What Should FirstNet Do First?

State Integration into the National Public Safety Broadband Network

A Report on Technical and Policy Implications of the Integration of State Public Safety Broadband Networks into the National Broadband Network and Possible Courses of Action

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EXECUTIVE SUMMARY

A nationwide public safety broadband network holds tremendous promise to deliver revolutionary public safety and emergency data (and later voice) services. At the same time, this network promises to solve the persistent and deadly problem of non-interoperable public safety communications systems. One intent of the Middle Class Tax Relief and Job Creation Act of 2012, a triumph in bi-partisan legislation, was to fulfill those promises. Yet the board of directors of the First Responders Network Authority (FirstNet) faces daunting challenges to make the National Public Safety Broadband Network (NPSBN) a reality.

One of those challenges is funding. FirstNet may not be able to count on more than $2 billion authorized by the Act to establish the network in the first few years, far less than will be needed to ensure that the NPSBN is truly nationwide. An additional $5 billion still may not be enough, and those funds will not be available until the Federal Communications Commission (FCC) is able to conduct voluntary incentive auctions for some of the television broadcast spectrum. This auction has been slated for 2014, but incentive auctions are new, innovative and therefore no one is exactly sure of the outcome or the timetable. FirstNet will have to act on the $2 billion until it gets other sources of reliable funding or revenues from leasing the spectrum it has been allotted.

Timing is another challenge. The statutory planning process may take years, followed by a complex Request for Proposals (RFP) for the new network. Between funding, planning and other timing matters, the NPSBN may not be launched until 2015, 2016 or beyond. The problem with funding alone may mean that the NPSBN will not be completed for a decade, bringing with that long period more challenges to keep the network interoperable.

During the planning stages of the NPSBN, several States want to proceed with state networks which can interconnect with the NPSBN when it becomes available. Prior to the passage of the Act, several waivers were granted by the FCC for early deployment, and the Department of Commerce's National Telecommunications and Information Agency (NTIA) made grants totaling approximately $382 million to start deployment of the State broadband networks. Some waiver recipients had other funding as well.

Unfortunately (in light of the underfunding of the network), NTIA impeded the early deployers after the passage of the Act, apparently because of concerns about compatibility and to preserve options to the FirstNet Board. The technical challenges raised by NTIA can be overcome with reasonable oversight and without undue expense. Accordingly, early deployers should be allowed to use their grants and their own funding to move forward, especially since it may be years before the NPSBN reaches them otherwise.

The FirstNet Board also will have the challenge of reaching out to its primary stakeholders and customer base, the States, the governors of which feel that they have been ignored and left out of representation on the FirstNet Board. FirstNet must find effective ways to incorporate the States through the governors, the governors' technical advisors and State Chief Information Officers (CIOs). If FirstNet is not deployed soon, States may choose the statutory opt-out procedure, or if this is too politically challenging or the NPSBN is too

expensive, the States may simply not participate. FirstNet should establish a separate advisory board for the governors, their advisors and State CIOs, provide non-voting representation on the FirstNet Board and develop a strategic plan with input from the States.

FirstNet needs its own, robust staff and professional resources with specific network, broadband and LTE expertise as well as business and oversight acumen, and they need more capacity to deal with the enormity of this $7 billion undertaking. Once FirstNet, an independent authority, gets that expertise and capacity, FirstNet may be more comfortable with embracing the States as early deployers that interconnect with the NPSBN and may even come to view States that opt-out as a strategy to extend the network. Even though NTIA has dedicated, hardworking staff members now, it will need more staff, too, to increase its oversight capacity.

While opting out is statutory right given to the States, the Act does not make opting out easy, and any State desiring to preserve its options must start planning and acting well in advance of the statutory trigger whereby the State governor notifies the federal government of the intent to build a state radio access network (RAN). Even if States are able to surmount the statutory obstacles, they still face the unprecedented prospect of paying leasing fees for the spectrum and use of the NPSBN core. For the NPSBN to succeed, FirstNet must be neutral and fact-based from the outset on the matter of opting out.

No one knows how much the services of the NPSBN will cost. For States opting-in, cost allocations for the RAN and other existing State infrastructure may be highly complex. The costs for States opting-in would include the resources required to manage access by FirstNet to State infrastructure. FirstNet must create a cost model and conduct a financial analysis, both to inform the Board of what business model should be adopted, but also to give the States the confidence that the services will be affordable and the ability to start budgeting for them.

Here are some of the things that FirstNet should do first:

1. Get expertise and personnel capacity.
2. Quickly develop a cost model and business plan.
3. Develop a customer relations and marketing plan for the States; embrace the States.
4. Facilitate the early deployment of those States and localities that are funded and ready to launch.
5. Formalize state representation.
6. Broaden the base of users to include transportation, utilities, and others.
7. Adopt a policy of national interoperability, local control.
8. Develop an Identity and Access Management System.
9. Negotiate roaming agreements.

FirstNet also must choose a course of action that launches the NPSBN in sustainable phases, leveraging State networks and commercial networks while preserving interoperability.

METHODOLOGY AND SCOPE

The Potomac Institute for Policy Studies is a non-partisan, not-for-profit science and technology policy research institute. The mission of the Potomac Institute is to identify and aggressively forge knowledge, discussion and collaborative courses of action on key science, technology, and national security issues facing the Nation.

For this study, Potomac Institute analyzed the implementation of the National Public Safety Broadband Network (NPSBN) under the Middle Class Tax Relief and Job Creation Act of 2012 and the actions that had been taken prior to that legislation. Those actions include waivers and grants for early deployment by State and local jurisdictions. The purpose of the study is to produce this report on the implications of integration of the States into the NPSBN, both technically and from a policy standpoint, with conclusions and recommendations. A list of technical and policy questions were developed, which were segmented into three related topic areas: (1) FirstNet Technical Challenges and Timing, (2) FirstNet Financing and (3) States Options and Alternatives.

The study was started on August 15, 2012 with the goal of completing the report in time to be useful to FirstNet's formation. During this intense period, Potomac Institute conducted research, interviewed experts and current and former government officials and held a colloquy of technical and policy experts. Research was conducted largely from online and print sources, including from government, academia, non-profit and the media.

The colloquy was held at Potomac Institute on September 10, 2012, moderated by the study's principal investigator, James Arden Barnett, Jr. The subject matter experts were:

- Dr. Jon Peha, Full Professor and Research Director at Carnegie Mellon University and former Chief Technologist at the Federal Communications Commission;
- Dr. Kenneth Zdunek, Senior Research Associate, Wireless Network & Communications Research Center, Illinois Institute of Technology;
- Mr. Anthony Parrillo, Parrillo Associates, Engineer and former Advanced Concepts and Technology Senior Advisor to the USDA CIO and program manager for the first rural 700 MHz public safety broadband (LTE) deployment;
- Mr. Bruce Gottlieb, J.D., former Chief Counsel to the Chairman of the Federal Communications Commission and, prior to that, legal advisor to FCC Commissioner Michael Copps.

The results of the colloquy were analyzed and combined with the prior research, but this report represents the conclusions of the principal investigator only and should not be ascribed to any particular individual consulted during this process.

INTRODUCTION: THE PROMISE AND CHALLENGES OF PUBLIC SAFETY BROADBAND

The advent of a nationwide, ubiquitous broadband wireless network for public safety has the potential to revolutionize the level and types of services that can be offered to save lives, protect property, deter and solve crimes, prevent violence, provide medical services, safeguard critical infrastructure, improve emergency management and ensure the rapid restoration of services following a disaster. This network additionally could solve the quandary presented by the patchwork of non-interoperable public safety communications that has plagued the nation for three quarters of a century. The promise of this technology is enormous.

President Obama signs the Act in February 2012, a bi-partisan effort led by Vice President Joe Biden, Senator Jay Rockefeller (D-WV) & Congressman Greg Walden (R-WA). Source: Official Photos

The Middle Class Tax Relief and Job Creation Act of 2012 (the Act) seeks to fulfill this promise.[1] The Act was a spectacular bi-partisan achievement in the 112th Congress, which has become notable for the scarcity of bi-partisan legislation. The Act adds the 10 megahertz of the D Block to the existing public safety broadband spectrum in the 700 MHz range for a total of 24 MHz of broadband–a tremendous amount of capacity.[2] The Act provides $7 billion for the establishment of the nationwide public safety broadband network (NPSBN), funded by voluntary incentive auctions of broadcast television spectrum authorized by the Act.

The First Responders Network Authority (or FirstNet) was established by the Act as an authority, under NTIA but independent of NTIA, to operate the NPSBN through its Board of Directors. Under the Act, FirstNet has the duty and responsibility to deploy and operate a NPSBN "in consultation with Federal, State, tribal and local public safety entities" among others.[3] The FirstNet Board was named in August, 2012, but it may take some time to get organized. Additionally, the Act provides specific directions on how States may plan for the network and how FirstNet will advertise for and build the network. These statutory procedures could mean, conservatively, that the initial operations may not begin for years,

[1] The Middle Class Tax Relief and Jobs Creation Act of 2012, adopted February 22, 2012, was known as H.R. 3630 for the 112th Congress, Pub. L. 112-96, 126 Stat. 156 and will be referred to in this report as "the Act."

[2] Public safety also has narrowband spectrum in 700 MHz, which the Act provides may be able to be used flexibly for broadband.

[3] §6204(a) of the Act provides that FirstNet is established as an independent authority within NTIA, and §6204(b) provides that FirstNet shall be headed by a Board. In §6206(b), the Act provides that FirstNet's powers, duties and responsibilities are to be exercised "through the actions of its Board."

and when the complexity of the revenue which will be used to complete the network is factored, FirstNet may not be truly nationwide for over a decade.

However, prior to the Act, several State and local entities applied to the Federal Communications Commission (FCC) for permission to build early public safety networks in the original 10 MHz of the public safety spectrum in the 700 MHz band. The FCC granted 21 such waivers and several received Broadband Technology Opportunity Program (BTOP) grants from the NTIA amounting to approximately $382 million.[4] A handful of other waiver recipients had existing grants or State and local funding. To ensure interoperability, the FCC required public safety broadband networks to use Long Term Evolution (LTE) technology and established interfaces and other interoperability requirements. Waiver recipients could not proceed with their networks under an FCC order unless the State or local entity could show that its network would interoperate with each other and the nationwide network. Still other jurisdictions had various levels of funding and had applied for waivers, but those waivers had not been granted by the FCC prior to the passage of the Act.

FirstNet Board

- Sam Ginn, Chairman, former Chairman of Vodafone AirTouch & of Pacific Telesis
- Craig Farrill, Co-founder of Kodiak Networks, formerly of Vodafone and AirTouch
- William Keever, retired regional president for Vodafone, AirTouch, Pacific Telesis
- Paul Fitzgerald, Sheriff, Story County, Iowa, former president, National Sheriff's Association
- Deputy Chief Chuck Dowd, NYPD, Major Cities Chiefs Police Association representative
- Jeff Johnson, Fire Chief (retired), former President, International Association of Fire Chiefs
- Kevin McGinnis, Program Manager, National Association of State EMS Officers (NASEMSO)
- Tim Bryan, CEO, National Rural Telecommunications Cooperative
- Ed Reynolds, retired, former president of BellSouth Mobility and AT&T executive
- Susan Swenson, retired, former president & CEO of Cellular One
- Teri Takai, DoD CIO and former CIO of Michigan and California
- Wellington Webb, former Mayor of Denver, Colorado
- Secretary of Homeland Security Janet Napolitano
- Attorney General Eric Holder
- Director of the Office of Management and Budget (Acting) Jeffrey Zients

Figure 1 Membership on the FirstNet Board of Directors

Not long after passage of the Act, NTIA suggested the delay or suspension of certain expenditures by the BTOP grant recipients and requested that the FCC revoke the waivers (whether BTOP recipients or not).[5] These actions by NTIA represented a significant shift in

[4] FCC Order of May 11, 2010 in the Matter of the Requests for Waiver of Various Petitioners to Allow the Establishment of 700 MHz Interoperable Public Safety Wireless Broadband Networks, http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-10-79A1.pdf.

[5] Wayne Hanson, "Feds Rethink Public Safety Network While Locals Stew," *Emergency Management,* August 30, 2012, http://www.emergencymgmt.com/safety/Feds-Rethink-Public-Safety-Network.html.

policy, and either stopped the projects cold or threw them into a contractual limbo with a risk of losing grant funding.

In doing so, NTIA has raised significant policy and technical questions about the nature of State relations and integration into the NPSBN. NTIA officials have cited concern that the State waivers and BTOP projects might not be interoperable with FirstNet and the desire to preserve all available options for FirstNet. However, with regard to interoperability, NTIA awarded the BTOP grants on the premise that the State and local networks would interoperate with the nationwide network.[6] The passage of the Act did not change the underlying premise or capability to ensure that State systems could be integrated into the NPSBN.

Additionally, the NTIA action could delay the use of the public safety spectrum in those jurisdictions for years until FirstNet is able to extend the NPSBN to those areas. The safety of the public in those areas for those years could become a significant policy question.

Beyond the waiver and BTOP recipients, other complexities exist. The Act seemingly provides two avenues for States to participate in the NPSBN. The Act provides each State with an alternative to opt out of FirstNet's RAN and to construct and operate its own State RAN as long as it is interoperable with FirstNet. However, the process the Act creates is bureaucratically cumbersome and intentionally so rapid that States may not have a meaningful amount of time and information to react and decide. The Act provides the option, but clearly does not favor any State to exercise the opt-out alternative, and if the States do opt-out, they are subject to undetermined leasing fees for public safety spectrum. The Act seems to indicate that the FCC will have more responsibility over those States that opt out, creating questions about authority and interoperability.

