to technical and interference protection measures.³⁶ States, therefore, might be able to convert some existing narrowband networks to broadband use in addition to service from FirstNet.

The act requires that public safety users return frequencies known as the T-Band.³⁷ These are frequencies between 470 and 512 MHz allocated for television that have been made available for public safety use in 11 urban areas.³⁸ Since the transition to digital television, radio transmissions on some of these frequency assignments have experienced interference and the public safety agencies that use them are considering moving to new networks at 700 MHz. Other areas have recently invested to upgrade networks built on the T-Band frequencies and are concerned about the loss of this communications capacity. The act requires that the FCC act by February 2021 to establish a relocation plan that would free up the T-Band for reassignment through competitive bidding. Proceeds from the auctions of T-Band frequencies are to be available for grants to cover relocation costs.³⁹ There are no requirements in the law as to how the NTIA, the designated grants administrator, is to structure the grant program or determine eligible costs, although the agency might decide to follow procedures for reallocating federal spectrum.

Some of the earliest spectrum assignments for public safety are in channels below 512 MHz. Public safety and other license-holders in designated channels below 512 MHz are required to

³⁴ 769-775 MHz and 799-805 MHz.

³⁵ Push-to-talk—walkie-talkie—provides the capability for group communications. 3GPP, the international standards group for LTE, has announced that mission-critical voice communications will be available over LTE networks in 2016. See Donny Jackson, “LTE Standards Group Targeting Mission-Critical Push-to-Talk Voice Specifications for Early 2016,” *Urgent Communications*, February 12, 2015, http://urgentcomm.com/3gpp/lte-standards-group-targeting-mission-critical-push-talk-specifications-early-2016?NL=UC-03&Issue=UC-03_20150212_UC-03_140&sfvc4enews=42&cl=article_2_b&YM_RID=CPEQW000001101112&YM_MID=2611.

³⁶ P.L. 112-96, Section 6102.

³⁷ P.L. 112-96, Section 6103.

³⁸ Metropolitan areas: Boston, MA, Chicago, IL, Dallas/Fort Worth, TX, Houston, TX, Los Angeles, CA, Miami, FL, New York, NY/Newark NJ, Philadelphia, PA, Pittsburgh, PA, San Francisco/Oakland, CA, and Washington, DC.

³⁹ The National Public Safety Telecommunications Council (NPSTC) prepared a report that provided an overview of T-Band assignments, some of the problems created by the act’s requirements, and possible alternative solutions. NPSTC, *T-Band Report*, March 15, 2013; link to PDF at <http://www.npstc.org/>, “NPSTC Releases T Band Report.”

reband their holdings to conform to an FCC mandate to improve spectrum efficiency.⁴⁰ This narrowbanding requirement, as it is called, requires that assigned channels be reduced from a width of 25 khz to 12.5 khz, thereby freeing up new spectrum capacity for public safety and other uses. The deadline to meet the narrowbanding requirement was January 1, 2013. To accommodate public safety license holders in the T-Band that now fall under requirements established in the act, the FCC has ruled to exempt them from the narrowbanding requirements.⁴¹

Expenditures and Revenue Sources

The cost of building a new wireless communications network is likely to be in the tens of billions of dollars.⁴² To meet these costs, the expectation is that FirstNet will have access to existing infrastructure for some of the network's components and that it will be able to invest through partnerships—with commercial wireless carriers or other secondary users of its spectrum and infrastructure—that generate revenue.

The Spectrum Act provides over \$7 billion in funding directed to FirstNet and to states, either as direct transfers or as grants. There is an initial loan of \$2 billion (repayable from spectrum-license auction proceeds) to set up FirstNet and begin its operation.⁴³ The remaining \$5 billion will become available as auctions for spectrum licenses are concluded and the revenues deposited in the Public Safety Trust Fund.

Public Safety Trust Fund

The law provides for transfers from a Public Safety Trust Fund, which is established in the Treasury by the act, to receive revenues from designated auctions of spectrum licenses.⁴⁴ The designated amounts are to remain available through FY2022, after which any remaining funds are to revert to the Treasury, to be used for deficit reduction. Auction proceeds are to be distributed in the following order of priority:

- To the NTIA, to reimburse the Treasury for funds advanced to cover the initial costs of establishing FirstNet: not to exceed \$2 billion.
- To the State and Local Implementation Fund for a grant program: \$135 million.
- To the Network Construction Fund for costs associated with building the nationwide network and for grants to states that qualify to build their own networks: \$7 billion, reduced by the amount advanced to establish FirstNet.
- To NIST for public safety research: \$100 million.
- To the Treasury for deficit reduction: \$20.4 billion.

⁴⁰ Details at <http://transition.fcc.gov/pshs/public-safety-spectrum/narrowbanding.html>.

⁴¹ FCC, "Waiver of Narrowbanding Deadlines for T-Band (470-512 MHz) Licenses," Docket No. WT 99-87, released April 26, 2012.

