Sharing 700 MHz Public Safety Broadband Spectrum With Utilities: A Proposal

Utilities Telecom Council

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Executive Summary

1. Technically, LTE should enable utilities to share 700 MHz public safety broadband network spectrum without preemption.

Many utilities are interested in sharing the 700 MHz public safety broadband network (PSBN) with public safety, and the Spectrum Act includes provisions which permit the 700 MHz PSBN to be shared with secondary users under covered leasing agreements that permit access to network capacity on a secondary basis for non-public safety services.

Despite secondary basis conditions for access, LTE should enable utilities to share the 700 MHz PSBN without having their communications preempted, as a practical matter. That is because LTE is capable of assigning many different levels of prioritization of traffic on the network, such that utility communications could be assigned very high levels of priority access on the network that would ensure reliability.

This is important for utilities, because they demand high levels of reliability for mission critical communications that could impact the safety, integrity and security of the grid, utility crews and the public at large. They cannot afford to compromise on communications coverage, capacity and availability, particularly during emergencies, which is fundamentally why utilities own, operate and maintain their own extensive private internal communications networks.

2. Utilities should be able to partner with public safety to construct, operate and maintain the network, if there is an RFP process that is flexible and run through the states, as contemplated by the statute

Public safety is also interested in sharing the 700 MHz public safety network with utilities. As the FCC explained in its National Broadband Plan, utilities and public safety have similar communication needs such that there are significant synergies that could be gained through sharing. Utilities could contribute infrastructure and other resources that would reduce the cost and accelerate the build-out of the PSBN. In addition, sharing capacity with utilities would make efficient use of spectrum and promote interoperability with utilities during emergency response. Finally, utilities represent a significant end-user base of devices that could share the network, which would create economies of scale that would help to reduce equipment costs and increase equipment availability in the market and help to share ongoing operations costs.

Public safety will be able to partner with utilities to the extent that utilities have a meaningful opportunity to participate in the RFP process. The RFP process should be flexible and allow utilities and other parties to provide input into specific parameters and technical requirements detailed within the RFPs so that both the public safety and utility communications needs in a given area can be met. A centralized and closed process that limits the field to only a handful of nationwide commercial entities will discourage utilities from partnering with public safety, and would be contrary to the provisions of the Spectrum Act and the FCC's National Broadband Plan which sought to create an open, transparent and competitive RFP process in which utilities and numerous other entities could seek to partner with public safety.

3. Utilities have successfully shared networks with public safety in the past and could use the same model to share the 700 MHz public safety broadband network.

There are many successful shared systems with utilities and public safety. The governance models from these shared systems could be applied to the 700 MHz PSBN. These models are straightforward and are based on cost-sharing principles and prioritization that ensures communications reliability and affordability for both public safety and utilities. Moreover, the governance models are consistent with the provisions of the Spectrum Act and should be adopted in order to ensure that end-users engage in the management of the network and have input into its operation. These governance models for the network policies should be formally adopted by FirstNet, consistent with the provisions of the Spectrum Act.

I. Introduction

a. Utilities' communications needs

Utilities are under increasing demand from their customers and regulators, and they rely on private internal communications systems to help meet those demands. These private internal systems support the safe, reliable, and efficient delivery of essential services to the public at large. Owing to the critical nature of their communications, utilities design, build and operate these systems to standards for reliability that are more stringent than those available from commercial communications service providers. For example, latency must be much lower than on commercial networks, under 20 milliseconds for some utility applications. Communications availability must be much greater than on commercial networks, requiring 99.999% or even 99.9999% reliability for some applications. Hence, utilities operate their own private internal communications, because commercial networks can become overwhelmed with congestion or lose power during emergencies, which reduces their levels of reliability. Utilities must be able to communicate during emergencies and when power is out, when commercial networks may become congested, and in remote areas, where commercial systems may not cover. This critical role for utilities has been accomplished in the past through utility reliance on their own private internal communication systems.

New demands on the electric system and the vulnerabilities to both manmade and natural disasters underscore the need for a more robust, smarter and secure communication network. National energy, environmental and other policies are demanding a more efficient, clean and reliable electric grid. Energy independence will rely on a movement toward electric vehicles to reduce our dependence on foreign oil. Climate change initiatives will rely on the integration of renewables and programs for energy efficiency to meet 15-30% or more of our energy needs. Demand response programs will be needed to help keep electric rates from escalating by avoiding or at least deferring major generation, transmission, and distribution investments. The proliferation of smart devices, such as communicating programmable thermostats, potentially millions of solar roofs and other distributed resources, and smart electric vehicle chargers will demand that utilities, in their unique position, work with consumers to manage supply and demand to optimize the grid and all of its resources for the benefit of all consumers requiring vast amounts of data flow in the process.