Great expectations have been levied on FirstNet to fulfill the promise of a nationwide, interoperable public safety broadband network with the tools and authorities provided by the Act. The task is daunting. This report addresses the challenges the FirstNet Board faces in launching the network with limited funds and how the possibility and implications of interoperable State public safety networks, either through early deployers or by States opting out, play in the first decisions by FirstNet.

THE TECHNICAL AND POLICY IMPLICATIONS FOR THE LIKELY DEPLOYMENT TIMELINE FOR THE NATIONAL PUBLIC SAFETY BROADBAND NETWORK

The deployment of the NPSBN by FirstNet will take several years, perhaps as many as five to six to even launch the first phase based on current actions and projections. The date when the NPSBN will be truly nationwide may be over a decade away, and even that

[6] The FCC waivers to early deployers also were conditioned upon interoperability.

prediction may be optimistic. The pre-deployment planning and decision-making will be a lengthy process, and several factors play in the length of time.

The first factor is the Act itself. The FirstNet Board was not named until August 20, 2012 as required by the Act, and the first meeting of the new Authority board members in person is slated for September 25, 2012.[7] Once the Board is seated, some experts estimate that it will take a 3-6 months to get fully organized before major decisions can be made.[8] While the question has been widely asked, "When will the network be deployed," a more salient question is "When will the network get started?"

Those major decisions that the FirstNet Board must address include matters central to the operating concept of the NPSBN. The Act imposes a statutory duty on FirstNet to establish a nationwide, interoperable public safety broadband network, and it must do so "taking into account the plans developed" through the State and local planning process.[9] The network also must be based on "single, nationwide network architecture."[10] This single architecture, however, may be distinguishable from a single network, and the technological importance of this will be discussed below.

The planning process likely will not start until sometime in 2013, and some experts have opined that the planning will not get started until after 2014. If the nationwide network must wait on the State planning process, three to five years may elapse before a Request for Proposals (RFP) for the construction, maintenance and operation of the NSPBN could even be issued by FirstNet. The Act incongruously required that NTIA issue guidelines for the State planning grants by August 22, 2012, in consultation with the FirstNet Board, which was not even required to be named until August 20 and did not hold its first in-person meeting prior to the August 22, 2012 statutory deadline for the state planning grant guidance.

However, NTIA did publish its findings (noting the incongruence) in the Federal Register on August 21, 2012 from a Request for Information (RFI), issued on May 16, 2012, in preparation for the grant guidance.[11] Those findings reveal a key factor in the timing of the planning process. Several respondents to NTIA's RFI noted that States will need time and money to hire staff and prepare for the planning process, something that could take months

[7] Media Release from NTIA, August 20, 2012, http://www.ntia.doc.gov/other-publication/2012/acting-secretary-rebecca-blank-announces-board-directors-first-responder-netw.
[8] Presentation by NTIA Staff at the National Governors Association's National Forum on Preparing for Public Safety Broadband, June 28-29, 2012, Leesburg, Virginia.
[9] The Act §§ 6202(a) and 6202(b)(2)(B).
[10] *Id.* at §6202(b).
[11] Development of Programmatic Requirements for the State and Local Implementation Grant Program To Assist in Planning for the Nationwide Public Safety Broadband Network, Federal Register, Vol. 77, No. 162, August 21, 2012, Notices at Page 50481.

Technologically, networks in States and regions can be linked into a "single, nationwide network architecture" without interoperability problems. Telecommunications carriers have been doing so for years.

or years.[12] Many States are already underfunded and suffering from budgetary shortfalls. They are operating, maintaining and in some cases upgrading existing public safety communications systems, so the fiscal flexibility to hire staff with expertise in broadband networks and communications is nearly non-existent.[13]

Nevertheless, the mindset that the new NPSBN has to be a single network may be driving a timeline that excludes a phased, flexible deployment. The Act requires a "single, nationwide network architecture," which can be interpreted as allowing phases, and the Act specifically refers to phases in requiring rural development throughout the establishment of the NPSBN.[14] Some States are farther along and better prepared; these could receive earlier grants if NTIA and FirstNet have the technological expertise and the oversight capacity and competence to ensure that earlier development does not introduce interoperability problems. Technologically, networks in States and regions can be linked into a "single, nationwide network architecture" without interoperability problems. Telecommunications carriers have been doing so for years. This is particularly the case given that the FCC required LTE interoperability for public safety waiver recipients two years ago and all subsequent state planning has been under that requirement.

The current process envisioned by NTIA seems to be as follows: in the next few months, NTIA will have contracted with a consultant to help with writing an RFP and working through federal-state procurement matters (and as an independent authority, FirstNet should obtain its own consultants). By the spring of 2013, the FirstNet Board and staff should be organized and can consult with NTIA on the grant guidance for the state planning grants. The grant process is anticipated to having two phases (which naturally means more time). The first phase is aimed at initial planning, governance planning and stakeholder education. The second phase involves consultation with the authorized state point of contact on matters of network coverage, user requirements and hardening of the network.[15]

[12] *Id* at Page 50483.
[13] The matter of expert staffing and capacity must be addressed at the federal level as well. NTIA had less than 20 persons working on public safety communications issues before the passage of the Act on February 22, 2012. As late as September 1, 2012, there are still less than 20 at NTIA assigned full-time to working on bringing about a $7 billion nationwide network.
[14] The Act §6206(b)(3).
[15] Development of Programmatic Requirements for the State and Local Implementation, F.R. at Page 50485.

Hypothetically, if the first phase grant guidance goes out as early as April, 2013, States could be required to apply for the State planning grants by August, 2013, and it would take some time for the grants to be evaluated and awarded. The States would then have to implement the grant, issuing requests for proposals or otherwise issuing contracts, hiring staff, conducting outreach to State stakeholders, creating inventories of assets and educating users. While there is nothing that says that phase two must wait until phase one is complete, as envisioned by NTIA, phase one may take a year or more.

For the sake of the hypothetical, this means that the phase one planning grant could be completed, ambitiously, by August, 2014. If the phase two grant process starts before the end of phase one, it is possible that phase two could start immediately in August, 2014. Phase two could then take six months, completing in February, 2015. Accordingly, this would be about the earliest that a State's planning information could be considered by FirstNet for the purposes of preparing a RFP for that particular State.

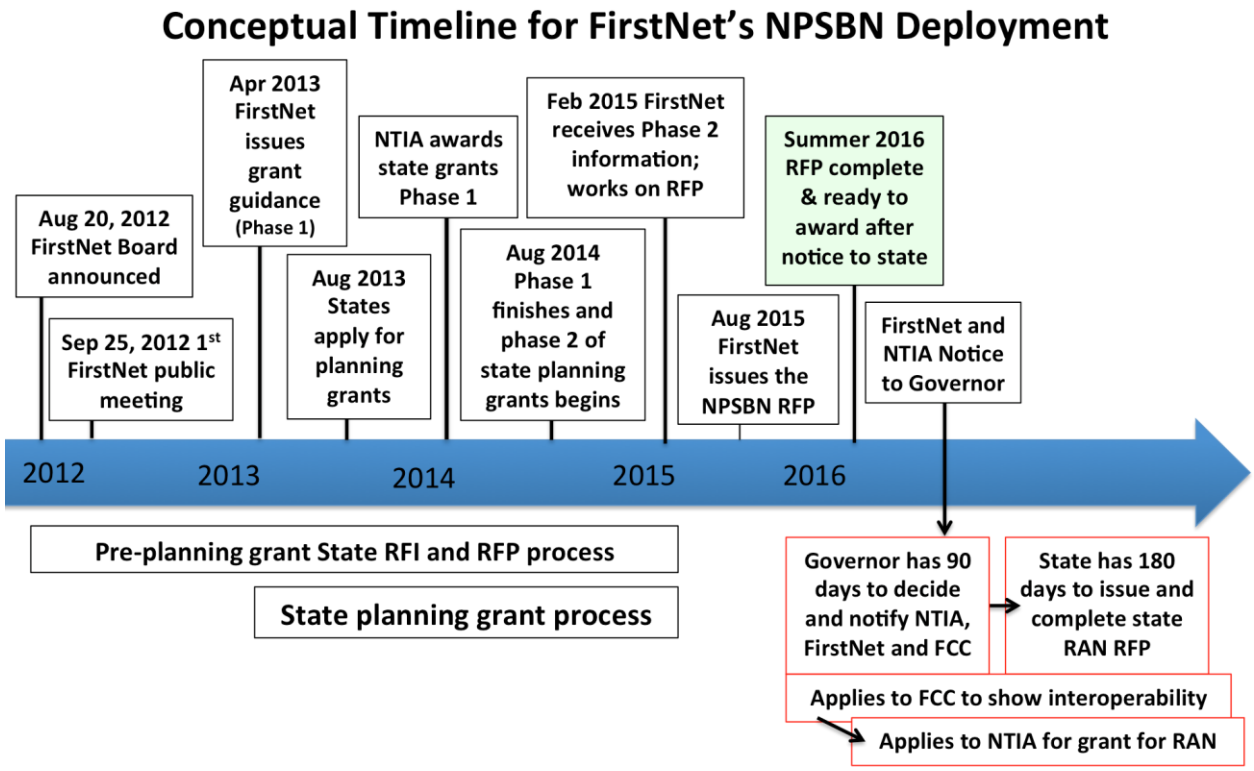

Figure 2 Conceptual Timelines for Deployment and Opting Out

If FirstNet takes the position that all States must have turned in their plans in order to meet the statutory requirement that State plans be taken "into account" in the development, construction and operation of the network, then the timeline becomes significantly longer.

States which fail to plan, plan slowly or suffer some setback in planning would become the determinant force in the timing of the new NPSBN.

A more practical approach would be for FirstNet to phase the launch of the NPSBN, providing the wherewithal for States to conduct their planning to level the playing field among financially strained States and those with some funding; and incentivizing speed and enthusiasm with the promise that those who plan first and well will have an advantage of getting the funding and the network before others who do not plan and implement energetically. This position presupposes that FirstNet and NTIA have the necessary technical expertise and oversight capacity to ensure interoperability even as the phased deployment proceeds.

Assuming for the hypothetical that FirstNet does not wait until it has all the State plans before it issues its first RFP, the FirstNet RFP process could begin as soon as it evaluates and takes into account the phase two information that it receives in February, 2015. Realistically, the review of the planning information could take several months to incorporate into a NPSBN RFP. Hopefully, initial groundwork for the RFP would shorten this length of time, but a reasonable (if ambitious) estimate may be six months, with FirstNet issuing the RFP in August 2015.[16]

This RFP will be technologically complex, requiring a longer response time, perhaps nine months, and some time to review and award, perhaps one to two months. Under this hypothetical, the NPSBN contract to begin the network would be in the summer of 2016, except for one statutory matter which does not follow the generally accepted government contracting process.

The Act requires that FirstNet provide to the governor of each State the details from the RFP for the build-out of the NPSBN in that governor's State and the funding level for the State which has been determined, not by FirstNet, but by NTIA.[17] Upon receipt, the governor has 90 days to decide whether to proceed under the FirstNet plan or to have the State build its own public safety broadband radio access network. If the governor chooses the latter, then the State has only 180 days to complete its own RFP for the construction, maintenance and operation of the State's RAN.[18] This statutory process could inject an additional 270 days into the award of bids for the NPSBN, a factor which is unusual for government contractors and may affect the bidding process and price structure.[19]

[16] August of 2015 if FirstNet does not break the RFP up into regions or pieces which could make the launch in those areas go somewhat faster.
[17] The Act §6302(e).
[18] The Act §6302(e)(2) and (3). The state also must obtain approvals from the FCC and NTIA (not FirstNet), but these requirements are not included within the 180 day deadline.
[19] The awarding of the NPSBN contracts may be segmented regionally, which could allow other States to proceed. The 270 day addition becomes a factor if the state's RFP process fails, and it must resort to FirstNet's NPSBN.

While no specific deadlines are imposed by the Act, once the governor has notified the federal government that the State will opt out, the State must apply to the FCC and show that it can meet the Minimum Technical Recommendations (the "Minimum Recommendations") for interoperability and that it can interoperate with the NPSBN.[20] If the FCC approves the application, the State must apply to NTIA for a lease of the spectrum and for a grant to fund construction of the state RAN. These approval processes do not line up well with the requirement that the State complete its RFP within 180 days. The approval process could take longer, leaving the potential contractors, the State and its RFP process stranded until a final decision is made.

Another key factor in the timeline for deployment is funding. While the Act authorized $7 billion for the network, $5 billion is dependent on the receipt of revenues from the incentive auctions of spectrum which is currently licensed and used by other entities. Rules and agreements must be established, broadcast channels repacked, border interference protection negotiated, and since all of this could take a significant amount of time, a possibility exists that a funding gap could occur. The spectrum will not be cleared until after the auction, which could affect what price the spectrum brings.