⁴² Some cost estimates for building and operating a public safety broadband network are provided in CRS Report R41842, *Funding Emergency Communications: Technology and Policy Considerations*, by Linda K. Moore.

⁴³ P.L. 112-96, Section 6207.

⁴⁴ P.L. 112-96, Section 6413.

- To the NTIA and the National Highway Traffic Safety Administration for a grant program to improve 911 services: \$115 million.
- To NIST for public safety research, phase two: \$200 million.
- To the Treasury for deficit reduction: any remaining amounts from designated auction revenues.

In compliance with the act, the FCC conducted two auctions in 2014-2015 (Auction 96 and 97) that generated sufficient revenue to meet funding requirements of the act.⁴⁵

Network Construction Fund

The Network Construction Fund is established in the Treasury to be used by FirstNet for expenditures on construction, maintenance, and related expenses to build the nationwide network required in the act; by the NTIA to make payments to states that are participating in FirstNet; and by the NTIA for grants to those states that qualify to build their own radio access network links.⁴⁶

FirstNet: Limit on Expenditures

The act caps FirstNet's administrative expenses at \$100 million in total over the first 10 years of operation. Costs attributed to oversight and audits are not included in the expense cap.⁴⁷

FirstNet: Fee Income and Other Revenue

Congress gave FirstNet the authority to obtain grants, and to receive payment for the use of network capacity licensed to FirstNet and of network infrastructure "constructed, owned, or operated" by FirstNet.⁴⁸ Specifically, FirstNet is authorized to collect network user fees from public safety and secondary users⁴⁹ and to receive payments under leasing agreements in public-private partnerships.⁵⁰ These partnerships may be formed between FirstNet and a secondary user for the purpose of constructing, managing, and operating the network. The agreements may allow access to the network on a secondary basis for services other than public safety.⁵¹ The act requires that these fees be sufficient each year to cover annual expenses of FirstNet to carry out required activities,⁵² with any remaining revenue going to network construction, operation, maintenance, and improvement.⁵³ There is a prohibition on providing service directly to consumers; this does not impact the right to collect fees from a secondary user or enter into leasing agreements.⁵⁴

⁴⁵ For additional information on the auctions, see CRS Report R43256, *Spectrum Policy: Provisions in the 2012 Spectrum Act*, by Linda K. Moore.

⁴⁶ P.L. 112-96, Section 6206 (e).

⁴⁷ P.L. 112-96, Section 6207 (b).

⁴⁸ P.L. 112-96, Section 6206 (b) (4).

⁴⁹ P.L. 112-96, Section 6208 (a) (1).

⁵⁰ P.L. 112-96, Section 6208 (a) (2).

⁵¹ P.L. 112-96, Section 6208 (a) (2) (B).

⁵² P.L. 112-96, Section 6208 (b).

⁵³ P.L. 112-96, Section 6208 (d).

⁵⁴ P.L. 112-96, Section 6212.

State and Local Implementation Fund

The State and Local Implementation Fund was allocated \$135 million from the Public Safety Trust Fund. The NTIA, which administers the grant program for this fund, may borrow up to the full amount. The grants are to be made available to all 56 states and territories to develop a plan on how to use a nationwide public safety broadband network to meet their emergency communications needs. The program is to be established as a matching grant program. Federal grants from the fund are not to exceed 80% of the projected cost to the state, however, the NTIA may make the decision to waive the matching funds requirement. The distribution of available funds among the states will be established by the NTIA in consultation with FirstNet.

The NTIA subsequently decided to plan for funding in two phases. The first phase provided funding for initial planning and related activities. The announced amount available for the first phase of grants from the fund was \$121.5 million. Grants totaling over \$116 million were awarded to 54 of the 56 eligible states and territories in FY2013. The state of Louisiana and the territory of the Northern Mariana Islands did not receive grants. Many of the grants will be used to bolster existing state programs for public safety communications and interoperability, and for outreach and education. The second phase will address states' needs in preparing for additional consulting with FirstNet, and for planning to undertake data collection activities. The amount available for grants in the second phase is \$10.1 million.

Other Sources of Funds

The construction of this new network represents a significant investment for all participants. State public safety agencies have multiple obligations to build, upgrade, and equip other networks and may not be in a position to contribute to building and maintaining the new broadband network. The ability of FirstNet to procure funding from the private sector may be crucial to its success.

Planning Authority

The Spectrum Act created FirstNet as an independent entity within the NTIA. FirstNet is required to plan for and establish an interoperable broadband network for public safety. The act requires that state and local agencies and tribal authorities have a consulting role in the development, deployment, and operation of the nationwide network. The act further provides an opportunity for states to plan and build their own radio access networks within the framework of the nationwide broadband network.⁵⁵

FirstNet

When Congress creates an independent entity within the federal government, it may have the obligation to achieve a specific goal, usually within a specific time frame.⁵⁶ As an independent entity, FirstNet—the First Responder Network Authority—has been given both goals and timeframes. It has been instructed by Congress to exercise all powers specifically granted by the

⁵⁵ Current information on FirstNet's activities, including network design and state planning, is available at <http://www.firstnet.gov>.