Utilities need to upgrade their private internal communications systems to meet more stringent demands, now and in the future. While utilities have primarily used these systems for voice services to communicate with field crews, they are implementing advanced automation systems, such as phasor measurement units (PMUs) on transmission facilities and capacitor bank controls on distribution facilities, and will increasingly use these systems for data services to communicate with devices all across the grid. The advent of smart grid will require two-way, broadband communications all the way to the customer, which will require utilities to upgrade portions of their existing communications systems, particularly their wireless networks that were primarily designed for narrowband voice or one-way data communications. In addition, utilities need to upgrade their voice communications to ensure system reliability and interoperability, particularly during emergencies, when crews are working to restore power and coordinating with public safety agencies. If public safety intends to add voice capability to the LTE core technology supporting the broadband network, then in order to ensure interoperability, utilities may also need to implement this capability.

b. Utilities' communications options

Existing spectrum bands available to utilities are predominately narrowband. For mobile communications, utilities use channels on frequencies in the HF, VHF, UHF and 800/900 MHz bands. For fixed communications[1], utilities use 12.5 kHz 900 MHz MAS channels, and 50 kHz to 30 MHz channels in various frequency bands above 2 GHz, including the 6, 11, 18 and 23 GHz bands. Utilities use unlicensed operations for certain applications, including advanced metering infrastructure (AMI) and fixed data for routine dispatch. Finally, while some utilities have acquired spectrum through auctions and secondary markets, the vast majority of utilities rely on private wireless spectrum licensed on a site by site basis from the Federal Communications Commission (FCC).

The spectrum bands available without going through the FCC auction process are not well-suited to meet the increasing needs of utilities now and in the future. Existing land mobile spectrum is subject to further narrowbanding and many of the bands are subject to interference and congestion. Existing microwave spectrum is subject to reallocation and relocation of incumbent operations, such as was the case when the FCC reallocated the 2 GHz bands for PCS and now AWS. Moreover, this spectrum is not suitable for reliable point to multipoint broadband fixed and mobile applications. Unlicensed operations do not support mobile data applications that utilities need, and they are inherently unreliable because they are relatively low power operations and must accept interference from, and not cause interference, to others. Finally, auctions and secondary markets are not suitable generally, because utilities can't compete against deep-pocket commercial service providers for licenses whose geographic areas may not conform to utility service territories. To the extent that utilities have acquired spectrum through these means, they have been in discrete areas and bands, and have generally represented the exception rather than the rule.

As such, utilities lack a single spectrum band or roughly contiguous bands that would support interoperable broadband capabilities and that would attract investments and promote economies of scale in products and services.

[1] Fixed communications can be point to multipoint supervisory and control telemetry (SCADA) systems or point to point broadband backhaul,

c. Why sharing 700 MHz makes sense for both utilities and public safety.

Utilities are interested in sharing 700 MHz public safety broadband spectrum because it would provide suitable spectrum to meet their communications needs for both fixed and mobile applications. As described above, utilities have increasing communications needs that cannot be met through existing spectrum bands. Moreover, it makes sense to share networks with public safety because they are compatible users of the spectrum. They have similar communications needs for coverage, capacity and reliability, and they need interoperability during emergency response scenarios.

Public safety is interested in sharing 700 MHz public safety broadband spectrum with utilities because they need to be able to communicate with utilities during emergencies, and utilities can provide access to infrastructure and other resources that public safety needs to be able to deploy the nationwide PSBN quickly and cost effectively. As one public safety representative succinctly put it, “"[w]e want interoperability with [utilities]," and “[w]e also want their money to support it."[2] As another public safety official explained to Congress, “they [utilities] become at many times more 'first responder' than we are. If you don't have electricity and you don't have the wherewithal to get the job done, we have to rely on them.”[3]

Sharing the PSBN creates synergies by leveraging utility infrastructure, including transmission towers and distribution poles, as well as underlying rights-of-way, fiber, microwave, radio and back-office systems, which could significantly offset the costs and the time it would take to deploy the PSBN. At the same time, leveraging public safety spectrum would make efficient and effective use of spectrum among complementary users who must be able to communicate with each other during emergency response. Finally, priority access can be developed through negotiations and using LTE technologies, which will ensure communications reliability even during emergencies when both utilities and public safety need to communicate.

d. Issues for sharing the 700 MHz public safety broadband network with utilities.

[2] Remarks of Harlin McEwen, Chairman of the Public Safety Spectrum Trust, before the International Wireless Communications Expo (IWCE), Feb 22, 2012. *See* “Public Safety Representatives Highlight Role for Utilities And Critical Infrastructure in Public Safety Broadband Network” at http://www.utcinsight.org/content/public-safety-representatives-highlight-role-utilities-and-critical-infrastructure-public-sa

[3] Testimony of William Carrow, President of the Association of Public Safety Communications Officials (APCO), before the House Homeland Security Committee, March 30, 2011. *See* “APCO Gives Shout Out to Utilities As ‘At Times More First Responder Than We Are’” at http://www.utcinsight.org/content/apco-gives-shout-out-utilities-times-more-first-responder-we-are

There are several primary issues for sharing the 700 MHz public safety broadband network with utilities. These issues include: 1) priority access and fees for sharing agreements, 2) the RFP process, 3) cost of the network, and 4) sustainability of the network. The following subsections describe these issues in further detail.

i. Priority access and fees for sharing agreements

In order to promote sharing between utilities and public safety there needs to be regulatory clarity with regard to priority access and fees.