Even the most ambitious plan by the FCC does not have the first incentive auction occurring until 2014.[21] The revenue for the auctions will not accrue to FirstNet quickly or regularly, and there is no guarantee on the amount of the auction proceeds. FirstNet is allowed to borrow $2 billion from the U.S. Treasury in anticipation of the auction revenues, but it must also pay this amount back to the Treasury. Statutorily, FirstNet is required to become self-sustaining through revenues it generates from spectrum leasing and user fees.[22]

Almost irrespective of how well the auctions might ultimately succeed, the specter of funding gaps will militate the FirstNet Board to operate cautiously within the confines of the initial $2 billion for the first few years and until the next installment of funding becomes available from auction revenues. No one has suggested that a nationwide public safety network can be established for $7 billion, much less $2 billion. FirstNet will be forced to see the initial funding as phase one of the NPSBN, and this will delay nationwide implementation unless Congress amends the Act or advances the funding. Unless FirstNet adopts a phase one approach or gets significant revenues from the lease of the spectrum,

[20] *Recommended Minimum Technical Requirements to Ensure Nationwide Interoperability for the NPSBN,* FCC Technical Advisory Board for First Responder Interoperability, May 22, 2012.
[21] Stacey Higginbotham, "Need Spectrum? FCC Plans TV Incentive Auction for 2014," *Gigaom*, September 6, 2012; http://gigaom.com/2012/09/06/need-spectrum-fcc-plans-tv-incentive-auction-for-2014/.
[22] The Act §6208.

some of the initial members of the FirstNet Board may rotate off before the network becomes operational.[23]

The real question for FirstNet will be how to implement phase one. The Act requires that rural coverage be included in all phases of deployment.[24] Accordingly, phase one will not be just a combination of large cities, and politically it will not be tenable to concentrate the phase one network in one part of the country. However, spreading out phase one geographically is also problematic, since systems which are remote from each other will necessarily not have as much opportunity or need to interoperate.

Thus, the Act, the funding scheme and the complexities of launching a NPSBN combine to push the *initial* operational capability of a small part of the system until five or six years after the adoption of the Act. The final operational capability (FOC) of the NPSBN is not foreseeable at this time because the funding and the funding model simply do not exist. Clearly, FOC is more than ten years away on the current course.

The current course of action is not the only one available to FirstNet, however. FirstNet can move forward with those jurisdictions that received waivers to use the 700 MHz public safety spectrum and received either BTOP grants or other funding. Proceeding with the waiver recipients would require the right technological expertise and more oversight capability than NTIA (or FirstNet) currently has. FirstNet also could establish the first phase of the NPSBN by simply contracting with wireless carriers to provide a 10x10 Band Class 14 radio access network along their current commercial network lines, with an emphasis on those serving rural areas (or a requirement that some percentage of the commercial network serve rural areas).[25] Part of this bargain might be a leasing arrangement with the carriers for the spectrum capacity to bring in revenue for FirstNet.

FirstNet also has an opportunity to encourage those States that have the funding and enthusiasm to move forward without any or significant federal funding. Here again, the question is ensuring interoperability by having the right expertise and capacity for technical and budgetary oversight.

[23] The Act §6204. Other than the three federal members, the 12 appointed members serve 3 year terms. Some, however, will be staggered. Members may be reappointed once.
[24] The Act §6202(b)(3).
[25] The 3GPP standards group established four different band classes for 700 MHz, and Band Class 14 encompasses the D Block plus the public safety spectrum previously designated for public safety broadband.

TECHNICAL CHALLENGES FOR STATE INTEGRATION INTO THE NPSBN AND SOLUTIONS

Technical challenges for the integration of the State and local public safety broadband networks into an interoperable NPSBN do exist, but they can be overcome reasonably and, with proper planning and execution, without undue expense.

First, it must be recognized that all forces work against interoperability, especially market and local budget forces. Our American system of free enterprise is actually based on producing products that can be differentiated from the competition. Interoperability costs money, and when public safety communications systems come under budgetary pressure, as they always do, cutting interoperability does not actually degrade the capability of the system within that jurisdiction. For example, in a budgetary crunch, why would Smith County pay more just to be able to talk to Jones County, especially when it doesn't have to do so except in rare emergency situations? The same is true for States. In addition, the U.S. system of federalism highly values State (and local) autonomy, an issue not encountered in some large European countries, where police forces are organized at the national level.

The lack of interoperability, however, costs lives, often the lives of first responders, a fact that unfortunately can become detached in the fray of procurement and budget decisions. If market forces do not drive interoperability, and State and local budget pressures work against it, the driver has to be a national resolve that interoperability must exist throughout the public safety communications environment. That national resolve now resides in the Act, and the opportunity for an affordable NPSBN only exists because a new technology is being launched into a relatively unencumbered spectrum.

The longer the Nation takes to launch the NPSBN, the greater the risk that it will not be interoperable and the greater the cost to ensure that it is interoperable. For instance, an expanse of ten years from the start to final operational capability means that some parts of the system will be a decade old just as new jurisdictions are brought on line.[26] The Act anticipates constantly upgrading the system to keep it in close parallel to commercially available systems.[27] This disparity in age and upgrade status invites problems with interoperability and increased costs to maintain interoperability. Clearly, funding and time are two of the greatest non-technological threats to interoperability.

Second, a significant threat to interoperability comes from a lack of technical expertise and a sufficient workforce to provide technical, budgetary and contractual oversight of the multi-billion dollar national asset. The Act shifted responsibility for State and local public safety communications in the broadband world away from the FCC, where there are over

[26] The rapid obsolescence of technology can be seen in changes in cellphones just in the last decade. The first iPhone was only five years ago and is no longer supported by Apple or most of the carrier infrastructure.
[27] The Act §6206(c)(4).

1,800 employees, over one hundred of whom work on public safety communications, to the NTIA, where there are only a handful dedicated employees who were working on public safety communications *before* the Act was adopted. NTIA's numbers for working on public safety and FirstNet have not changed appreciably in the months since then. The persons who currently work on FirstNet are dedicated experts, who are now being overworked to keep up with the awesome responsibility. None has constructed or managed the launch of a broadband network of this proportion. The point is that they need reinforcements immediately with the right expertise and the right numbers; this should be a high priority.

The reinforcement of NTIA and FirstNet should be an "all hands on deck" endeavor. Federal agencies with expertise, such as the FCC and Department of Homeland Security, should be called upon to detail experts to NTIA and FirstNet. The FCC set up a division entitled the Emergency Response Interoperability Center (ERIC) while it still had responsibility for the public safety broadband network to provide the expertise required for the early deployers. Experts from ERIC could be detailed temporarily to FirstNet and NTIA.[28] NTIA has already advertised for expert assistance in program management, cost-estimating, acquisition management and professional expertise in telecommunications in an RFP that was released on August 10, 2012.[29] FirstNet itself should contract for independent expert assistance in the short run. In the long run, NTIA and FirstNet must obtain permanently the expert staff that they need as integral parts of their respective organizations.

NTIA's lack of capacity and capability may have already become manifest in its decision to stop the BTOP grant recipients and other early deployers of 700 MHz public safety systems. NTIA issued BTOP grants totaling over $382 million to seven recipients who had received waivers from the FCC to deploy in the 10 MHz of the public safety spectrum in 700 MHz band. With the assurance that the NPSBN will never have enough funding, $382 million is a significant down payment on the network. The grants also spurred a great deal of State and local spending, sometimes at the expense of other public safety communications priorities and needs.

NTIA's grants were conditioned on interoperability. Presumably, NTIA thought at the time of the BTOP grants for public safety broadband that these systems could be integrated into the NPSBN seamlessly, a national goal since the passage of the homeland security

[28] §6213 of the Act provides that the FCC may provide technical assistance to FirstNet. The Act represents a major shift in responsibility for public safety communications from the FCC, which has a dedicated and experienced expert force, to NTIA, which traditionally deals with federal communications, not state or local. FCC has a force of over 1800; NTIA has a total force of just over 200 and really less than twenty hardworking people dedicated to FirstNet so far.

[29] Department of Commerce Request for Proposal to Obtain Advisory and Management Support Services for NTIA to Form the First Responders Network Authority, August 10, 2012.

legislation in 2004 and a leading recommendation of the 9/11 Commission.[30] NTIA encouraged the building of these systems and pushed hard to make sure that the BTOP funds were obligated on time and were being expended on schedule. NTIA got the National Institute of Standards and Technology (NIST) and its Public Safety Communications Research laboratory involved in working on interoperability.

After the passage of the Act, NTIA abruptly shifted its position and ultimately stopped these systems from moving forward, citing concerns about keeping options open for FirstNet and NTIA's concept that the purchase of components it had already funded might not be compatible with the NPSBN.[31] NTIA did not suspend the grants or order that LTE equipment not be purchased or, if already purchased, installed. The BTOP recipients were asked to "pause" in ordering, taking delivery or installing LTE equipment, even though each of them had contractual obligations based on the BTOP grants.[32]

Unfortunately, the stoppage may mean a loss of millions of dollars to the network of grant funding and of State and local funding. Most probably, this loss would be a permanent one; the unspent federal money may simply revert back to the Treasury and would not be re-programmed for the NPSBN. An opportunity cost was exacted as well, since those State and local funds and the time of the local and State officials were needed for other public safety communications projects. The network in Charlotte, N.C. could have been operational for its recent National Special Security Event, the Democratic National Convention. The networks in Mississippi and Houston, Texas, could have been operational for Hurricane Isaac and the remainder of the 2012 hurricane season. If NTIA had already had the level of expertise and the numbers of persons required for oversight, the BTOP grants could have been managed to ensure interoperability with the NPSBN, especially given the LTE interoperability requirements. Allowing BTOP recipients to continue moving forward would expedite state and local broadband interoperability, which is especially important given that the NPSBN may not be operational for several years.

Early deployment has already yielded a great deal of crucial information, which was one of the essential reasons that NTIA and the FCC pursued waivers and BTOP grants for early deployers. Even with the stoppage, NTIA has acknowledged that early deployments are useful and that FirstNet and NTIA will learn from them, and its officials have stated

[30] National Commission on Terrorist Attacks Upon the United States, *The 9/11 Commission Report,* 2004, at p. 293. The 9/11 Commission Report does not specifically recommend a nationwide interoperable public safety network, but it cites the problem of the lack of the ability to communicate and some of its recommendations are answered by an interoperable NPSBN (*see* p. 396-398). http://www.9-11commission.gov/report/911Report.pdf

[31] Testimony of Assistant Secretary of Commerce Lawrence Strickling on "Broadband Loans and Grants" before the House Energy & Commerce Subcommittee on Communications and Technology, May 16, 2012.

[32] Letter from Assistant Secretary Lawrence Strickling to Charles Robinson, City of Charlotte, N.C., May 11, 2012, http://www2.ntia.doc.gov/files/grantees/20120511095904533.pdf.

optimism about moving forward with up to three such systems.[33] While such optimism does not clearly square with the stoppage and loss of funding and time, it is a muted recognition that development of State and local systems can be managed to ensure integration into the NPSBN.

Technical challenges to the integration of State and local systems, at this point, include the disparity in the spectrum. The original waiver recipients got permission from the FCC to deploy systems that used the original 10 MHz of public safety spectrum. FirstNet's NPSBN will use, in essence, 20 MHz, that includes the D Block that was reallocated for public safety use by the Act.[34] Since the Act requires the FCC to assign the D Block to FirstNet, the FCC declined to grant permission to use it to the existing waiver recipients. Instead, the FCC said it would wait for FirstNet to request a license for the public safety broadband spectrum.[35] Originally, usage by the waiver recipients was limited to a 5x5 configuration, in contrast to the 10x10 configuration expected under FirstNet.

NTIA had an interoperability concern with systems moving from a 5x5 to a 10x10 configuration, and NTIA has asked the FCC to reconsider its decision and allow waiver recipients to use the spectrum *only* if they used the entire 20 MHz in a 10x10 configuration.[36] The concern expressed was that waiver recipients would have to upgrade their systems in order to be compatible with FirstNet's 10x10 NPSBN.

However, this technological challenge can be handled in other ways than simply denying the early deployers the ability to use the systems that they already have planned at NTIA's behest and encouragement. First, FirstNet's NPSBN system will not even reach initial operational capability for several years; final operational capability may be much longer. That is four to six years that these early systems could be used to protect the public and first responders, all the while learning from them. Second, the early deployers could be required to upgrade their systems to 10x10, and their vendors could be brought in contractually or by bond to ensure that this will be done. This upgrade may not be very expensive, since much of the deployed equipment has the ability to use all of Band Class 14. Since NTIA has already acknowledged that one to three early deployments should be allowed, then a policy of facilitating these deployments should be energetically pursued. This is a technical challenge that can be overcome.

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[33] Donny Jackson, "The Impact of NTIA's Decision to Put LTE on Hold," *Urgent Communications*, September 7, 2012, http://urgentcomm.com/policy_and_law/mag/Public-safety-broadband-deployments-stopped-in-their-tracks-20120907/index.html.

[34] The Act §6101 (requires the FCC to reallocate the D Block in the 700 MHz spectrum).

[35] Order Implementing Public Safety Broadband Provisions of the Act, PS Docket No. 12-94 (July 31, 2012), http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db0802/FCC-12-85A1.pdf.

[36] Letter from Hon. Lawrence Strickling to FCC Chairman Julius Genachowski, August 17, 2012. http://www.ntia.doc.gov/files/ntia/publications/ps_dkt_no_12-94_08172012_fcc_letter.pdf

Moreover, Release 10 by 3GPP, the standard for LTE, will allow for carrier aggregation of spectrum. Carrier aggregation increases capacity by adding bandwidth. Since a principle of LTE is backward compatibility with LTE Release 8 and 9, aggregation is accomplished by combining the component carrier with a bandwidth of 1.4, 3, 5, 10, 15 or 20 MHz with a maximum of up to 5 component carriers, or a maximum bandwidth of 100 MHz.[37] Simple carrier aggregation uses contiguous component carriers within the same operating frequency band, and the D Block and the 700 MHz public safety broadband (Band Class 14) fall into this description. However, even if the component carriers were not contiguous, a situation which commercial carriers face using LTE in the 700 MHz range, these component carriers can be combined as well under LTE Release 10.

…the concerns raised by NTIA can be addressed by requiring adherence to LTE Release 10, which was made available in 2011 and the features of which are being tested by companies now.