⁵⁶ For examples, see CRS Report RS22230, *Congressional or Federal Charters: Overview and Enduring Issues*, by Henry B. Hogue.

act and “such incidental powers as shall be necessary”⁵⁷ to create a nationwide broadband network for public safety. Unless renewed, this authority expires in 2027.⁵⁸ The law requires FirstNet to become a self-funding entity, independent of government subsidies.⁵⁹ FirstNet is to take “all actions necessary to ensure the building, deployment, and operation” of the network in consultation with federal, state, tribal, and local public safety entities, the Director of NIST, the FCC, and the public safety advisory committee.⁶⁰ FirstNet appears therefore to be an autonomous organization, with broad powers to carry out its mandate, within the requirements established by the law. It has, for example, sole power to select the program’s manager and its agents, consultants, and other experts subject to the requirement that they be chosen “in a fair, transparent, and objective manner.”⁶¹ However, FirstNet, except for certain exemptions provided in the act, must follow federal agency requirements, notably in hiring and procurement, slowing down the process for establishing FirstNet as a going concern.⁶²

FirstNet is headed by a board of 15 members of which 12 are appointed by the Secretary of Commerce according to criteria established by the law, which are intended to provide both representation from key stakeholders and expertise. The other three members of the board are designees of the Secretary of the Department of Homeland Security, the Attorney General of the United States, and the Director of the Office of Management and Budget. The Secretary of Commerce is required to appoint a chairman of the board for an initial term of two years.⁶³

As part of its management of the network, FirstNet is required, at a minimum:

- To establish network policies, including development of detailed requests for proposals to build the network, and operational matters such as terms of service and billing practices.⁶⁴
- To consult with states on network-related expenditures, as part of the preparation of policies and requests for proposals.⁶⁵
- To enter into agreements to use existing communications infrastructure, including commercial and federal infrastructure, “to the maximum extent economically desirable.”⁶⁶
- To ensure the construction, maintenance, operation, and improvement of the broadband network, taking into account new and evolving technologies.⁶⁷

⁵⁷ P.L. 112-96, Section 6206 (a) (1).

⁵⁸ P.L. 112-96, Section 6206 (f).

⁵⁹ P.L. 112-96, Section 6208.

⁶⁰ P.L. 112-96, Section 6206 (b) (1).

⁶¹ P.L. 112-96, Section 6205 (b) (1).

⁶² Hearing, House Committee on Energy and Commerce, Subcommittee on Communications and Technology, “Oversight of FirstNet and the Advancement of Public Safety Wireless Communications,” testimony of Samuel Ginn, Chairman, FirstNet, November 21, 2013.

⁶³ P.L. 112-96, Section 6204.

⁶⁴ P.L. 112-96, Section 6206 (c) (1).

⁶⁵ P.L. 112-96, Section 6206 (c) (2).

⁶⁶ P.L. 112-96, Section 6206 (c) (3).

⁶⁷ P.L. 112-96, Section 6206 (c) (4).

- To enter into agreements with commercial networks to allow public safety roaming on their networks.⁶⁸
- To represent the interests of the network's users before standards-setting boards, in consultation with NIST, the FCC, and its own Public Safety Advisory Committee.⁶⁹

FirstNet is required to create a public safety advisory committee to assist in carrying out its mandate.⁷⁰ There are no requirements in the statute as to the composition of the committee. By-laws adopted at the organizing meeting of the First Net Board of Directors on September 25, 2012 created a Public Safety Advisory Committee.⁷¹ It was further agreed that the members of the committee would be chosen from the Advisory Committee to SAFECOM, within the Department of Homeland Security, to be chosen in consultation with the Secretary of Homeland Security. The organizations chosen to be represented on the committee were announced on February 20, 2013.⁷² State and local government interests are represented through a subcommittee of PSAC.

Federal Governance

Federal governance of the nationwide public safety broadband network, as required by the Spectrum Act, is primarily through consultation and oversight. Planning, investment, operations, and other related decisions are to be made by the FirstNet board and the experts it is to hire on a permanent or consultative basis.

Statutory Obligations

Examples of statutory obligations for Congress and the Administration in the direction of FirstNet include the following.

Membership on FirstNet board. The members of the FirstNet board are to be chosen by the Secretary of Commerce, within the parameters established in the act. The Department of Homeland Security, the Attorney General, and the Office of Management and Budget each have one member on the board in permanence. The Secretary of Commerce is required to appoint a chairman of the board for an initial term of two years.⁷³

Grant programs for planning. The NTIA is to establish and administer the State and Local Implementation Fund. Grant provisions are to be decided in consultation with FirstNet,⁷⁴ but not necessarily in accordance with decisions made by the FirstNet board and executive management.