Section 6208(a)(2)(B) of the Spectrum Act provides that secondary users may access the PSBN under covered lease agreements and may provide non-public safety services on a "secondary basis". Moreover, such access is subject to lease fees for network capacity, and there are additional fees that may apply for network users and network equipment and infrastructure.[4] Section 6208(b) of the Spectrum Act limits the fees such that they may not exceed "the amount necessary, to recoup the total expenses of the First Responder Network Authority in carrying out its duties and responsibilities described under this subtitle for the fiscal year involved."[5] Section 6207 of the Spectrum Act limits the Administrative expenses of the First Responder Network Authority such that they "may not exceed $100,000,000 during the 10-year period beginning on the date of enactment of this title."[6] But, the term ''administrative expenses'' does not include the "costs incurred by the First Responder Network Authority for oversight and audits to protect against waste, fraud, and abuse."[7]

Applying the provisions of the Spectrum Act to the question of priority access, it appears that the term "secondary basis" within Section 6208 is undefined and that public safety has flexibility to determine the appropriate priority access for secondary users. Public safety can provide varying levels of priority access for various devices and applications. Further, Section 6206(c)(2) provides that FirstNet shall consult with regional, State, tribal, and local jurisdictions regarding a variety of issues including "the assignment of priority to local users" and "the assignment of priority and selection of entities seeking access to or use of the nationwide public safety interoperable broadband network."[8] As such, public safety has discretion to determine the appropriate levels of priority access by utilities and FirstNet is required to consult with public safety to set prioritization among devices on the network under Section 6206.

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[4] *See* Section 6208(a)(1)-(3) of the Spectrum Act (outlining the fees that apply for network users, network capacity and network equipment and infrastructure).

[5] Section 6208(b) of the Spectrum Act.

[6] Section 6207(b)(1) of the Spectrum Act.

[7] Section 6207(b)(2) of the Spectrum Act.

[8] *Id*.

Turning to the question of fees, it also appears that regional, state and local, and tribal public safety representatives have authority to negotiate the appropriate fees that would apply for access to network capacity, as well as network use and equipment and infrastructure. The fees must be cost-based and are further limited by the provisions of Section 6207. Finally, nothing in the Spectrum Act prohibits in-kind contributions (such as utility infrastructure and other resources) in lieu of or in addition to fees. As such, public safety has authority to determine the appropriate fees for network capacity, as well as network use and network equipment and infrastructure by utilities; and such fees must be cost-based and limited under other provisions of the statute and may be offset by in-kind contributions.

In conclusion, priority access and fees for utilities may be negotiated with regional, state and local, and tribal jurisdictions; and it is critical that utilities are subject to priority access levels that ensure reliable communications and fees that are limited to reasonable costs. As noted above, utilities do need to be able to communicate during emergencies as well as routine operations, which is fundamentally why they operate their own private internal communications networks. In addition, the cost of the network must be prudent; otherwise utility regulators or boards will deny their investment in such networks.

ii. RFPs

In order to promote partnerships between utilities and public safety, utilities need to have a meaningful opportunity to respond to an RFP.

Congress required FirstNet to develop “open, transparent, and competitive requests for proposals to private sector entities for the purposes of building, operating, and maintaining the network,”[9] and it required FirstNet to “enter into agreements to utilize, to the maximum extent economically desirable, existing commercial or other communications infrastructure; and Federal, State, tribal, or local infrastructure.”[10] As part of the RFP process, Congress required FirstNet to (A) ensure the safety, security, and resiliency of the network, including requirements for protecting and monitoring the network to protect against cyberattack and to (B) promote competition in the equipment market.[11] Congress established an entire sub-provision that requires FirstNet to

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[9] Section 6206(b) of the Spectrum Act (emphasis added).

[10] Section 6206(c)(3) of the Spectrum Act.

[11] Section 6206(b) of the Spectrum Act. Note that the purpose of the competition provisions was to ensure that equipment for use on the network be— (i) built to open, non-proprietary, commercially available standards; (ii) capable of being used by any public safety entity and by multiple vendors across all public safety broadband networks operating in the 700 MHz band; and (iii) backward-compatible with existing commercial networks to the extent that such capabilities are necessary and technically and economically reasonable.

promote rural coverage through the RFP process by requiring deployment phases with substantial rural coverage milestones as part of each phase of the construction and deployment of the network.[12] Utilities will have a more meaningful opportunity to respond to an RFP if the process developed by FirstNet is open, transparent and competitive. That will ensure that utilities have an opportunity to partner with state and local public safety for some or all of the services needed for the PSBN within a specific geographic area. Conversely, a centralized, closed process that only contemplates proposals to construct, maintain and operate the entire nationwide PSBN will disadvantage utilities from partnering, due to limitations associated with their geographic service territories and their available resources. Additionally, forcing utilities to join a team of prospective bidders may risk a solution that excludes utilities and their resources in the event their overall bid does not win.

Section 6208(a)(2)(B) provides that a covered leasing agreement "means a written agreement resulting from a public-private arrangement to construct, manage, and operate the nationwide public safety broadband network between the First Responder Network Authority and secondary user. Therefore, these public-private arrangements result from the RFP process contemplated under the Spectrum Act.

iii. Cost of the network

The PSBN is significantly underfunded, and will need participation by utilities as both partners and users of the network for it to be deployed quickly and cost-effectively.