Hence, the concerns raised by NTIA can be addressed by requiring adherence to LTE Release 10, which was made available in 2011 and the features of which are being tested by companies now.[38] Most of the upgrades involve software changes and should not cause undue expense. At any rate, during the four to six years before FirstNet deploys the NPSBN, early deployers could be required to upgrade to 10x10 or face either a revocation of the ability to use Band Class 14 spectrum or higher spectrum fees. The FCC declined to limit applications for Special Temporary Authority (STAs) to only 10x10 configurations, leaving these few jurisdictions with flexibility in managing the transition to interconnection with the NPSBN; the FCC order provided that it would entertain STA applications for either 10x10 or 5x5 configurations.[39] The amount and configuration of the spectrum is not a sufficient technological reason for stopping the early deployments.[40]

[37] Jeanette Wannstrom, "Carrier Aggregation Explained," *3GPP*, May 2012); http://www.3gpp.org/Carrier-Aggregation-explained.

[38] *4G Mobile Broadband Evolution: 3GPP Release 10 and Beyond*, page 11, 4G Americas, February, 2011. http://www.4gamericas.org/documents/4G%20Americas_3GPP_Rel-10_Beyond_2.1.11%20.pdf

[39] FCC Order on Reconsideration Adopted August 29, 2012 In the Matter of Implementing Public Safety Broadband Provisions of the Middle Class Tax Relief and Job Creation Act of 2012, FCC 12-96, PS Docket No. 12-94, WT Docket No. 06-150, PS Docket 06-229.

[40] *See also, Public Safety Priority Access to Shared Commercial Networks,* Roberson & Associates, LLC, Ex Parte Filing, March 2, 2012, FCC WT Docket No. 06-150; PS Docket No. 06-229; GN Docket No. 09-51. While this filing with the FCC discusses spectrum sharing with priority access relating to commercial and public safety sharing, the concept can be applied to public safety-only scenario, where an existing state/local RAN is shared between a state/local EPC core and the NPSBN EPC core.

However, STAs are not the perfect answer for early deployers. Harris County, Texas will now proceed on STAs granted by the FCC on August 31, 2012.[41] Charlotte, North Carolina may be next. The State of Mississippi is still interested, but the nature of STAs is that they are temporary. Governor Phil Bryant expressed the desire of the State of Mississippi to proceed on its public safety broadband network in a letter dated August 15, 2012 to Larry Strickling, Assistant Secretary of Commerce and NTIA Administrator, but he also expressed the concern that long-term access to the spectrum was necessary to warrant Mississippi's investment.[42]

The letter also indicated that negotiations were ongoing with the State's vendor for a contractual indemnification provision to ensure that the State of Mississippi's system could interoperate with the NPSBN when it became available.[43] This indemnification provision is a reasonable safeguard upon which to proceed with State and local public safety broadband systems.

FirstNet will need to design and move forward with a network core as early in the process as possible (discussed more below), since the network core is essential to interoperability. A component of the process of developing the core is establishing NPSBN Identity and Access Management, as seen in Figure 3. While much of the discussion of FirstNet and the NPSBN revolves around 700 MHz, Band Class 14 and the RAN, the radio access network is just one way to access the full utility of the network. Police officers, firefighters, EMS personnel and other first responders will be on the radio network for data and information on the front line, but other public safety personnel will need access to that same data as well. They may access the databases and applications via commercial networks, a cable Internet service provider or WiFi service. To facilitate that, FirstNet should develop a robust identity and access management system consisting of five important components:

a. Network Access
b. System Access
c. Applications Access
d. Process Access
e. Data Access

Users will be allowed into levels and compartments based on need and function. This system is indispensable to figuring out how federal, State, local, tribal and regional jurisdictions will work together, and partnering with the States as discussed in the section on consultation below.

[41] FCC Order Adopted on August 31, 2012, DA 12-1432, granting the STA application of the State of Texas to proceed in Harris County.
[42] Letter of Governor Philip J. Bryant to Assistant Secretary of Commerce Larry Strickling, August 15, 2012.
[43] *Ibid.*

Just as "eternal vigilance is the price of liberty," constant testing will be the price of interoperability.[44] The Act and the FCC's Minimum Recommendations both express the requirement for non-proprietary equipment and infrastructure to ensure interoperability.[45] Even with the clearest of technical requirements, manufacturers, vendors and integrators may have interpretations that cause interoperability problems.[46] Since the FCC will not be involved in providing regulations for the NPSBN, FirstNet will have to rigorously enforce interoperability testing, and FirstNet must have the capacity, expertise and culture to do so, including training, legal[47] and contractual oversight capabilities.

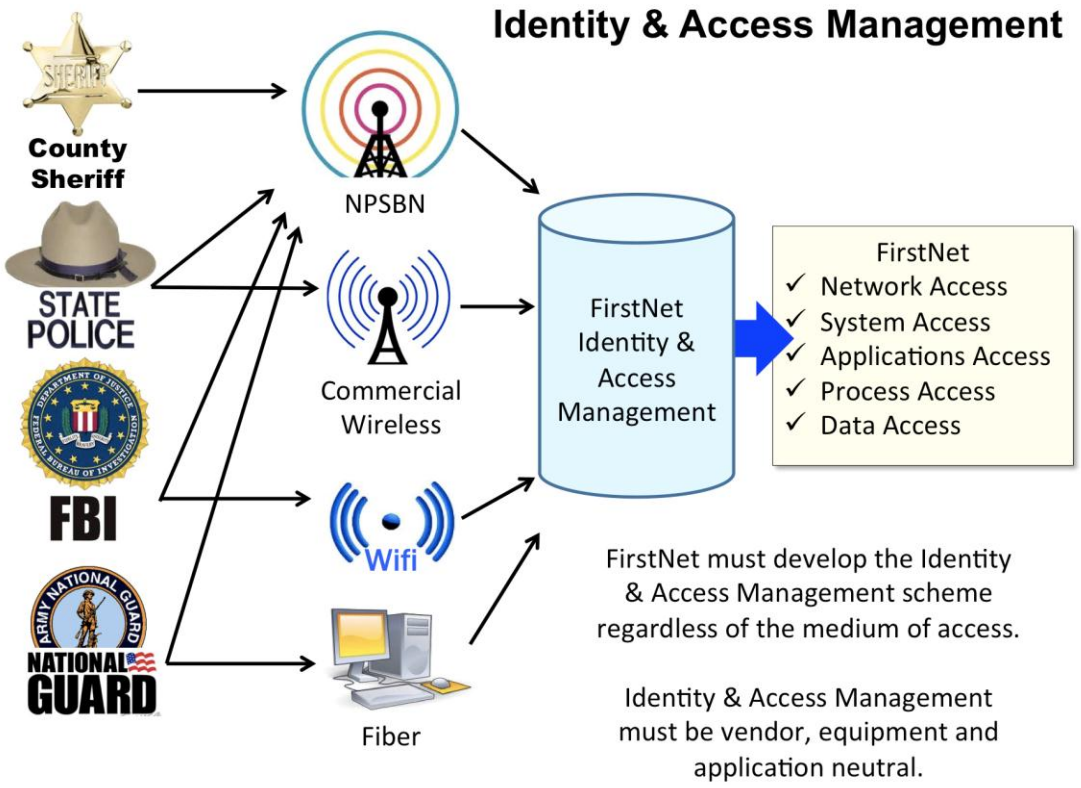


Figure 3 Identity and Access Management

[44] Wendell Phillips' Speech to the Massachusetts Antislavery Society, 1852.

[45] *Recommended Minimum Technical Requirements* at §4.1.11 Additional Recommended Reference Points and Standards; http://apps.fcc.gov/ecfs/document/view;jsessionid=T5wnP2fJynkxfcZG8vcncmwnbwBcR3hTV7hRYQRl2Cq2jLlfgjLQ!-1969853125!-1221852939?id=7021919873.

[46] *Recommended Minimum Technical Requirements* at §4.3.3.2 Infrastructure Interoperability Tests.

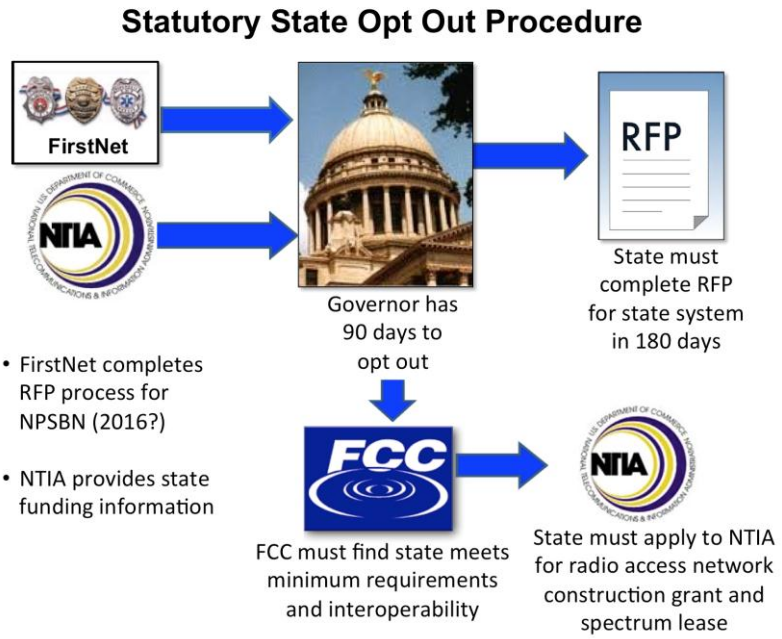
[47] One interesting detail of a combined state-federal NPSBN system will be law enforcement intercept of other law enforcement agency communications. For instance, what happens if a federal investigation is opened on a State or local agency which is suspected of corruption or illegality? In the same vein, what procedures will be in place for a State or local investigation of a federal agent suspected of corruption or other illegality when the communications system is shared?

Early deployments raise the risk that problems with interoperability will occur when the early systems tie onto the NPSBN, but these risks have already been weighed and accepted by NTIA in issuing grants totaling $382 million. FirstNet must require that any network cores that serve the State public safety broadband systems become subservient to the NPSBN core and Network Operations Center (NOC) once they are on line and ready for interconnection.

The technical challenges to interoperability can be mitigated and handled by close coordination and monitoring by NTIA, FirstNet and its technical consultants (until NTIA and FirstNet can be fully staffed with the number of experts that they need). The current early deployers are geographically dispersed (in Charlotte, North Carolina; Harris County, Texas; the State of Mississippi; Adams County, Colorado; and even the Bay Area). Despite any functional interoperability problems, operational interoperability problems among them are unlikely in the first years leading up to the NPSBN due to this geographic dispersion. Their operational systems will provide opportunities to work out problems with interoperability to the advantage of NPSBN.

OPTING OUT: TECHNICAL, FINANCIAL, POLICY AND SPECTRUM ACCESS IMPLICATIONS

The Act sets up a statutory opt-out procedure for the States so that the States may have their own Band Class 14 Radio Access Network (RAN) and with it the right to enter into public-private partnerships for construction, maintenance, operation, and improvement of the network within that State, including leasing excess network capacity.[48] However, the Act provides many challenges for any State considering opting out, setting up a byzantine set of tight deadlines, serial reviews from federal agencies, and gubernatorial decisions on state plans prior to the assurance of federal funding. Any State that opts out must follow a statutory process that will be exceedingly difficult to navigate successfully. These procedures also imply the need for



[48] The Act §6302(e) and (g).

state legislative authority and appropriations in advance of the triggering event set forth in the statute. [49]

The Statutory Opt-Out Process

Once FirstNet completes the RFP process for the NPSBN, presumably in 2015 or 2016, the Act requires FirstNet to provide the governor of each State notice of the completion, "details" of the plan for build-out in the governor's State and information on the funding level for the State as determined by NTIA (not FirstNet).[50] This notice and information from FirstNet is the statutory trigger for the State's decision. First, the governor has 90 days to notify FirstNet, NTIA and the FCC of the governor's decision to participate in FirstNet's NPSBN or for the State to build its own public safety radio access network (RAN).

If the State chooses to build its own RAN, the governor must develop plans for the construction, maintenance and operation of the RAN and *complete* an RFP for the same within a brisk 180 days.[51] A six-month period is not unusual for an RFP process for a construction project alone; for the development of plans for a statewide RAN and the completion of an RFP, six months is breakneck speed.

Although not part of the 180 day period, another statutory process is triggered at the same time which will be determinative of the State's ability to have its own RAN. The Act requires that the State submit an alternative plan for the network to the FCC that demonstrates (1) compliance with the minimum technical requirements developed by the statutory Interoperability Board at the FCC in May, 2012, and (2) interoperability with the NPSBN.[52]

A short review of the Interoperability Board's process and product is appropriate at this point. The Act required the FCC to impanel a committee of experts to develop the minimum technical requirements for interoperability for the new network[53], a tacit recognition of the FCC's technical expertise in overseeing this work. FirstNet has the duty to include the Minimum Requirements, without material alteration, in its RFPs. The Act set up the Interoperability Board with technical representative from national, regional and State wireless providers, public safety members and State and local governments as voting members; it also provided NTIA with an appointment of one non-voting member.