⁶⁸ P.L. 112-96, Section 6206 (c) (5).

⁶⁹ P.L. 112-96, Section 6206 (c) (7).

⁷⁰ P.L. 112-96, Section 6205 (a).

⁷¹ Board Resolution 1, By-Laws, http://www.ntia.doc.gov/files/ntia/publications/firstnet_resolution_no_1_on_bylaws_adopted_9.25.12.pdf.

⁷² NTIA, "FirstNet Names members of Public Safety Advisory Committee," February 20, 2013, <http://www.ntia.doc.gov/press-release/2013/firstnet-names-members-public-safety-advisory-committee>.

⁷³ P.L. 112-96, Section 6204.

⁷⁴ P.L. 112-96, Section 6302 (a).

Grant programs for state networks. The NTIA is to administer grants from the Network Construction Fund to states that qualify to build their own radio access networks and choose to apply for a grant.⁷⁵

Funding for FirstNet and participating states through the Network Construction Fund. The NTIA is to determine the funding level available to each state for the buildout of the nationwide broadband network, if the state chooses to participate in FirstNet.⁷⁶

Spectrum leases for state networks. The NTIA sets the terms and is responsible for enforcing the requirement that states qualifying to build their radio access networks must sublease spectrum through FirstNet, the assigned license-holder.⁷⁷

License review. The FCC is required to review the initial 10-year license assigned to FirstNet and consider its renewal based on performance criteria.⁷⁸

Performance review. The Government Accountability Office (GAO), within 10 years, is to prepare a report providing recommendations on “what action Congress should take” regarding the mandated termination of authority of FirstNet in 2027.⁷⁹

Fee schedule. The NTIA is to review and approve the annual schedule of fees charged to public safety agencies and other users for access to FirstNet’s resources.⁸⁰

Annual audit. The Secretary of Commerce is to contract for an annual audit of FirstNet’s finances and activities. The reports are to be submitted to Congress, the President, and FirstNet.⁸¹

Report to Congress. FirstNet is required to submit annual reports to Congress on its “operations, activities, financial conditions, and accomplishments.”⁸²

The designated appropriate congressional committees are, in the Senate, the Committee on Commerce, Science, and Transportation; in the House, the Committee on Energy and Commerce.⁸³ These committees and other committees with jurisdiction are likely to take an active role in oversight, many believe.

Although there are several platforms for oversight and guidance provided in the act, it seems likely that the primary, day-to-day responsibility for monitoring progress will fall to the NTIA. Agency discretion for funding states that participate in FirstNet and for providing grants to states that opt out is authorized by the act. The \$7 billion grant to the Network Construction Fund is implicitly divided into three parts: one funding FirstNet to establish the network; one funding states that participate in FirstNet; and one funding states that choose to opt out. Clauses that may

⁷⁵ P.L. 112-96, Section 6302 (e) (3) (C) (iii) (I).

⁷⁶ P.L. 112-96, Section 6302 (e) (1) (C).

⁷⁷ P.L. 112-96, Section 6302 (e) (3) (C) (iii) (II).

⁷⁸ P.L. 112-96, Section 6201 (b).

⁷⁹ P.L. 112-96, Section 6206 (g).

⁸⁰ P.L. 112-96, Section 6208 (c).

⁸¹ P.L. 112-96, Section 6209.

⁸² P.L. 112-96, Section 6210.

⁸³ P.L. 112-96, Section 6001 (3).

have been intended to oversee state expenditures might be construed by the NTIA to include FirstNet. The act, however, does not provide guidance to the NTIA on how to balance fiduciary caution with entrepreneurial initiative in assuring a flow of funds to FirstNet.

Public-Private Partnerships

Partnerships are expected to play a critical role in building and operating the network. Electric utility companies, for example, are upgrading their networks to meet Smart Grid requirements,⁸⁴ and some companies have expressed an interest in partnering with FirstNet or state authorities. Some commercial wireless service providers have also expressed an interest in working in partnership with public safety entities to develop and operate new broadband networks.

The Spectrum Act requires FirstNet to issue “open, transparent, and competitive” requests for proposals to private sector entities for building, operating, and maintaining the network⁸⁵ that leverage to the extent “economically desirable” existing commercial wireless infrastructure, in order to expedite network deployment.⁸⁶ It is charged with managing and overseeing the resulting contracts or agreements. As part of a separate requirement to assure substantial rural coverage during all phases of deployment, the act requires that industry proposals and contracts include, if possible, partnerships with existing commercial mobile providers.⁸⁷

Decisions by FirstNet about the network’s design, construction, and operation are likely to have a significant impact on commercial participation in a public safety broadband network or networks. These decisions may also influence decision-making by states as to whether or not to pursue radio area network construction independently or through their own partnerships.