Section 6413 of the Spectrum Act provides $7 billion for the build-out of the network by FirstNet, but that funding won't be available unless and until broadcasters voluntarily participate in incentive auctions under Section 6402. There is also $2 billion that is available in start-up loans, but that is far less than the estimated $10-40 billion cost of the entire network build-out. Finally, there is $135 million set aside for a state and local implementation fund, but that is for planning purposes, not necessarily capital expenses associated with the network construction.

As noted above, utilities have significant infrastructure and other resources that they can contribute towards the construction, maintenance and operation of the network. Utilities have structures which could be used for the wireless equipment for the PSBN, and they have fiber and microwave facilities that interconnect with towers, providing necessary backhaul for the PSBN. In addition, utilities do have significant rights-of-way that could pave the way for new tower construction or fiber backhaul that would be necessary for the PSBN. While an exact estimate of the potential cost savings is impossible due to the uncertain extent to which utilities will partner on the network and the extent to which their existing infrastructure and rights-of-way would support the

[12] Section 6206(c). Note that Congress directed that proposals include partnerships with existing commercial mobile providers to utilize cost-effective opportunities to speed deployment in rural areas.

PSBN, as a general matter two-thirds of the cost of a network is composed of infrastructure costs, which does provide some sense of the potential cost savings.

In addition to cost-savings in capital expenses, utilities would make significant investments of their own. By sharing these costs, there will be significant operational cost savings. Moreover, utilities estimated that they spent approximately $3.2 billion last year on telecommunications, which is a 3% increase over 2010. Based on those expenditures, it is reasonable to believe that utilities could make a significant revenue contribution to the build out costs of the PSBN.

iv. Sustainability of the network

In addition to the network build-out costs, there are real concerns whether the PSBN could be economically sustainable in terms of ongoing operational costs, if the costs are only shared among 3 million public safety users and an equal number of government employees. Public safety needs to bring the monthly average cost of an end-user device down to about the same price of comparable commercial service (i.e. $70 per month, depending on the applications supported). Clearly, there are intangible benefits from having a stand-alone public safety broadband network that is built to higher specifications for reliability than a commercial network. However, there is a cost-benefit breaking point for public safety, and that breaking point is likely to be particularly sensitive for rural end-users where costs per user are higher and financial resources tend to be scarce.

Utilities could offer a substantial contribution towards a sustainable base of end-user devices for the PSBN. They are deploying smart grid networks to millions of end-user devices and thousands of network nodes. In addition to smart grid, there are mobile broadband applications for thousands of service personnel in the field that could be supported using the 700 MHz PSBN, as well.

Thus, sharing with utilities would promote the development of an ecosystem of sufficient scale and scope that would increase equipment production and reduce equipment costs.[13]

[13] *See e.g.* Comments of American Electric Power Company, Inc. in FCC Docket No. 09-51, at 22—23 (filed Oct 2. 2009)(concluding that a nationwide allocation of spectrum “would allow an ecosystem of solutions to flourish since equipment vendors would only need to build wireless equipment for a common utility band instead of having to supply a number of differing solutions for a market fractured with spectrum allocations.”).

II. Opportunity for Utilities – 700 MHz Spectrum Sharing

This section describes the opportunities for utilities to share the 700 MHz PSBN including: a) technical feasibility of sharing, b) the meaning of “secondary basis” status, c) how the RFP process should work, d) the use case for sharing with public safety and e) the outlook for partnering with carriers on an RFP.

a. Technical feasibility – Introduction to LTE and traffic management

LTE is a cellular technology intended to greatly increase the speed and capacity of mobile data networks. LTE costs are lower than those of other technologies, due to simpler architecture, higher spectral efficiency, and a more open, standards-based design. Download and upload speeds are much faster due to technological advances. The use of Long Term Evolution (LTE), mandated by the law to ensure interoperability, serves as the technological basis for sharing 700 MHz systems between utilities and public safety entities.

LTE natively supports a higher average throughput out of the box for any given channel size over earlier Point-to-Multipoint (P2MP) technologies, with theoretical speeds in the available 10 MHz channel size approaching 173Mb/s, though this is highly dependent on how the network is designed and built. Typically, the LTE can be built with enough capacity in a 10MHz channel as to be hard to overwhelm, with the exception of major emergencies.

LTE currently supports nine Quality of Service (QoS) Class Identifiers (QCI). QCIs describe predefined QoS parameters for various applications, users, and devices. The QCI defines if a “bearer” has a Guaranteed Bit Rate and also sets up the minimum queuing priority, latency, and packet-loss attributes that the network must provide for each bearer. An application, device, or user may have multiple bearers established to carry the traffic. The QCI is the operative controlling mechanism that insures all traffic gets what it needs until a base station reaches the point of congestion, at which point other controls come into play.

b. Secondary uses – what do they mean exactly?

There is a misconception among many utility and public safety officials regarding non-emergency uses of the LTE network. These ancillary applications of the broadband capacity have been labeled “secondary” and there is a fear that in an emergency, these secondary applications will be left without available bandwidth. LTE offers a variety of traffic control mechanisms and architectural options that significantly increases the likelihood that applications are provided the needed bandwidth. This is accomplished in the following manner.