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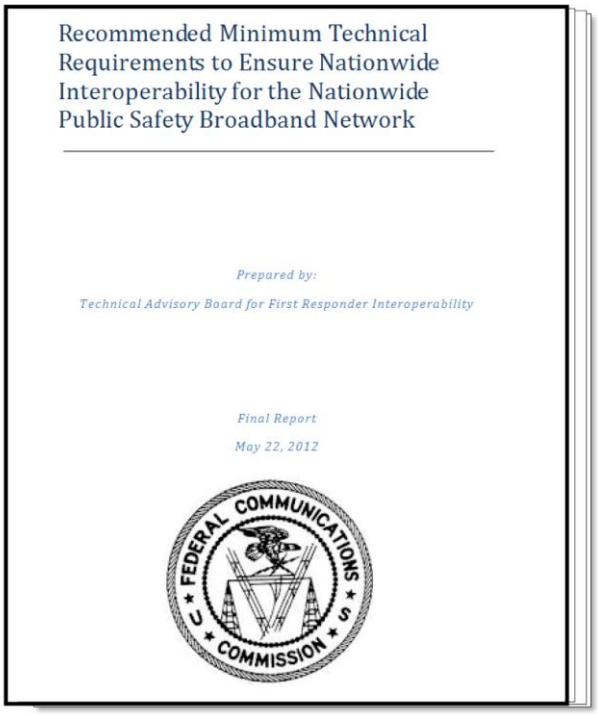
[49] *Id.* The triggering event is the presentation of information to the governor from FirstNet's Request for Proposal, including the funding level determined by NTIA (not FirstNet) for that governor's state.
[50] The Act §6302(e).
[51] *Id.* at §6302(e)(3)(B).
[52] *Id.* at 6302(e)(3)(C).
[53] The Act §6203. The formal name of the Interoperability Board is the "Technical Advisory Board for First Responder Interoperability."

The recommendations of the Interoperability Board on its Minimum Requirements for interoperability, released on May 22, 2012, received widespread praise as on target.[54] However, even members of the Interoperability Board noted limitations due to time and other constraints.[55] Some experts have noted that the Minimum Requirements are indeed minimal and non-specific.[56]


Recommended Minimum Technical Requirements to Ensure Nationwide Interoperability for the Nationwide Public Safety Broadband Network

Prepared by:

Technical Advisory Board for First Responder Interoperability

Final Report

May 22, 2012

FEDERAL COMMUNICATIONS COMMISSION

The NTIA non-voting representative advocated for non-specificity in the Minimum Requirements for interoperability in order to preserve FirstNet's flexibility and options (since FirstNet would not be established until after the statutory deadline for the Interoperability Board). An irony of NTIA's position is that flexible Minimum Requirements means that States will have more flexibility in showing the FCC that they meet those requirements for the purpose of opting out.

States deciding to opt out, however, also will have to show the FCC that they can interoperate with the NPSBN, and no statutory guidance is provided on how the FCC should make this determination and what the status of the NPSBN will be at that point. Whatever the FCC's decision, the Act places the exclusive jurisdiction for appeals of the decision on alternative state plans with the U.S. District Court for the District of Columbia and establishes a standard of review that requires affirmation of the FCC's decision unless there is a showing that the decision was "procured by corruption, fraud, or undue means."[57]

If the State does not receive approval from the FCC, the State "shall proceed" with the plan proposed by FirstNet.[58] Assuming that the opting out State receives the approval of the FCC, the State must then apply to NTIA (not FirstNet) for a grant to construct its own public safety broadband RAN and for a lease of the public safety 700 MHz broadband spectrum. To secure the funding grant and the spectrum lease, the State must show:

[54] Statement of FCC Commissioner Jessica Rosenworcel, *Recommendations of the Technical Advisory Board for First Responder Interoperability*, PS Docket No.12-74, FCC 12-68; http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db0621/FCC-12-68A6.pdf.

[55] Donny Jackson, "Advisory Board Submits 700 MHz Broadband Interoperability Report to FCC," *Urgent Communications*, May 24, 2012; http://urgentcomm.com/policy_and_law/mag/dblock-law-whats-next-201203/.

[56] Potomac Institute NPSBN Expert Panel, September 10, 2012.

[57] The Act §6302(g)(1).

[58] The Act §6302(e)(3)(C)(iv).

a. The technical capability to operate the State RAN;
b. The funding to support the State RAN;
c. The ability to maintain ongoing interoperability with the NPSBN (which implies upgrades);
d. The ability to complete the project in a timeframe that is comparable to FirstNet's plan for that State;
e. The cost-effectiveness of the State's plan as submitted to the FCC; and
f. That the State RAN will have comparable security, coverage and quality of service to that of the NPSBN.[59]

The overall result is the statutory equivalent of a requirement to obtain the broom of the Wicked Witch of West: nearly impossible and fraught with risk. Clearly, no State could accomplish all that would be required of it to opt out in the six to nine months after the governor has received notice of the details of what FirstNet intends to do in the governor's State; the planning process must have started well before that point in order to preserve the State's options. States desiring to preserve or pursue this option will have to develop a strategic plan, issue requests for information or RFPs for a State RAN, and work with legislatures on flexible funding authorizations in advance of the FirstNet notice and NTIA funding information.

While the Act requires FirstNet to consult with state officials during its development of the initial national RFP, with 56 States and territories, and FirstNet's limited resources, it will be a challenge for the national RFP to adequately reflect specific needs of each State.[60] States which have biennial budget cycles particularly will have to plan well in advance to preserve the option for a State public safety RAN. However, opting out is a statutory right given to the States, and FirstNet and NTIA may actually have some unrecognized reasons to work with the States to facilitate opting out rather than discouraging, as will be discussed below.

In an ideal world, the best course for interoperability would be for every State and jurisdiction to sign onto FirstNet's NPSBN for service, but this is only true if FirstNet has a truly *nationwide* network. The NPSBN is not nationally interoperable if it does not extend to all jurisdictions (those jurisdictions without NPSBN will be on some other system). As discussed, interoperability is the prime consideration, but it is not the only one; funding limitations, financial uncertainty, and timing make a truly nationwide network unlikely for a decade or longer. Gaps in coverage are inevitable in the first years of the network. FirstNet could leverage both State funding and assets and commercial funding and assets, drawing more dollars into the overall system, by encouraging and incentivizing State and commercial investment in interoperable state systems for States that opt out.

[59] The Act §6302(e)(3)(D).
[60] The Act §6206(c)(2).

FirstNet's facilitation of opting out of the RAN, for those States that desire it, seems counter-intuitive. However, if FirstNet develops the technical expertise and oversight capability and capacity to ensure interoperability, FirstNet's facilitation of State opt out could improve relationships with States, deliver public safety broadband service to those States sooner, allow FirstNet to focus on the national evolved packet core, free up FirstNet funding for the rest of the NPSBN and contribute to the early revenues of FirstNet.

Whether or not States are successful in opting out, another first will occur: traditionally, public safety entities and States have not had to pay to use public safety spectrum. Even if States opt out of the national RAN, they will have to negotiate with NTIA for a lease, with lease payments, to use the spectrum as well as pay network user fees for using the core network, just like their non-opting out sister States.[61] States that choose to use FirstNet's RAN and evolved packet core also will pay network user fees.[62]

The fact that the Act appears to allow FirstNet to charge participating States a bundled fee, and opting-out States must negotiate spectrum lease terms, could raise concerns. Fees should be based on a reasonable basis, such as the prorated use of the network core and administrative costs. The FCC and NTIA will have to be careful that fees are reasonable for all States and not unduly discriminatory against opt-out States. Congressional oversight may be needed to ensure that the overarching goal of increasing and expediting public safety interoperability is served.

The Other Opt-Out

States have another opt-out alternative which is not statutory but is inherent: some States may decide that they cannot afford to use the NPSBN. Many States and jurisdictions are already using broadband systems in their vehicles and many public safety officers and employees have commercial broadband user devices. If the per user charge per month for using the NPSBN exceeds the current commercial charge, and if the device cost is significantly higher, States may simply sit out the NPSBN and wait to see when and if it gets cheaper. Nothing in the Act compels States to use the system, and States will still have to maintain their voice systems for some time (perhaps 10 to 20 years).

The NPSBN will be a data only system until the 3GPP standards are developed for mission critical voice, which could take several years to develop and implement.[63] This extra expense of maintaining the voice system while building the broadband data system was recognized in the National Broadband Plan, which recommended that States be provided

[61] The Act §6302(e)(3)(C)(iii) and (f).
[62] The Act § 6208(a)(1). Because the Act defines the nationwide public safety broadband network as encompassing both the evolved packet core and the radio access network, § 6202(b) and § 6001(21), the network user fee in 6208(a)(1) refers to a participating State's obligation with respect to both the core and the RAN.
[63] Donny Jackson, "Panel: Broadband Will Not Supplant LMR Voice in the Short Term," Urgent Communications, December 7, 2011; http://urgentcomm.com/mobile_voice/news/broadband-wont-replace-lmr-20111207/.

with a budget-neutral fund for operational transition.[64] In the absence of this support, the transition will be difficult for many States and jurisdictions.

Another policy difficulty for FirstNet and the NPSBN is that NTIA has not recognized who FirstNet's customers would be: the States.[65] The FirstNet Board is made up of excellent individuals with extensive experience and knowledge, they are diverse and talented, and they seem to meet the criteria set up for the twelve appointed members of the Board. The Act requires that the Secretary of Commerce appoint at least three persons who represent States, localities, tribes and territories. Rural and urban interests must be represented, as well as public safety professionals. The Board must have at least one person from the fields of public safety, broadband communications, commercial communications networks and finance (especially financing and funding networks).[66]

States have another opt-out alternative which is not statutory but is inherent: some States may decide that they cannot afford to use the NPSBN.

The Secretary of Commerce's appointments reflect these criteria. However, the persons supposedly appointed to represent States and localities have represented national public safety professional organizations over the past few years and understandably wanted to be on the Board as the public safety professionals required by the Act. The Secretary did not appoint anyone who currently serves as a state official. The States, however, perceive that they have no one to whom they can point who represents the interests of the States and the State officials who actually operate networks.[67]

[64] National Broadband Plan, Chapter 16, March 16, 2010, http://www.broadband.gov/plan/16-public-safety/.
[65] States should be considered both stakeholders and customers, since they will have to invest in infrastructure and operations as well as buy the services of the NPSBN. Users may be considered customers, too, but FirstNet must address its essential partners in the NPSBN, the States.
[66] The Act at §6204.
[67] The Honorable Teri Takai is currently the Chief Information Officer for the Department of Defense, but she is a former CIO for California and Michigan. She is arguably the most knowledgeable person on the FirstNet Board about state communications and information technology systems and needs. For the governors, the question may still be perception, and the NGA clearly wanted someone currently serving in a state position.

The dissatisfaction of the primary customers of FirstNet was unmistakably shown in the comments of the National Governors Association (NGA) immediately after the announcement of the membership of the FirstNet Board. An NGA press release expressed appreciation to the Department of Commerce and NTIA for the appointment of the FirstNet Board, but then remarked, "…however, [the] governors are disappointed by the failure to provide States with adequate and appropriate representation by current State officials."[68] The NGA statement is remarkably strong for an organization made up of governors of both parties, which do not normally agree on policy and therefore rarely issue such strong statements.

Just in case this was not clear, Governor Jack Markell, Democrat of Delaware, and Governor Mary Fallin, Republican of Oklahoma, the NGA Chair and Vice Chair respectively, signed a letter to Acting Secretary of Commerce, Rebecca Blank, on September 19, 2012, regarding the "strong concern and disappointment" of the governors about State representation on the FirstNet Board.[69] They suggested that future appointments include representatives of the State, that a State advisory board be established and that FirstNet meet with the governors promptly.

> "The nation's governors appreciate the FirstNet board appointments…however, [the] governors are disappointed by the failure to provide States with adequate and appropriate representation by current state officials…."
>
> National Governors Association
> August 20, 2012

The FirstNet Board has a goodly number of former executives who have a superior knowledge of and experience in customer relations, but FirstNet starts in the negative territory because of the failure to recognize States as key stakeholders from the beginning. Appointments of state officials to the advisory boards allowed in the Act may help ameliorate the situation, but it is not clear what if any influence the advisory board or boards will have at this point. At any rate, the State governors currently do not perceive that they have a voting member or representative on the FirstNet Board, and this perception will make FirstNet's job more difficult.

The FirstNet Board will find another interesting problem as it builds its customer relationships with the States: no cost model currently exists for the NPSBN. Although the NPSBN has been envisioned for years and certainly since the passage of the Act in February 2012, NTIA has not conducted (or publicly released) a cost model or financial analysis to

[68] "Governors: FirstNet Board Appointments a Critical First Step," NGA Website, August 20, 2012, http://www.nga.org/cms/home/news-room/news-releases/page_2012/col2-content/governors-firstnet-board-appoint.html

[69] Letter from Governor Jack Markell and Governor Mary Fallin, NGA, to Acting Secretary of Commerce Rebecca Blank, September 19, 2012; http://www.nga.org/cms/home/federal-relations/nga-letters/economic-development--commerce-c/col2-content/main-content-list/september-19-2012-letter----firs.html

show States NTIA's projection of how much the NPSBN will cost, how it will operate, how it will reach and maintain financial self-sufficiency, fund upgrades, and how much NPSBN service will cost each State annually or on a cost per user basis.

The FCC prepared a cost model based on its concept for a NPSBN as described in the National Broadband Plan, released in March, 2010, two years before the Act.[70] The FCC's cost model may have influenced the amount initially requested for the NPSBN, but the FCC's concept of the NPSBN and its assumptions about it were very different from the NSPBN set up in the Act. In the absence of this information, States will have a difficult decision of whether to opt out or not. Until some financial projections are known, even States who decide now not to opt-out are taking a risk; the per-user network cost may be too high for State and local budgets.

Many State and local public safety entities already use broadband devices through commercial services, so it is clear that these public safety entities value the service and are willing to pay, at least, commercial prices. Presumably, these public safety entities would be willing to pay a marginally higher price for additional features such as security, exclusivity, interoperability and access to public safety specific databases and applications. However, if the price disparity is more than marginal, public safety entities and budget makers may decide that the NPSBN is too expensive. A priority for FirstNet will be developing a cost model that works for the NPSBN and for public safety.