Congress may be interested in the composition of private sector partnerships formed by FirstNet and individual states, not only for their business plans but also for the inclusion of a wide variety of stakeholders. For example, are rural and tribal wireless carriers included as business partners? Do secondary access agreements support services that meet social goals, such as for telemedicine, or are they exclusively for commercial purposes? Is competition in providing wireless services being enhanced or hindered?

Infrastructure

Infrastructure for the new network includes operations centers, towers, antennae, base stations, routers, small cell nodes, and other communications equipment, as well as radios and the software that links them to the network. For wireless communications, an important infrastructure component is the connection between base stations and communications backbones. These networks, which usually operate over fiber-optic cable or microwave connection, are typically referred to as backhaul.

⁸⁴ “Smart Grid” is the name given to the evolving electric power network as new information technology systems and capabilities are incorporated. See also CRS Report R41886, *The Smart Grid and Cybersecurity—Regulatory Policy and Issues*, by Richard J. Campbell.

⁸⁵ P.L. 112-96, Section 6206 (b) (1) (B).

⁸⁶ P.L. 112-96, Section 6206 (b) (1) (C).

⁸⁷ P.L. 112-96, Section 6206 (b) (3).

The Spectrum Act requires FirstNet to establish a nationwide, interoperable public safety network.⁸⁸ Network infrastructure components that are specifically required include

- Core network of national and regional data centers and other elements, all based on commercial standards.
- Connectivity between the radio access network and the public Internet or the Public Switched Telephone Network, or both.
- Network cell site equipment, antennas, and backhaul equipment, based on commercial standards, to support wireless devices operating on frequencies designated for public safety broadband.⁸⁹

FirstNet is required to leverage existing infrastructure by entering into agreements to use commercial or other communications infrastructure, including federal, state, tribal, or local infrastructure.⁹⁰ Planned phases for infrastructure deployment are to include “substantial rural coverage.”⁹¹

FirstNet’s ability to build the required network may depend on the timeliness, scope, and outcome of its negotiations to share infrastructure with other parties in order to focus resources on providing elements deemed essential for public safety use of broadband communications.

Timeframe

The requirements of the Spectrum Act must be substantially met and the viability of the project demonstrated no later than the end of FY2022, if not sooner. The State and Local Implementation Fund and the Network Construction Fund expire in 2022, with any balances reverting to the Treasury. By 2022, the GAO must have assessed the performance of FirstNet and provided a report to Congress; and the FCC must decide whether or not to renew the licenses for the public safety broadband network. Within this 10-year timeframe, there are few deadlines beyond requirements for the initial establishment of the planning and implementation framework.

Many of the important steps for building the network have no required deadline. Some milestones, such as rural coverage, are mandated in the act, but the deadlines are not specified. There are, for example, no deadlines in provisions that require FirstNet to:

- Develop requests for proposals that include a requirement for timetables.⁹²
- Consult with states on establishing state and local planning processes.⁹³
- Complete the request for proposal process that is to be given to each state governor regarding the request for proposal and its details, and the funding level for each state as determined by the NTIA.⁹⁴

⁸⁸ P.L. 112-96, Section 6202 (a).

⁸⁹ P.L. 112-96, Section 6202 (b).

⁹⁰ P.L. 112-96, Section 6206 (c) (3).

⁹¹ P.L. 112-96, Section 6206 (b) (3).

⁹² P.L. 112-96, Section 6206, (c) (1).

⁹³ P.L. 112-96, Section 6206, (c) (2).

⁹⁴ P.L. 112-96, Section 6302 (e) (1).

Mandated deadlines for states include

- Within 90 days of receipt of notice from FirstNet, the governor shall choose either to participate in deployment of FirstNet or to conduct its own radio access network deployment within the state.⁹⁵
- Within 180 days of giving notice to opt out of FirstNet, the governor shall complete requests for proposals for a state network.⁹⁶

No deadline is established in the statute for the FCC to approve or disapprove state proposals for their own portion of the nationwide broadband network.⁹⁷ There are also no specified deadlines for a state to apply to the NTIA for a grant to construct the radio access network and to lease spectrum capacity from First Net, if FCC approval is received for a state network.⁹⁸ However, one condition of eligibility for a grant to a state to build its own radio access network is that the state's plan must demonstrate "the ability to complete the project within specified comparable deadlines...."⁹⁹

Next Generation 9-1-1

Today's 911 system is built on an infrastructure of analog technology that does not support many of the features that most Americans expect to be part of an emergency response. Efforts to splice newer, digital technologies onto this aging infrastructure have created points of failure where a call can be dropped or misdirected, sometimes with tragic consequences. Callers to 911, however, generally assume that the newer technologies they are using to place a call are matched by the same level of technology at the 911 call centers, known as Public Safety Answering Points (PSAPs). However, this is not always the case. To modernize the system to provide the quality of service that approaches the expectations of its users will require that the PSAPs and state, local, and possibly federal emergency communications authorities invest in new technologies. As envisioned by most stakeholders, these new technologies—collectively referred to as Next Generation 911 or NG9-1-1—should incorporate Internet Protocol standards. An IP-enabled emergency communications network that supports 911 will facilitate interoperability and system resilience; improve connections between 911 call centers; provide more robust capacity; and offer flexibility in receiving and managing calls. The same network can also serve wireless broadband communications for public safety and other emergency personnel, as well as other purposes.