Once an eNodeB (base station) reaches its point of congestion and there is more traffic or users than it can handle, then Access Retention & Priority (ARP), Maximum Bit Rate (MBR), and Aggregate Maximum Bit Rate (AMBR) come into play to manage and prioritize the available bandwidth and “talkers” on the base station.

ARP defines the priority of the bearer and its susceptibility to pre-emption or whether or not it can establish a new connection. A bearer on a device or application (or perhaps a user) can have one of 15 ARP priority levels. On a given device it is possible to have a very high priority on a specific function (such as emergency call) or very low, best effort (such as meter data). As a result, on the same device, it’s possible to have 15 variations on a condition where critical data continues to flow while non-critical data is rejected until the congestion clears.

MBR and AMBR control the maximum bit rate of a bearer and can be used to scale back the available bit rate that an application, device, or user is allowed under congestion conditions. MBR is done “per bearer” for applications with a Guaranteed Bit Rate (GBR) while AMBR controls the aggregate bit rate on a device for all applications without a GBR. These controls can also be prior to congestion as a preventative measure to keep a high-priority user from hogging all the bandwidth with, for example, a HD video stream.

Taken together, these controls and a robust network design allow for defining the priorities of each user, device, and application; and they provide sufficient capacity to support both user communities.

c. Summary of RFP process and utility industry preference for flexibility

The RFP process outlined under the Spectrum Act is one that provides significant flexibility in terms of its actual implementation. The Spectrum Act very simply provides that FirstNet shall develop an RFP template. If the states opt-out, they need to develop their own plan and get it approved by the FCC. If it is not approved by the FCC and NTIA, they must proceed under FirstNet.

The only really specific language regarding the RFP process in the Spectrum Act is found within the provisions detailing the duties and responsibilities of FirstNet, and those provisions specifically require that FirstNet and/or states promote reliability, security and resiliency, as well as competition and rural coverage through the RFP process. These goals can be best achieved through a flexible RFP process, as described below in more detail.

There are several benefits that can be achieved by adopting an RFP process that ensures competition, innovation, cost-control, reliability and interoperability. Conversely, there are several disadvantages that result from adopting an RFP process that is centralized and closed, including: higher costs, slower deployment and lost efficiencies.   This section assesses in more detail these alternatives and examines possible use cases for sharing from a public safety and utility perspective. It also considers the benefits that would result from partnership between utilities, commercial service providers and public safety.

i. Benefits of flexibility

<u>In General</u>

Competitive bidding will lower costs and promote better service.

A process that is flexible will promote competition among a wider variety of potential partners who can provide a range of different products and services that are tailored to the needs of regional, state, local or tribal jurisdictions. It is axiomatic that competitive bidding is likely to result in lower costs and better service for the public safety broadband network, and this axiom is particularly true in the case of utilities.

<u>Specific Issues</u>

Efficient Use of Utility Infrastructure and Other Benefits

Utilities could reduce the capital cost of the network by contributing infrastructure and backhaul capacity, and they could reduce operational costs of the network as well by promoting economies of scale that would bring down equipment costs. There are also intangible benefits that utilities could bring through a flexible RFP process, including interoperability among first responders and utility workers during emergencies and improved rural coverage (due to the fact that utilities must have reliable communications into remote areas as well as urban areas). In addition, network hardening, including reliability and resiliency of the network could be promoted through partnerships with utilities, because utilities engineer their communications networks to exceptionally high standards for back-up power, coverage and latency – all key issues for emergency response communications. There is also a virtuous cycle of benefits in the sense that power restoration can be effected more rapidly if the shared communications network is maintained during emergencies because of increased network reliability and resiliency through better back-up power, coverage, etc.

Tailoring Products and Services to Regional, State, Local and Tribal Needs

Promoting an open and transparent RFP process that provides utilities with a meaningful opportunity to partner with public safety on a regional, state, local or tribal basis will unleash the benefits that utilities could provide, as described above. The process should permit utilities to bid on some or all of the products and services for the PSBN in a given area. The process should not require a bidder to provide all of the services for the entire PSBN nationwide. Such a process would place utilities at an unfair disadvantage to other potential partners that are not limited by their geographic service territory or the products and services that they can provide. Conversely, providing a flexible process that allows for multiple RFPs that are tailored to the needs of regional, state, local and tribal public safety would promote competition from providers such as utilities that have particular strengths that are aligned with the needs of public safety for the construction, maintenance and operation of the PSBN.

ii. Disadvantages of one-shot RFP

<u>In General</u>

Waste of Resources and Higher Costs

It would be an unfortunate waste of potential benefits if utilities were shut-out of the RFP process as a practical matter. That is likely to happen if the RFP process consists of a single RFP to provide all services for the entire PSBN nationwide. And utilities would not be alone in that respect. Such a process would virtually guarantee that only a handful of potential entities would be capable of bidding on the RFP. Not only would that likely increase costs, but it may also mean slower deployment and/or poor service if the network is built top-down by one nationwide partner instead of multiple entities working with regional, state, local and tribal jurisdictions.