In the economic uncertainty that may engulf the first few months or years of the NPSBN, FirstNet should endeavor to broaden the base of users of the network. The network is and must be primarily for first responders and public safety users, but if the massive capacity of the NPSBN spectrum is only used by these groups, it constrains the number of potential users, limits the number of contributing organizations and entities and drives up the cost per user. FirstNet can boost its financial base by endeavoring to include in the network more potential users. For example, in a disaster, power utility workers are essential before the first responders can be effective. Forging alliances and strategies that bring in utilities, transportation, hospitals and other essential services could augment the effectiveness of the network, expand the financial support for the NPSBN and without diminishing the use or priority of the network to public safety (see Figure 4).

[70] *A Broadband Network Cost Model: A Basis for Public Funding Essential To Bringing Nationwide Interoperable Communications to America's First Responders*, FCC Omnibus Broadband Initiative, 2010. http://transition.fcc.gov/pshs/docs/ps-bb-cost-model.pdf

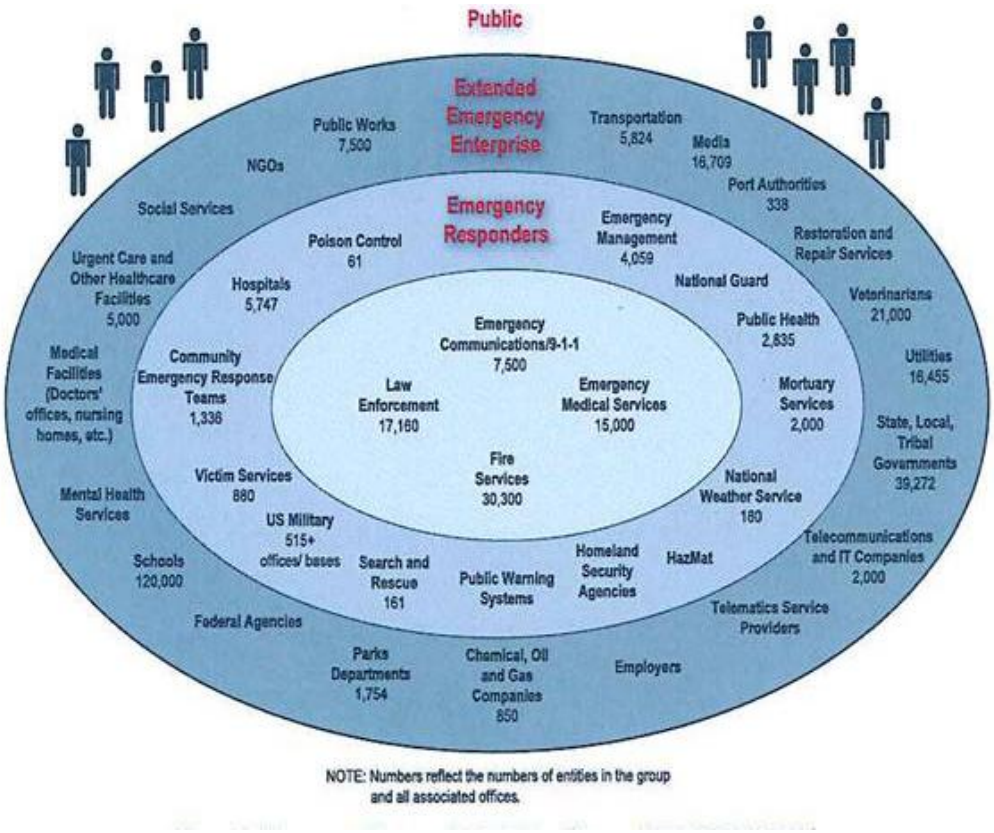


Figure 4 Expanded Base of NPSBN Users Source: COMCARE 2007

As the concept has developed for the NPSBN, certain assumptions have been ingrained into the discussion and even the Act. First, the NPSBN will, in many places, have more capacity than it needs for public safety purposes (except in major emergencies). Second, this excess capacity is valuable and can be marketed to commercial providers. The Act provides authority for FirstNet or the opt-out States to collect revenues for the use of excess network capacity by non-public safety users on a secondary basis.

> No one should invest $2 billion to $7 billion in a new network without some due diligence into how the NPSBN will work financially and whether a business model and plan can be developed that works for FirstNet and its customers.

Yet, no one has produced an estimate of what this excess capacity is worth, how valuable it could be to commercial carriers, and what revenues it could generate. One reason that this estimate has not been produced is because of the financial uncertainty in which it is engrossed. First, the excess capacity can only be used on a secondary basis. If public safety needs the capacity, public safety can pre-empt the commercial, non-public safety use of the network. This is understandable and desirable from a public safety standpoint, but it severely impacts the value of the capacity to commercial carriers. After all, most customers want to be able to use their cell phones and

broadband devices in emergencies, too.

The places where this network capacity will be most valuable will be in cities where commercial broadband capacity is already stretched. FirstNet may be able to garner significant revenues from excess capacity in densely populated areas. However, these urban areas also are where public safety communications may impact the NPSBN capacity from time to time. In less urban areas and in rural areas, carriers may need less or no extra capacity, and the excess capacity of the NPSBN may have little or no value. In other words, revenues from excess NPSBN capacity will be generated from densely populated areas and not from rural areas. How those revenues are shared or employed could become contentious. The first priority, though, is for FirstNet to get some sound economic projections on what revenues can be expected and what cannot.

In fact, a major priority for FirstNet must be to invest in a comprehensive financial analysis and cost model. No one should invest $2 billion to $7 billion in a new network without some due diligence into how the NPSBN will work financially and whether a business model and plan can be developed that works for FirstNet and its customers.

INTEROPERABILITY REQUIREMENTS: HUGE CHANGES IN PUBLIC SAFETY COMMUNICATIONS

Figure 5. RCA Radio and Federal Interceptor Siren. Source: SEOCOMM.COM

Public safety communications are undergoing the greatest change in three quarters of a century. Wireless voice communications have been the mainstay of public safety communications since the mid-1930's. Public safety land mobile radios will still play a vital role for the next ten to twenty years, but the advent of broadband communications will fundamentally change public safety communications. Public safety agencies have become accustomed to owning and operating their own systems, so that a patchwork of technologies and capabilities proliferated and frustrated interoperability and efficiency. However, an advantage of this model was local control and responsiveness.

As public safety communications transitions from narrowband voice to broadband voice and data, local control and responsiveness are possible even in the absence of ownership, but the governance and operating procedures must provide for it. Indeed, unless States

and local jurisdictions perceive that the new NPSBN will provide some degree of local control and responsiveness, as well as robust new capabilities, States and public safety agencies will not commit to FirstNet and instead will hold onto LMR systems and commercially provided broadband systems.

As the transition occurs, public safety agencies will become more reliant on State broadband experts and NPSBN and commercial expertise. The broadband systems are exponentially more complex than the LMR systems. This complexity is manifest in the Minimum Recommendations submitted to the FCC by the Technical Advisory Board for First Responder Interoperability required by the Act.[71]

The Minimum Recommendations imply a baseline of interoperability wherever the NPSBN system is deployed and used. Not every application used by every jurisdiction will work across the system, but the clear intention is that any person using an authorized device on the NPSBN could go to another jurisdiction on the NPSBN and expect to have some level of communications and use of applications.

The ramifications of interoperability and vastly increased applications and utility are momentous and in some ways are inversely proportional. As interoperability increases, the applications must be standardized across jurisdictions (or universally available), presumably at increased cost. As applications which are not universally available increase, interoperability decreases, requiring a baseline.

Such a baseline dictates national governance which must be provided by FirstNet, or interoperability will be thwarted (again). This imperative for national governance is repeated in other aspects, such as network operations and management, security for the network, access to the network and through the network to databases, and testing.

This is the main polar tension that will exist in the transition from State and locally owned systems to a nationally provided public safety communications network: the need for local control for the day-to-day efficiency of public safety operations on the one hand, and the imperative for national network control for interoperability and efficiency of operations on the other. Issues of governance and control must be determined early by FirstNet.

The network core is a major factor. The entity that controls the network core in essence controls the network. Exact definitions will be an immediate priority and an ongoing challenge for FirstNet, but "network core" should not be confused with the "core network."

[71] *Recommended Minimum Technical Requirements*. http://apps.fcc.gov/ecfs/document/view;jsessionid=T5wnP2fJynkxfcZG8vcncmwnbwBcR3hTV7hRYQRl2Cq2jLIfgjLQ!-1969853125!-1221852939?id=7021919873.

The Act defines a "core network" as being the data centers that connect the Radio Access Network (RAN) to the Internet or publicly switched network or both.[72]

The network core refers to the servers and equipment that constitute the Evolved Packet Core (EPC) that controls and manages the network. As the NPSBN was being imagined, some talked about one network core. One network core is actually impractical; what is needed is central control and management of the network. FirstNet does not need to decide on the front end how many network cores are needed. FirstNet needs to decide what network operation and management capabilities are needed and the level of latency, distributive characteristics, redundancy and expense which are acceptable. Those factors will drive the number and location of network cores. FirstNet can look to the commercial networks and to the Department of Defense standards and practice and guidance for the number, distribution and location of cores (such as the number per time zone, the spacing between cores for latency reduction, and the redundancy for disaster and attack management).[73] Network cores will need to be uniform and distributed to reduce latency and provide redundancy for outages and interruptions.

The management and control of the network strongly implies a NOC, something very different from the past experience of current State and local public safety systems. The NOC and network operations and management are functions that FirstNet may obtain contractually. However, public safety communications contain some functions that may be classified as inherently governmental, so FirstNet may not be able to completely outsource these functions. For efficiency, a government owned, government operated NOC may not be practical, but a government owned, contractor operated (GOCO) NOC may be, one with governmental oversight and ultimate control.

HOW FIRSTNET DECISIONS AFFECT STATE AND LOCAL PUBLIC SAFETY FIRST RESPONDERS ONCE THE NPSBN IS DEPLOYED AND OPERATIONAL

The FirstNet Board faces huge technical, operational and financial challenges. FirstNet starts in uncharted waters: the establishment of this network is unprecedented. The technology is new, and the standards are still developing. No one has integrated federal, State and local public communications into one broadband network previously.

The Interoperability Board's Minimum Requirements are an excellent starting point, but must be seen as the bare minimum. Many problems with interoperability can develop, so the FirstNet Board must concern itself with what are the *most effective requirements* to ensure interoperability, not just the minimum imposed by the Act.

[72] The Act §6202.
[73] Potomac Institute NPSBN Expert Panel, September 10, 2012.

Some of the most important technical, operational and financial decisions the FirstNet Board will make are those which will determine how willing State governors, chief information officers and public safety officers are to invest in and adopt the new NPSBN.

First, a paradigm shift will occur as public safety communications systems move from a model where the system is built, owned, maintained and controlled locally or on the State level to a model where the system is built, owned, maintained and controlled by someone else which provides a service to State and local jurisdictions. Those State and local jurisdictions will, no doubt, retain the responsibility for effective communications for public safety, and for that reason, the States and localities will require procedures that offer a significant degree of confidence that State and local jurisdictions can control and rely on those communication services.

What could undermine this confidence? One of the great benefits of the NPSBN will be that it will facilitate interoperable communications among State, local, tribal and federal agencies, but that also stimulates a concern. How will the States know that the federal government will not dominate or pre-empt a communications system upon which the States and localities rely and have significant investment? Accordingly, FirstNet, as it is shoring up its relationship with governors and States, must act quickly to reassure the States that they will have input into the development of standard operating procedures and protocols for the usage of the network.

On a day-to-day basis, federal-state usage may not be a problem. The broadband spectrum provided for the NPSBN has tremendous capacity.[74] The concern will arise where an incident quickly accelerates to involve more than one jurisdiction and then several agencies, including federal agencies. Who will control the network communications? Who will decide allocations and which applications can be used to conserve bandwidth? FirstNet must come up with a process to determine these procedures and protocols which incorporates the views of the States and localities and inspires confidence that the NPSBN is not a federal network that the States are allowed to use.

This potential crisis of confidence is magnified by the governance structure of FirstNet itself. FirstNet is established as an "independent authority with the NTIA."[75] NTIA has the responsibility, among others, to manage federal spectrum.[76] Technically, the spectrum used by the NPSBN is not federal spectrum, but the Act does not preclude that and

[74] Certainly there will be areas and situations where congestion exists, but the Band Class 14 spectrum has the capacity to handle a great deal of users at the same time depending on the application. LTE allows for dynamic aggregation and dis-aggregation of spectrum. The use of video or high definition video, concentrated in one area, will be a major limiting factor and will have to be managed, but the 10x10 MHz channelization recently allowed by the FCC certainly ameliorates concerns.

[75] The Act §6204.

[76] http://www.ntia.doc.gov/category/spectrum-management

estimates of users of the NPSBN by NTIA include federal users. Indeed, not including federal users would be an unthinkable mistake for a network designed to be interoperable following widespread disasters or terrorist attacks. Additionally, the FirstNet Board is comprised of three federal executives and twelve members appointed by the Secretary of Commerce. In combination, some may perceive FirstNet as a federal board managing federal or federalized spectrum.