Recognizing the importance of providing effective 911 service, Congress has previously passed three major bills supporting improvements in the handling of 911 emergency calls. The Wireless Communications and Public Safety Act of 1999 (P.L. 106-81) established 911 as the number to call for emergencies and gave the Federal Communications Commission (FCC) authority to regulate many aspects of the service. The most recent of these laws, the NET 911 Improvement Act of 2008 (P.L. 110-283), required the preparation of a National Plan for migrating to an IP-enabled emergency network. Responsibility for the plan was assigned to the E-911 Implementation Coordination Office (ICO), created to meet requirements of an earlier law, the

⁹⁵ P.L. 112-96, Section 6302, (e) (2).

⁹⁶ P.L. 112-96, Section 6302, (e) (3) (B).

⁹⁷ P.L. 112-96, Section 6302 (e) (3) (C) (i).

⁹⁸ P.L. 112-96, Section 6302, (e) (3) (C) (iii).

⁹⁹ P.L. 112-96, Section 6302, (e) (3) (D) (i) (III).

ENHANCE 911 Act of 2004 (P.L. 108-494). Authorization for the ICO terminated on September 30, 2009. ICO was jointly administered by the National Telecommunications and Information Administration and the National Highway Traffic Safety Administration.

Spectrum Act provisions re-establish the federal 9-1-1 Implementation Coordination Office (ICO) to advance planning for next-generation systems and to administer a grant program.¹⁰⁰ ICO is to provide matching grants to eligible state or local governments or tribal organizations for the implementation, operation, and migration of various types of 911 and IP-enabled emergency services, and for public safety personnel training.¹⁰¹ States that have diverted fees collected for 911 services are not eligible for grants under the program.¹⁰²

Provisions in the act regarding 911 programs include

- The GAO is required to study how states assess fees on 911 services and how those fees are used.¹⁰³
- The General Services Administration is required to prepare a report on 911 capabilities of multi-line telephone systems in federal facilities and the FCC is to seek comment on the feasibility of improving 911 identification for calls placed through multi-line telephone systems.¹⁰⁴
- The FCC is to assess the legal and regulatory environment for development of NG9-1-1 and barriers to that development, including state regulatory roadblocks.¹⁰⁵ The FCC is also to (1) initiate a proceeding to create a specialized Do-Not-Call registry for public safety answering points, and (2) to establish penalties and fines for autodialing (robocalls) and related violations.¹⁰⁶
- ICO, in consultation with NHTSA and DHS is to report on costs for requirements and specifications of NG9-1-1 services, including an analysis of costs, and assessments and analyses of technical uses.¹⁰⁷
- Immunity and liability protections are provided—to the extent consistent with specified provisions of the Wireless Communications and Public Safety Act of 1999—for various users and providers of Next Generation 911 and related services, including for the release of subscriber information.¹⁰⁸

The act also requires FirstNet to promote integration of the nationwide public safety broadband network with PSAPs.¹⁰⁹ Since the NTIA has responsibilities for both ICO and FirstNet, the

¹⁰⁰ P.L. 112-96, Section 6503, “Section 158 “(a).

¹⁰¹ P.L. 112-96, Section 6503, “Section 158 “(b).

¹⁰² P.L. 112-96, Section 6503, “Section 158 “(c).

¹⁰³ P.L. 112-96, Section 6505.

¹⁰⁴ P.L. 112-96, Section 6504.

¹⁰⁵ P.L. 112-96, Section 6509.

¹⁰⁶ P.L. 112-96, Section 6507.

¹⁰⁷ P.L. 112-96, Section 6508.

¹⁰⁸ P.L. 112-96, Section 6506.

¹⁰⁹ P.L. 112-96, Section 6206 (b) (2) (C).

agency is in a position to encourage interoperability between PSAPs and First Responders as they move to common IP-based platforms.

Technology and Standards

Standardization of network components, including radios, is generally considered essential to achieving interoperability, improving service, and reducing operating costs. Technical requirements for FirstNet are to be based on commercial standards for LTE.¹¹⁰ The commercial sector has begun the transition to operating 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.¹¹¹ LTE Advanced technologies will be able to operate across noncontiguous spectrum bands, thereby increasing 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.

To expedite the expansion of LTE, commercial carriers have often relied on Wide Area Network (WAN) installations and configurations of small cells to create what are commonly referred to as micro networks. The micro networks operate on standards for LTE and IEEE (Institute of Electrical and Electronics Engineers) 802.11 for WiFi. Micro networks may become a key component of FirstNet, as they represent an opportunity to add capacity at a local level in times of emergency.