<u>Specific Issues</u>

Higher Chipset Costs

In addition to wasting resources, the public interest would further lose out on the chipset supply and cost savings that utilities could drive as potential partners with public safety. By itself, public safety does not represent a large enough potential market for the major chipset manufacturers, such as Qualcomm, to design, develop and produce a cost-effective chipset for the digital broadband devices that will be used on the PSBN. By comparison, utilities could drive that market development, because they have hundreds of millions more chipsets that would be used for smart grid and other utility applications. This would in turn drive up the availability of chipsets and drive down the cost of the end-use devices, thereby promoting the sustainability of the PSBN. This is another important aspect against adopting an RFP process that excludes utilities from partnering with public safety, as a practical matter.

Less Competition Among Potential Bidders

A single RFP build-out would reduce competition, drive up prices, reduce service and availability in favor of cost constraints, leave funding sources (e.g. utilities) out of the equation, and delay the deployment in rural areas. By contrast, encouraging utilities to partner with public safety would promote competition among potential bidders. Therefore, concerns about transaction costs with regard to a multiple RFP process are misguided, and instead the RFP should promote the opportunity for utilities and other third parties to respond, either alone or in combination with other partners.

Unnecessary exclusion of utilities (and other potential partners) who may not respond to the initial RFP

In addition to flexibility to bid on parts of the PSBN, there should be multiple opportunities to partner with public safety. Otherwise, the process may unnecessarily exclude potential partners that were unable for whatever reason to bid on the RFP at the time the initial RFP was issued, but which would be subsequently able to partner with public safety on the PSBN. This is very likely the case with utilities, some of whom are better prepared to respond to an initial RFP than others. It would be unfortunate if some utilities were unable to partner with public safety simply because they missed the initial RFP.

Separate Networks Deployment May be Unaffordable for Public Safety and Utilities
Many utilities have partnered with public safety on shared radio systems in other spectrum bands simply because they couldn't have afforded the cost of deploying separate systems by themselves. Those same basic factors are likely to drive decisions regarding the deployment of 700 MHz public safety broadband networks, which will be significantly more expensive than other land mobile shared systems that have been deployed in the past. The RFP process should promote partnerships between compatible users of the network itself, so that they can pool their resources to afford to build out a 700 MHz broadband public safety network in their area.

d. Potentially compatible utility use cases with bandwidth requirements

Utilities and public safety are compatible users of the spectrum, and this section examines two abstract use cases that demonstrate how bandwidth requirements could be met by utilities and public safety respectively during emergency and routine operations.

As the FCC explained in its National Broadband Plan, "[t]he wide-area network requirements of utilities are very similar to those of public safety agencies. Both require near-universal coverage and a resilient and redundant network, especially during emergencies. In a natural disaster or terrorist attack, clearing downed power lines, fixing natural gas leaks and getting power back to hospitals, transportation hubs, water treatment plants and homes are fundamental to protecting lives and property. Once deployed, a smarter grid and broadband-connected utility crews will greatly enhance the effectiveness of these activities."

i. First responder and some utility emergency communications should be co-equal

During an emergency, utilities and public safety must respond to the affected area. The emergency could be a hurricane or some other natural disaster affecting a wide geographic area. Or the emergency could be more localized, such as a fire in a building, requiring utilities to turn off the gas before public safety can go in the building. In either case, the PSBN could be optimized to adjust to changing bandwidth requirements during an emergency, so that both utility and public safety communications are allocated sufficient bandwidth to maintain communications.

Bandwidth requirements during a hurricane or other wide-area emergency could be managed by ensuring that increasing volume of mission critical voice traffic in the affected area is given priority over other non-mission critical or lower priority communications, such as perhaps fixed data applications for meter reading. These prioritization schemes could be activated during such emergencies and limited to only those areas that are affected by the natural disaster. That way, the bandwidth requirements for non-mission critical or lower priority communications could be reduced in order to accommodate the spike in bandwidth that would result from emergency response communications in the affected area. Under this scenario, mission critical communications in the affected areas for both utilities and public safety could be maintained for emergency communications, and non-mission critical communications or lower priority communications could be compromised by either delaying or dropping the traffic for those applications. Because such an emergency would affect a wide area, the bandwidth requirements of public safety and utilities respectively would be relatively dispersed, thereby making it easier to manage those requirements through network prioritization, particularly using LTE which has multiple levels of prioritization as described above.

Similarly, bandwidth requirements during a localized emergency, such as a burning building, could be managed by prioritizing mission critical communications of both utilities and public safety in that immediate area. Unlike a hurricane or similar wide-area emergency, in such a localized emergency the challenge could be greater for accommodating both utility and public safety communications, depending on the type of applications that are being supported and the number of units that are trying to communicate at once. For example, a large number of low-bit rate data applications may be much easier to accommodate than a few high-bit rate video applications at the scene of the local emergency. However, there is only a remote possibility even in a relatively challenging scenario involving a high number of units and high-bandwidth applications that the performance of mission critical communications would be significantly affected during a localized emergency. Ultimately, it depends on how the network is architected and managed within a given localization, which will be determined in large part by the funds and other resources that are made available and the policies that are developed for network management. It should also be noted that each 700 MHz cell site is sectorized and limited in coverage, such that congestion may only be limited to the area covered by that sector of the cell site during an emergency.