The perception of federalization (and the consequent discourage of States to join the NPSBN) can be quickly obviated by the FirstNet Board in taking action to ensure that the States have direct input to the procedures and protocols for State, local and federal use of the NPSBN. One avenue may be to establish a standing State advisory committee as authorized by the Act that is geared to the governors' offices, their technical advisors and State Chief Information Officers.[77] This State advisory committee should be separate and distinct from the public safety advisory committee that is mandated to FirstNet by the Act.[78] Whatever means is chosen by FirstNet to accomplish the buy-in of the States, it should be part of an overall effort to repair the damage done to FirstNet's relationship with its primary customers.

CONSULTATION WITH THE STATES: DEVELOPING CUSTOMERS FOR FIRSTNET

FirstNet will spend a good deal of its time consulting. First, FirstNet is statutorily obligated to construct, maintain and operate the NPSBN in consultation with federal, State, tribal and local *public safety* entities and with the Director of NIST, the FCC and the public safety advisory committee established in the Act.[79] Second, FirstNet must consult with regional, State, tribal and local jurisdictions about the distribution and spending of funds for construction timetables, coverage areas, service levels, performance criteria, construction of the core network, RAN, and numerous other matters of State and local importance.[80] However, even though the consultation is with regional, State, tribal and local jurisdictions, the Act may be misconstrued to limit the consultation; the Act provides that consultation will only be between FirstNet and the single officer or governmental entity designated by the *State*.[81]

[77] The Act §6205.
[78] *Ibid.*
[79] The Act §6206(b)(1). Note that the Act does not require on-going consultation with the state executive, but rather with state public safety entities. Only with respect to developing the initial national RFP and the state planning grants does the Act require FirstNet to consult with a State's designated official. See §6206(c)(2)(B) and §6302(d). Local government public safety entities may consult with FirstNet directly, too. The Act also does not prescribe the method for on-going consultation, and it does not limit the consultation to national organizations or representatives.
[80] The Act §6206(c)(2)(A) on required consultation.
[81] The Act §6206(c)(2)(B) referring to the single officer or governmental body designated and certified by the state in the state's application for grant funds set forth in §6302(d). This seems to channel regional, tribal and local

Regardless of the minimum consultation required by the Act, FirstNet should develop an early and constant dialogue with the governors' offices, the State chief information and chief technical officers as well as the public safety entities in each State. In essence, FirstNet should design a strategic marketing plan geared to its customers, incorporating the States and the state leaders into the process. The clear message, which may have been lost during the pendency of FirstNet, should be, "States, FirstNet wants this to be YOUR network. We want to know and provide YOUR needs."

FirstNet's plan should include direct input from the States and plenty of transparency and information for the States. This could be accomplished by establishing an advisory council for the States, appointed by the governors, a gubernatorial representative or the State CIO[82]. The advisory council should be funded and given real influence. FirstNet may wish to appoint a non-voting representative from the governors or the NGA to attend FirstNet meetings and work with FirstNet, its staff and consultants.[83]

FirstNet will be a business. As a business, statutorily required to be self-sustaining, it must aggressively pursue business development, sales, and marketing to help States budget for service, implement partnerships and get users. If it is a business, it must have sales, a sales plan and a sales force.

Depending on the course of action and business model that FirstNet's adopts (hopefully with a lot of input from governors, State CIOs and State network managers), FirstNet actually may want to encourage States to build their own RANs as a way to speed network deployment and incorporate state funding. State leadership is an essential ingredient to a successful and affordable NPSBN.[84]

IMPLICATIONS OF THE FINANCING OF THE FIRSTNET NPSBN AND FOR LOSING BTOP AND OTHER GRANTS FOR STATE AND LOCAL SYSTEMS

With almost universal concurrence by experts, the costs of establishing FirstNet will not be covered by the funding amounts set forth in the Act, unless other funding is obtained early.[85] If this is true of the total authorization of $7 billion, the shortfall is aggravated by

consultation through this single officer or governmental body at least with respect to the RFP and state planning grants.

[82] Philip J. Weiser*, Communicating During Emergencies: Toward Interoperability and Effective Information Management,* 59 Federal Communications Law Journal 547, 571 (2007), emphasizing the inclusion of state CIO's as part of a successful strategy.

[83] FirstNet also may want to have a Native American non-voting representative, since some of the sovereign Native American tribal lands cross state lines and the interests and needs of the States and the sovereign nations do not always align.

[84] Weiser at 571.

[85] *E.g.*, Potomac Institute NPSBN Expert Panel, September 10, 2012. *See also,* Donny Jackson*, "*Regarding Public-safety Communications, What a Difference a Year Can Make," *Urgent Communications*, September 11, 2012;

the timing of funding. The initial funding is only $2 billion, an amount that FirstNet is allowed to borrow, interest free, from the U.S. Treasury, but which must be paid back with revenues from the NPSBN or the lease of excess capacity. Congress imposed deadlines on FirstNet to achieve at least a break-even mark, and Congress limited the amount of administrative expenses that FirstNet can incur (not counting audit and oversight expenses to prevent fraud, waste and abuse) to $100 million over the first ten years after adoption of the Act.[86] However, no time limit or horizon was set by the Act for when FirstNet would receive, or start to receive, the additional $5 billion set forth in the Act.[87]

NTIA's original reasons for authorizing BTOP grants for early deployment of public safety broadband systems in 700 MHz are still good reasons for moving ahead with early deployments today. First, the money invested in early deployments represents a down payment on a nationwide system that will be underfunded. Moreover, the early deployments will draw in State and local funding that may not otherwise be available to the NPSBN. Much has already been learned from early deployers, which will save money and time as the system is built across the nation. For instance, an early deployment in Tampa and surrounding area for the Republican National Convention allowed local public safety agencies to communicate huge amounts of data during that National Security Special Event, proving the value and functionality of a multivendor public safety LTE network.[88]

Finally, early deployments of public safety broadband systems will save lives and property and protect first responders years before the NPSBN will reach initial operational capability. These advantages were apparent as the BTOP grants were given to early deployers, and they are still advantages now.

Since the NPSBN will not have enough funds initially to spread the system across the country, and a gap in funding may actually occur, the loss of the BTOP funds is particularly unfortunate. Each of the BTOP recipients, and other 700 MHz early deployers with other funding, re-directed public safety communications funding from current maintenance and improvement projects to facilitate the public safety broadband project. Those funds are now stranded, helping neither the broadband nor the narrowband communications efforts.

The lack of full funding and the foreseeable funding gap have a real and negative impact on the scope of the nationwide deployment. Even though the Act requires that each phase of the deployment of NPSBN include "substantial rural coverage milestones,"[89] the shortfall

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http://urgentcomm.com/policy_and_law/commentary/Public-safety-well-on-way-to-broadband-network-20120911/. If FirstNet is able to secure significant revenues for secondary leasing of the spectrum, these funds could be used early on to assist in spreading the network.

[86] The Act §6207.

[87] The Act §6413 (describing the usage of the Public Safety Trust Fund).

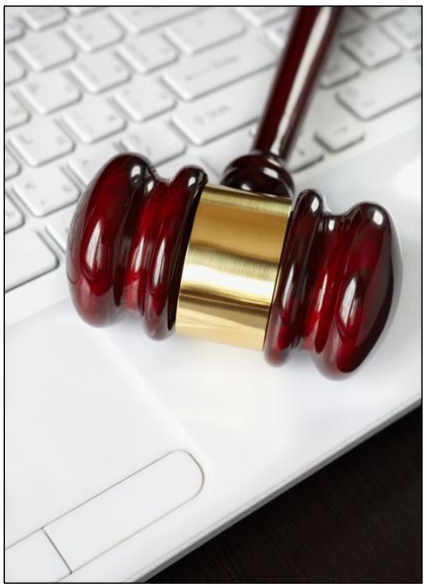
[88] *Public-safety Network Gets Trial Run at Republican Convention,* Brooks Boliek, Politico, September 18, 2012, http://www.politico.com/news/stories/0912/81309.html#ixzz26rZhYfI0

[89] The Act §6206(b)(3).

could result in major gaps in coverage in rural areas for a considerable amount of time. The NPSBN then becomes a system of the fortunate and the well-off: those rural and urban jurisdictions that were lucky enough to get NPSBN coverage in the phases before the money ran out and those that can afford to build the RAN and tie on to the NPSBN (if allowed to).

In August, the FCC issued an order that kept the possibility of an early deployment alive for some waiver recipients, setting forth the criteria against which the FCC would review applications to use the 700 MHz public safety broadband spectrum. The FCC approved the interoperability showings of Charlotte, N.C. and Harris County, Texas (Houston and some of the surrounding area) and indicated that these jurisdictions could apply for special temporary authority.

SPECTRUM AUCTION TIMING AND EXPECTATIONS TO FUND THE NPSBN



The FCC has announced its intention to hold the first broadcast incentive auction in 2014.[90] However, 2014 would be the earliest date for perhaps the first of a long series of auctions, which could extend over a decade or more. For the NPSBN, the first auction for the broadcast television spectrum is the only one that counts. The voluntary incentive auction concept is innovative, even revolutionary, but the auctions *are* voluntary and untried in this arena. At least one network has stated that it does not plan to participate. Broadcast stations do not have to participate, but it is anticipated that the FCC will be able to clear approximately 60-80 MHz of spectrum for the first auction (or initial series of auctions).[91] Estimates of the sale of this auction run between $15-25 billion, but the fact is that no one knows for sure.[92] The Congressional Budget Office (CBO), in scoring the Act, estimated that the incentive auctions will yield $15 billion for the network in the ten years after passage of the Act in February, 2012, with $8 billion coming in the first five

[90] Higginbotham, "Need Spectrum? FCC Plans TV Incentive Auction for 2014." Additionally, FCC Chairman Genachowski has announced his intention to take up the matter of auctions at the September FCC meeting in 2012. Dave Seyler, "Genachowski Holds Forth on TV Spectrum Auction," *RBR.com*, September 8, 2012, http://rbr.com/genachowski-holds-forth-on-tv-spectrum-auction/.

[91] Cecilia Kang, "FCC Kick-Starts Auction Plan, But Airwaves Won't Hit Your Smartphone For Years," *Washington Post*, September 7, 2012, http://www.washingtonpost.com/blogs/post-tech/post/fcc-kick-starts-auction-plan-but-airwaves-wont-hit-your-smartphone-for-years/2012/09/07/c45e2666-f914-11e1-a073-78d05495927c_blog.html

[92] Potomac Institute NPSBN Expert Panel, September 10, 2012.

years.[93] Based on the priorities in the Act, this would fund the network with the remaining $5 billion.

In fact, even though the CBO and the FCC auction experts and FCC watchers are optimistic about the incentive auction concept, the outcome is uncertain, and a possibility remains that the incentive auctions will not yield the revenues expected or will be delayed due to complications with negotiations or even lawsuits. Members of the public safety community will not forget that they were promised a NPSBN once before, based on revenues from the auction of the D Block. That auction closed without a bid that reached the established minimum.[94]

FirstNet may not have the luxury of waiting on the outcome of the initial spectrum auctions, and it will be driven to designing a phased plan that starts with the $2 billion upon which it can rely statutorily. Early leasing revenues may help. Alternatively, FirstNet could build the bridge halfway across the river on the expectation that the remainder of the money will become available and the political imperative to make sure that money is appropriated to avoid a "half a bridge" denouement. However, such a plan would be financially and politically risky.

LEVERAGING COMMERCIAL NETWORKS AND STATE SYSTEMS

FirstNet will have to leverage commercial systems if a NPSBN is to become a reality based on the funding and the timing. FirstNet also will have to offer something more than an alternative to commercial service, especially since the price of the NPSBN to States and jurisdictions may be more per-user than what public safety entities are currently paying. If FirstNet cannot compete on price, it must come more close as it can and still offer more and different services than can be offered commercially.

That lagniappe, the features not offered by commercial carriers, would need to include more than just interoperability. As discussed previously, LTE mission critical voice will not be available for several years, until the standards are established and the technology becomes available, but FirstNet should establish this as part of its trajectory from the beginning.

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[93] Adam Bender, Howard Buskirk, "Congress Clears Public Safety Network, Voluntary Incentive Auctions," *Communications Daily*, Vol. 32, No. 34, February 21, 2012; http://www.capitolsolutions.com/wp/wp-content/uploads/2012/02/120221-Communications-Daily.pdf

[94] Paul Kapustka, "FCC May Examine D Block Auction Fiasco," *Gigaom*, Feb 11, 2008. http://gigaom.com/2008/02/11/fcc-may-examine-d-block-auction-fiasco/. *See also*, Corey Boles, "Failure of D-Block Spectrum Sale Partly Caused by Fees-FCC," *Dow Jones Newswire (Cellular News),* http://www.cellular-news.com/story/30800.php.

Even if the first phase of the FirstNet data network is basically commercial grade, the NPSBN must have elements of mission critical communications, including coverage, security, signal availability, reliability, data rate, performance and hardening against disasters. FirstNet must develop a plan that ensures the network reaches a standard of mission critical communications, data and voice, at a level and timeframe that is acceptable to the public safety community and affordable by the States. FirstNet's NPSBN will need to have a suite of readily accessible, universally available applications and databases for public safety, and NPSBN needs to be an environment that encourages innovation and new ideas for public safety. The States should not accept a NPSBN which is only commercial grade, and the public safety community will not accept it.

As the network develops, the ability for public safety to roam over to commercial networks would be a tremendous advantage. This ability also provides redundancy in case the NPSBN suffers an outage. However, the public safety handsets would have to be equipped to use the commercial spectrum (such as Band Classes 12, 13 and 17). The more spectrum that the handset can use, the more complex and expensive the handset becomes. If some States or jurisdictions only have Band Class 14 (the public safety spectrum) and one other carrier, roaming in another jurisdiction where that carrier is not used and where the NPSBN does not have full coverage could result in a lack of communications.[95] FirstNet will have to weigh the cost and complexity of the handset against the benefit of roaming among multiple carriers. FirstNet may decide that Band Class 14 plus one other carrier may be the baseline for interoperability and redundancy, leaving the decision to add other carriers to the States and local governments and the evolution of the system.