FirstNet

The Spectrum Act requires FirstNet to assure nationwide standards for use of and access to the network it is tasked with developing. The act specifies the use of commercial standards for some of the network components.¹¹²

To promote competition, devices for public safety network radios and other wireless devices are required to be built to open, non-proprietary, commercially available standards, “capable of being used by any public safety entity and by multiple vendors across all broadband networks operating in the 700 MHz band” and backward compatible with existing commercial networks where necessary and reasonable.¹¹³

FCC

The act required the FCC to establish a Technical Advisory Board for First Responder Interoperability, and set out criteria for the selection and participation of board members.¹¹⁴ The primary purpose of the board was to agree on minimum technical requirements for nationwide interoperability on the public safety broadband network. The Interoperability Board was required to develop these technical recommendations in consultation with the NTIA, NIST, and the

¹¹⁰ P.L. 112-96, Section 6203 (c) (2).

¹¹¹ Also known as 3GPP Release 10, see <http://www.3gpp.org/LTE-Advanced>.

¹¹² P.L. 112-96, Section 6202 (b).

¹¹³ P.L. 112-96, Section 6206 (b) (2) (B).

¹¹⁴ P.L. 112-96, Section 6203.

OEC.¹¹⁵ The board's technical recommendations were required to be based on commercial standards for LTE.¹¹⁶ The establishment of minimum technical requirements has a two-fold purpose. One, the requirements are to be presented to the Board of Directors of FirstNet as recommended requirements for interoperability.¹¹⁷ Two, the minimum technical requirements are to be used by the FCC as a standard of interoperability for evaluating state plans in cases where states have asked to build their own radio access networks.¹¹⁸

In the report it submitted,¹¹⁹ the Interoperability Board, in addition to minimum technical standards, also provided additional considerations that it judged to be important for achieving interoperability.

NIST

The Director of NIST, in consultation with the FCC, DHS, and the National Institute of Justice, Department of Justice, is to “conduct research and assist with the development of standards, technologies and applications to advance wireless public safety communications.”¹²⁰ More specifically, in consultation with FirstNet and the Public Safety Advisory Committee, NIST is to

- Document technical requirements for public safety wireless communications.
- Accelerate the development of interoperability between currently deployed systems and the public safety broadband network.
- Establish a research plan and direct research for next-generation wireless public safety needs.
- Accelerate the development of broadband network features such as mission-critical voice, prioritization, and authentication.
- Accelerate the development of communications equipment and technology to facilitate the eventual migration of public safety narrowband communications to the public safety broadband network.¹²¹

Furthermore, the Director of NIST, in consultation with FirstNet and the FCC, “shall ensure the development of a list of certified devices and components meeting appropriate protocols and standards for public safety and commercial vendors.”¹²²

¹¹⁵ P.L. 112-96, Section 6203 (c) (1).

¹¹⁶ P.L. 112-96, Section 6203 (c) (2).

¹¹⁷ P.L. 112-96, Section 6203 (c) (3).

¹¹⁸ P.L. 112-96, Section 6302 (e) (3) (C).

¹¹⁹ *Recommended Minimum Technical Requirements to Ensure Nationwide Interoperability for the Nationwide Public Safety Broadband Network*, prepared by the Technical Advisory Board for First Responder Interoperability, Final Report, May 22, 2012, at <http://www.fcc.gov/document/recommendations-interoperability-board>.

¹²⁰ P.L. 112-96, Section 6303 (a).

¹²¹ P.L. 112-96, Section 6303 (b) (1 – 5).

¹²² P.L. 112-96, Section 6206 (c) (6).

Roaming and Priority Access Within the 700 MHz Band

In its *National Broadband Plan*, the FCC indicated that it wanted to make commercial networks in the 700 MHz band available for public safety use and requested that Congress confirm the FCC's authority to act.¹²³ The Spectrum Act provides the FCC with statutory authority to establish rules in the public interest to improve the ability of public safety networks to roam on commercial space and to gain priority access.¹²⁴

FirstNet is empowered by the act to enter into agreements with commercial providers that would allow public safety network users to roam on partnering networks.¹²⁵ The act does not state whether roaming agreements may be negotiated by states that opt-out and receive spectrum leases from the NTIA to operate their own radio access networks. Agreements might also cover rules for priority access in times of high demand for network capacity. Priority access can take several forms, such as “ruthless pre-emption,” in which non-public-safety transmissions are immediately terminated to make way for emergency communications, or negotiated priority agreements that might, for example, place public safety users at the head of the line for network access as capacity becomes available. The act stipulates that the FCC's authority may not require roaming or priority access unless (1) the public safety and commercial networks are technically compatible; (2) the commercial network is reasonably compensated; and (3) access does not preempt or otherwise terminate or degrade existing traffic on the commercial network.¹²⁶ Within these limits, the FCC appears to have some leeway to use its regulatory authority to support public safety in negotiations with partners. The FCC cannot, under the act, mandate ruthless pre-emption, although the act does not preclude contractual negotiations that would allow it.