As a matter of policy, prioritization schemes can be and should be developed that do not necessarily assign lower priority levels to all utility communications in a given area. In an emergency, both utilities and public safety communications are being used to protect the public and must be maintained and not significantly degraded. Utilities and public safety can be and should be permitted to negotiate prioritization schemes that ensure reliable communications during both wide-area and localized emergencies. Certain utility communications should be co-equal with public safety communications during emergencies.

This will encourage utilities to partner with public safety on the PSBN, because utilities will be discouraged from investing in networks that are inherently unreliable, particularly for mission critical applications that affect utility worker and public safety. The 700 MHz PSBN represents a significant investment for utilities, which will require careful balancing of the cost-benefits. Utilities are unlikely to compromise the safety and reliability of their mission-critical communications, particularly considering the significant investment that will be required to construct, maintain and operate the PSBN.

In addition to utility investment in the network, public safety will also benefit from interoperability with utilities during emergencies if they provide priority for utility communications during emergencies. Public safety and utilities need to ensure interoperable communications during emergencies to coordinate response. Lives will be at risk if public safety cannot communicate with utilities due to utilities lack of priority. Conversely, neither public safety nor utilities will rely on the PSBN for interoperability, if there is a substantial risk that utility communications would be preempted or seriously degraded during emergencies.

Finally, as a technical matter, LTE is capable of supporting both public safety and utility communications needs during either a wide-area or localized emergency, so there is no practical reason not to assign co-equal priority to certain utility communications. The 20 MHz of spectrum that is now available on the PSBN should provide ample capacity to support the relatively small bandwidth requirements associated with mission-critical utility communications during emergencies.

ii. AMI and other potential utility use cases

As described above, one of the key drivers for sharing the 700 MHz PSBN with public safety is the need for additional wide-area capacity to support AMI and other enhanced utility applications that require two-way, real-time communications to the customer premises. Not only do utilities have an interest in using the network for such purposes, so does public safety. If utilities are able to use the network for these applications, as well as for mission-critical communications during emergencies, it will substantially contribute towards economic sustainability of the network, as described above. Moreover, these applications can be supported as a technical matter, while ensuring that mission-critical public safety and utility communications are maintained during emergencies and at other times. As such, sharing the PSBN for AMI and other potential utility use cases is practically achievable and benefits both utilities and public safety.

As described above, utilities are deploying millions of advanced meters and other intelligent grid devices to improve the efficiency and reliability of their services and their infrastructure. Most of these communications will be fixed in nature and will consume incremental capacity on the network. Moreover, many of these applications are not mission-critical and can accommodate delays and other degradations without materially affecting their performance. For example, utilities can poll meters at various times of the day and manage the bandwidth requirements by storing data at various collection points until they actually need to read the meter. While they are performance tolerant, these applications represent much of the bandwidth that utilities would use on the network. As such, these applications could be managed so that they are supported at times when the network is not needed by public safety and utilities for mission-critical applications, thereby making more efficient use of the capacity of the network and promoting its economic sustainability.

The importance of these applications for the sustainability of the PSBN must be underscored. As noted above, the cost of the chipsets for the devices on PSBN could be substantially reduced and equipment availability substantially improved, if equipment manufacturers see the PSBN as a potentially large market. To the extent that the PSBN is used for the millions of advanced meters and other intelligent grid devices, it will create economies of scale and scope that will promote market development and increase equipment availability while reducing equipment costs. As such, public safety should promote the use of the PSBN for these applications, as well as for its own communications.

e. Potential for commercial carrier - utility – public safety triad

In addition to potential partnerships between utilities and public safety, there are also potential partnerships with commercial service providers in combination with utilities and public safety.

There are very real benefits that could be gained through such partnerships. By partnering with commercial service providers and utilities, public safety could gain additional resources from commercial service providers, as well as utilities. These resources could include expertise in communications networks, network redundancy, additional capacity and investment. On that point, utilities have technicians that are geographically dispersed and on-call around the clock throughout the year, who could assist with maintaining the PSBN. To the extent that communications service providers share capacity on the network, the PSBN may be used more efficiently and costs shared across a broader base of end-users, thereby reducing incremental fees and driving down equipment costs by virtue of increased economies of scale.

There are also potential challenges to achieving such partnerships. It is unclear whether commercial service providers are willing to partner with utilities to provide products and services to public safety. They may view utilities as a competitive threat rather than as a partner and/or they may be opposed to allowing utilities to share capacity on the PSBN for fear of losing their business on their commercial networks. There are also legitimate questions whether commercial service providers would make compatible users of the PSBN, such that they would be willing to accept lower priority on the network. Finally, as a simple matter of supply and demand, commercial service providers may have ample capacity on their own networks and spectrum to meet demand, such that they do not need to share capacity on the PSBN, especially in rural areas.