Part of the planning process envisioned for FirstNet involves the inventory of State infrastructure and assets and their use in the NPSBN. This is an excellent concept which could improve efficiency and coverage, and one that should be pursued, but the complexity of incorporating State assets and infrastructure into the NPSBN should not be underestimated. If the model adopted by FirstNet is a public-private partnership, the interaction of the private company and each State will take time. Understanding the implications of the State and territorial laws on the use of State assets by a private entity or by a federal entity may take an extended period of time. Some States may have to pass legislation to allow that to happen; some may refuse or be unable to do so. Ultimately, State assets can be used much more easily if it is a State system that ties onto the NPSBN. If the State uses the NPSBN, FirstNet may have to wait until a second or third phase to incorporate State assets.

[95] Moore, Linda K., "The First Responder Network and Next Generation Communications For Public Safety: Issues for Congress", p. 21, Congressional Research Service, August 7, 2012; http://www.fas.org/sgp/crs/homesec/R42543.pdf

T-BAND ISSUES AND IMPLICATIONS FOR THE NPSBN

In some urban areas in the Nation, public safety land mobile radio (LMR) voice communications are so congested that the FCC allowed the use of the television spectrum for Channels 14 through 20, known as the T-Band, for LMR on a shared basis with broadcasters. If one of the channels in a city was not being used for TV broadcast, the FCC would allow it to be converted to public safety LMR and other uses. The use of this spectrum has been critical to public safety communications, especially in places like Los Angeles, where thousands of public safety employees and multiple entities and agencies co-exist.

The Act requires the FCC to reallocate the T-Band currently used by public safety in 2021 and begin a system of competitive bidding to grant new licenses for the use of the T-Band spectrum, the proceeds of which will go to pay for the relocation of the current public safety occupants of the T-Band.[96] The relocation process must be complete by February 22, 2023.[97] Presumably, this T-Band give-back provision was part of the deal in which public safety got the valuable D Block spectrum adding to the public safety spectrum it already had in 700 MHz.

From both technical and policy standpoints, the T-Band give back is problematic as currently structured. The nine-to-eleven year horizon seems to provide an ample amount of time in which to move to other spectrum and to clear the T-Band. Some have counseled public safety to wait to see how it will work out. However, public safety LMR systems are very expensive and some investment decisions must be made now about systems that will have a life span past eleven years. Moreover, T-Band jurisdictions have no place to move. Generally, the reason they were allowed to use the T-Band was that all of the other public safety spectrum was choked.

Some policy makers may have assumed that T-Band use could simply move over to the new NPSBN, but as discussed, LTE is a data communications technology for now. Years will be needed before the LTE mission critical voice standards are even ready. In the meantime, places like Los Angeles and Chicago have to make investments in T-Band systems to keep them going. Voice over LTE (like VoIP) is possible, but it is not a replacement for the mission critical voice communications carried over public safety LMR.[98]

The T-Band conundrum is not one which FirstNet must solve, but the problem is an element of State and local angst about NPSBN and the Act. The ultimate solution will be for the FCC and most probably for Congress to provide. If new efficiencies cannot be found

[96] The Act §6103.
[97] *Ibid.*
[98] On August 7, 2012, MetroPCS announced the world's first commercial launch of Voice over LTE (VoLTE), and the first sale of a VoLTE-capable handset in the Dallas/Fort Worth market.

soon on existing public safety narrowband spectrum (and this would be doubtful), or other spectrum cannot be found for the T-Band jurisdictions (also doubtful), then the only other solution is some relief from Congress, such as more time before the T Band give-back for the development of LTE mission critical voice standards and implementation, relief which the T-Band jurisdictions would like to know about now so that they can make judicious and cost-saving decisions about their public safety narrowband voice systems.

WHAT SHOULD FIRSTNET DO FIRST?

FirstNet has a magnificent opportunity and an unenviable position. The foregoing discussion has attempted to lay out the difficult terrain through which this unprecedented board must lead many stakeholders with divergent interests to establish a national asset that delivers on the promise of an interoperable, public safety broadband network. Based on the foregoing discussion, here are action items that the FirstNet Board should consider and possible courses of action regarding a concept of the new NPSBN.

1. **Get expertise and personnel capacity.** FirstNet should immediately obtain additional expertise and capacity through consulting contracts, direct hires, and details from other agencies. FirstNet is an independent authority, and it should make sure that it is not dependent on any agency or solely reliant on NTIA's staff, which has an oversight function and should have a close, but arm's length relationship. The business acumen of several members of the FirstNet Board is acute, and the Board will quickly realize that it needs its own staff, including access to engineers who have built and operated broadband networks, economists, attorneys, contract and business people who know this business. FirstNet should capitalize on the expertise in DHS's Office of Emergency Communications, and the Board should use the functionality of the inter-agency group known as the Emergency Communications Preparedness Center (ECPC) as a sounding board for federal users.

   NTIA needs to acquire additional experts and staff capacity as well, but in addition to engineering expertise, NTIA will need extra capacity with contracting, grants, strategic planning, contract oversight and auditing. The Department of Commerce should make the staffing of NTIA to support this network a priority for human resources.

2. **Quickly develop a cost model and business plan.** For the States and local governments to believe in this network and want to invest their scarce funds, the State leaders with budgetary responsibility and network operations responsibility must understand what the NPSBN is going to cost them, what it can provide and when. Since the Act imposes the responsibility for FirstNet to be self-sustaining, a competent business plan is vital.

3. **Develop a customer relations and marketing plan for the States.** This is where FirstNet should say to the governors, "we want to be YOUR network" and then listen to the States to understand what that means to them. The governors, State CIOs and treasurers should be courted for their input. The States should be regarded as both customers and shareholders. Once FirstNet gets the technical expertise and capacity to oversee the NPSBN and its interoperability, the FirstNet Board will not have to be so wary of State systems. State funding (where available) can be leveraged as well as state assets, speeding the spread of the NPSBN, not impeding. FirstNet should consider facilitating States to opt out if that is their decision, rather than resisting it. FirstNet should reach out to the National Governors Association and the National Association of State CIOs to assist in repairing relations.

4. **Facilitate the early deployment of those States and localities which are funded and ready to launch.** Getting the necessary technical expertise for oversight is a prerequisite, but moving forward with the early deployers will show the value of the system, will allow some early success and will provide vast amounts of information to improve the NPSBN. The early deployers should be allowed to use BTOP and other grants. Network cores that serve the States must become subservient once the systems are connected with the NPSBN. FirstNet must be hardnosed about requiring that the early deployers remain interoperable and committed to paying the expense of making sure that they are interoperable when the NPSBN is more widely operational. Nevertheless, there is no technological reason why the state public safety broadband systems cannot be integrated into the NPSBN; it just takes the technological expertise, oversight and capacity to enforce interoperability to make it happen and to hold States, vendors and carriers accountable.

5. **Formalize representation.** FirstNet should ensure that the States are actually stakeholders, first by a dedicated State advisory board (not just public safety) made up of the senior technical advisors to the governors and the State CIOs. This advisory board should be treated like a corporate investor group or a body of FirstNet's largest customers, because, in essence, that is what it will be. Second, FirstNet should include a representative or two as non-voting members of the FirstNet Board from the governors (or suggested by the State advisory committee) in all matters except where the FirstNet Board feels that it must be in executive session.

6. **Broaden the base.** Another way to ensure the financial viability of the NPSBN is to broaden the number of potential users to include other quasi-first responders or critical second responders, such as transportation and utilities (such as power and water). Some of these industries which have critical infrastructures have a similar

need for the NPSBN, and they may have funding to invest. This can enhance the utility of the network without diminishing the capacity, function or control of the NPSBN by public safety.

7. **National interoperability, local control.** FirstNet should embrace the States as key stakeholders and partners, ensure their input on standard operating procedures and protocols for accelerating emergencies, which is actually part of the customer relations plan. FirstNet should assure the States that this is not just a federal network that FirstNet is allowing the States to use, too. With full input from the States, FirstNet should adopt a policy of (1) national technical control to ensure interoperability and (2) State and local control and certainty for tactical and operational priorities. To further instill confidence, FirstNet should hold workshops, hearings and take public comments on how federal users will be incorporated into the NPSBN.

8. **Develop an Identity and Access Management System.** Developing an Identity and Access Management system, and the procedures and protocols that go with it, in close conjunction with the States (such as the CIOs), public safety, and federal users, is critically important to the establishment of the network and the confidence of the stakeholders.

9. **Negotiate roaming agreements.** A feature of any business model that FirstNet adopts must be roaming agreements. Roaming agreements can ensure that public safety can still communicate if a public safety user leaves the NPSBN coverage, something that may happen more during the initial phases of the establishment of the network. FirstNet can use its national stature and position more effectively than any of the States alone. Roaming agreements can be a major benefit to public safety throughout the build out or establishment of the NPSBN.

COURSES OF ACTION

With these initial steps which are advisable regardless of the course of action, FirstNet can decide how to launch a nationwide network with only $2 billion and an unsure amount of lease revenues. The common themes among FirstNet's courses of action are (1) to establish a network core (or distributed set of cores), (2) to get some early public safety RANs by any reasonable means, (3) to require adherence to nationwide interoperability requirements and standards, (4) to add RANs as funding becomes available, and (5) to leverage commercial infrastructure by infrastructure sharing agreements and roaming agreements. A key issue will be making sure that handsets are interoperable across Band Class 14 and other commercial spectrum. FirstNet will need to work with the FCC on priority access for public safety roaming on to commercial networks.

Here are some possible courses of action:

Course of Action No. 1: Build the Core, Share the Infrastructure

a. Lay out the overall architecture for the NPSBN and install the minimum number of cores for a basic level of coverage, which would be affordable within the $2 billion.

b. Require any State or local public safety broadband systems to link into the FirstNet core and encourage other States with funding to build compatible systems also linked into FirstNet's core.

c. With any additional funds from the $2 billion, and any revenues from leasing excess capacity, fund the building of RANs in other States, either as part of the system or as State systems.

d. Encourage the collocation of Band Class 14 equipment on commercial sites by creating specific agreements by which local agencies can leverage existing infrastructure and then add RANs as funding becomes available.

Course of Action No. 2: Quality versus Nationwide Coverage

Another course of action is to ensure the quality of the service that the NPSBN provides from the very start, which may come initially at the expense of widespread coverage and availability.

a. Establish the NPSBN in as many States as possible with high quality, mission critical data service (resisting the temptation to trade quality for coverage).

b. Establish priority roaming agreements with at least two (or more) carriers in those regions.

c. The only construction would be to supplement commercial infrastructure in those regions (not to replace it), thereby reducing infrastructure costs.

d. As additional funds or revenues become available, extend the network.

Course of Action No. 3: Fully funded, geographically dispersed networks

A third possibility, as a variant to Course of Action No. 2, is not really demonstration network, but high quality, fully funded and built out networks in several areas around the Nation, some in urban areas, some in rural, all linked into the FirstNet core and NOC. This would prove the viability of the network, which could be added to in phases as more funding becomes available.

Course of Action No. 4: Turn Key Spectrum Leasing Agreements (MVNO 1)

a. Build a single, distributed Evolved Packet Core, Network Operations and Security Center and application databases.

b. Set standards and requirements for States to interconnect (disallowing interconnection and database access if those standard and requirements are not met).

c. Sign a turn-key spectrum leasing agreement with one or more major carriers for access to Band Class 14 spectrum in return for which the carriers would make Band Class 14 chips and handsets available to operate on the full 700 MHz broadband spectrum.

d. With funding from the leases, establish a Mobile Virtual Network Operator (MVNO) operating with any carrier in 700 MHz with the home form that network operator in Band Class 14.

Course of Action 5: MVNO 2

a. Establish a MNVO and procure and deploy an LTE network core, network operations center, and billing infrastructure, which should be feasible in the currently allocated funding.

b. Pursue roaming agreements with major carriers to get much better wholesale rates for the agencies and municipalities that are currently using the commercial carriers for data in the field.

c. FirstNet would be in a position to start provisioning and deploying its own SIMs and setting up recurring revenue models with the agencies across the nation in the form of lower broadband wireless data costs even though NPSBN end users would still primarily be riding on the commercial carrier networks.

CONCLUSION

The promise of a nationwide, interoperable public safety broadband network is possible but not assured. FirstNet must take immediate steps to gain independent expertise and capacity, recognize and establish strong ties with its key stakeholders and customers, the States, and allow early deployers to move forward, always with close, expert oversight to ensure nationwide interoperability. FirstNet must conduct financial analysis, develop a cost model and adopt a business model within is first $2 billion and its lease revenues to establish the NPSBN as a national asset.

APPENDIX

TABLE OF ACRONYMS

BTOP	Broadband Technology Opportunity Program
CBO	Congressional Budget Office
CIO	Chief Information Officer
ERIC	Emergency Response Interoperability Center
FCC	Federal Communications Commission
FRNA	First Responders Network Authority
FOC	Final Operational Capability
GOCO	Government Owned, Contractor Operated
LMR	Land Mobile Radio
LTE	Long-Term Evolution (4G)
MVNO	Mobile Virtual Network Operator
NIST	National Institute of Standards and Technology
NGA	National Governors Association
NOC	Network Operations Center
NTIA	National Telecommunications and Information Agency, Dept of Commerce
NPSBN	National Public Safety Broadband Network
RAN	Radio Access Network
RFI	Request for Information
RFP	Request for Proposals
STA	Special Temporary Authority

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