The act's provisions for roaming and priority access do not require a commercial vendor to make additional investments to insure technical compatibility, and the act's language might be interpreted as precluding an FCC mandate to that effect. Interpretation and enforcement of the compatibility provision may pose an obstacle to achieving desired levels of network interoperability and cross-network roaming because existing technical standards for the 700 MHz band might preclude affordable full-spectrum roaming, that is, the ability of any network within the 700 MHz to roam on any other network within the 700 MHz band. Full-spectrum roaming is considered by many to provide advantages for public safety and also for the public at large. For example, it makes more network capacity available for shared emergency communications of all types, not just for first responders. Many believe that full-spectrum access supports competitiveness among wireless carriers—in particular assisting small wireless carriers serving rural areas to offer new broadband services—by providing access to all customers within the band.

Achieving full-spectrum roaming on the 700 MHz band requires modifications of technical requirements for LTE, the preferred technology for mobile broadband within the 700 MHz band.

¹²³ FCC, *Connecting America: The National Broadband Plan*, <http://www.broadband.gov/download-plan/>.

¹²⁴ P.L. 112-96, Section 6211.

¹²⁵ P.L. 112-95, Section 6206 (c) (5).

¹²⁶ P.L. 112-96 Section 6211.

The FCC has taken actions in support of full-spectrum roaming,¹²⁷ including steps to implement a voluntary industry agreement to establish interoperability for LTE in the lower 700 MHz band.¹²⁸ Establishing additional standards to enable full-spectrum interoperability will permit interoperability among all commercial carriers and public safety agencies.

Congress may wish to examine the environment in which FirstNet is operating to see if it can be improved to help assure FirstNet's success in the efficient establishment of a nationwide network, such as assuring continuity of operations, and establishing self-funding measures for investment and operations.

Evolving Network Technologies

In the two years since the Spectrum Act was passed, communications technologies have evolved in ways not fully anticipated at the time.¹²⁹ Advances in small cell technology, in particular, are moving traffic management away from the core of cell tower infrastructure and toward micro networks built on the principles of Wide Area Networks. These micro networks are local in nature but fully interoperable across wide geographic areas.

FirstNet's decision to create ten regional offices meets both governance needs and the likely organization of FirstNet's nationwide infrastructure. The regional structure takes advantage of new networking solutions that can build on existing deployments of broadband networks. Every firehouse, 911 call center, police station, and other public structure, including lampposts and traffic lights, might be a link in a micro network. In this environment, the integration of Next Generation 911 infrastructure with FirstNet becomes a crucial part of network deployment strategy.¹³⁰

Assessment by the GAO

Before the end of FY2022, GAO is to recommend to Congress what actions should be taken in regard to the end of FirstNet's authority, which the act mandated to occur in 2027, 15 years after the passage of the act.

Options for GAO recommendations regarding governance may include the following:

- Federal corporation with the authority to issue bonds not backed by the federal government, and that, in time, becomes self-sustaining; the Tennessee Valley Authority (TVA) might provide an example of how such a charter might evolve.¹³¹

¹²⁷ FCC, "Promoting Interoperability in the 700 MHz Commercial Spectrum," Notice of Proposed Rulemaking, WT Docket No. 12-69, released March 21, 2012.

¹²⁸ FCC, "Report and Order and Order of Proposed Modification," WT Docket No. 12-69, released October 29, 2013.

¹²⁹ 4G Americas, *Meeting the 100X Challenge: The Need for Spectrum, Technology and Policy Innovation*, October 2013, http://www.4gamericas.org/documents/2013_4G%20Americas%20Meeting%20the%20100x%20Challenge%2010%204%2013_FINAL.pdf.

¹³⁰ Hearing, House Committee on Energy and Commerce, Subcommittee on Communications and Technology, "Oversight of FirstNet and the Advancement of Public Safety Wireless Communications," testimony of Samuel Ginn, November 21, 2013.

¹³¹ The Administrative Budget for FY2014 proposed privatizing the TVA and required the Office of Management and (continued...)

- Hybrid corporation established by the federal government, relying on a combination of earned income and federal funding, such as Amtrak.
- Corporation established by the federal government, such as Conrail. The federal presence on the Conrail board was tied to repayment of federal obligations.
- Federal corporation established as a transition vehicle to transfer to the private sector, such as the U.S. Enrichment Corporation.
- Federal agency in perpetuity either as an entity within the NTIA or through some other federal governance structure.

These potential choices will likely be influenced by decisions made by FirstNet's board and management team, and by the NTIA through the grant process and the policies it establishes.

In light of what is likely to become a significant shift in wireless network technology, a preliminary analysis of FirstNet by the GAO might lead to recommendations for how to mesh current business plans for the new network with a transition strategy for possible future governance structures.

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Budget to perform a strategic review.