This kind of partnership highlights the need for flexibility in the RFP process. Public safety should be able to enter into partnerships in combination with commercial service providers and utilities to meet their needs on a regional, state, local or tribal jurisdiction basis. This would be consistent with the Spectrum Act, which encourages leveraging existing commercial wireless and other infrastructure to accelerate the build out of the network. Moreover, it stands to reason, that such combination partnerships may produce additional synergies, which will further reduce costs and improve services. By adopting an RFP process that is flexible and that contemplates combinations of products and services from various entities in various different areas, it is likely that lower costs, better services and quicker deployment are just some of the benefits that can be achieved.

III. Governance

a. Introduction – what does governance mean?

Governance with regard to network policies is a critical element in determining the likely success or failure of sharing the PSBN between utilities. It includes network policies such as prioritization and QoS, as well as cost-sharing and access to the network. Governance is a critical element for sharing, because these issues go to heart of reliability and affordability of the network. This is distinct from the issue of governance within the organizational structure (e.g. the FirstNet board) of the PSBN. Although the governance structure of the PSBN is also important because utilities need representation and input into the governance of the PSBN, this section is focused on the separate issue of how the network is actually shared as a practical matter.

b. Examples of existing sharing arrangements and how they work.

By way of background, there are many examples of successful public safety/utility shared systems around the country, including in Nebraska, Nevada, Nashville and throughout the Southeast. State and local public safety entities have partnered with utilities like NV Energy, Nashville Electric Service, and Nebraska Public Power District, just to name a few. While each of these could serve as examples of successful sharing arrangements, this section will focus on the case of the shared networks between NV Energy and the State of Nevada and between Nebraska Public Power District and the State of Nebraska.

NV Energy/Nevada Case Study
NV Energy, the parent company of the Nevada Power Co. and Sierra Pacific Power, partnered with the Nevada Department of Transportation, the Nevada Department of Public Safety, Washoe County and a host of local, state, federal and tribal organizations. Nevada Power is the primary provider of electricity for the southern portion of Nevada, including Las Vegas. Sierra Pacific Power provides electricity for most of northern Nevada and the Lake Tahoe area. These companies have a long history as users of radio communications as a tool for operations and maintenance, as well as for life-safety purposes.

The Department of Transportation of the state of Nevada operates a statewide radio system, which was initially used for coverage of all state-managed roadways. In the mid-1990s, both the power companies and the DOT agreed that a joint venture into a common radio system would best serve all the interests of the participants. The power companies would concentrate on remote coverage sites, and the DOT would concentrate on roadway coverage.

As the system matured into the 21st century, the site uses blended, and both parties have been working together on site development, operation and maintenance. The overall combined radio system is now called the Nevada Shared Radio System (NSRS). The DOT, through an inter-local agreement, joined with Washoe County in 1999 as a member of the Washoe County Regional Communications Systems (WCRCS).

This inter-local agreement had provisions for all users to share in the use of the statewide DOT system and the WCRCS radio system, which covered the Reno, Sparks and Lake Tahoe areas with a high level of performance. The change of this radio system into a statewide public safety radio system began in 2001. The University of Nevada in Reno became a user of the WCRCS and the University of Nevada in Las Vegas joined the NSRS through NDOT. The police departments of these educational institutions are the primary users of the radio system. The connectivity of the radio system allows both campuses to have common talk groups and the ability to talk across the state.

The Nevada Highway Patrol serves the entire state. Its legacy VHF radio system was outdated and needed upgrades and additional sites in order to keep up with the population and infrastructure growth in the state. Through a series of issues related to spectrum availability, coverage requirements and the booming development of the state, the most expedient and cost-effective method for the Nevada Department of Public Safety to improve its radio coverage was to join the NSRS.

In 2003, the Nevada Highway Patrol became a statewide user of the NSRS. The radio system gave them the statewide mobile coverage they required, as well as a means of interoperability with the other primary public safety users of Nevada. The NSRS radio sites cover all of the primary highways in the state.

The system is an 800 MHz EDACS[14] system utilizing more than 90 sites. The number of channels at each site varies from one to 15. The channel quantities at each site are still being adjusted for best match of the loading in various parts of the state. The system has five “controllers” (IMCs), which are all tied to an EDACS “Stargate.” The Stargate allows all of the five systems to work seamlessly as one statewide system. Any user can have statewide coverage based upon his needs.

The partnership created by the NSRS has enhanced communications for all participants. Individually, each user would have to expend significantly more capital funding to achieve its necessary performance levels if not a member of the partnership. For example, the Washoe County School District, a member of the WCRCS, has buses traveling statewide to accommodate the requirements of the county’s sports program. It would be impossible for them to have statewide radio coverage if they had to fund their

[14] Enhanced Digital Access Communication System

own system. Since cellular service is limited in the rural areas of the state, they rely on the NSRS for necessary communications when away from home.

Both of the utility companies and NDOT have full radio maintenance facilities. Through working agreements, these three entities are responsible for the maintenance of the entire infrastructure. Sierra Pacific and Nevada Power are responsible for the sites in their operational areas. NDOT radio personnel cover the sites in other areas of the state. Several Washoe County sites are co-located with NSRS sites so their technicians always have the availability of the NSRS staff to assist them. The costs of maintenance for each participant in the system would be approximately tripled if they had their own system. Training costs have been reduced. Since all of the participants share the one technology and vendor, Harris (the former M/A-COM), the system provider has brought its trainers to Nevada, either Las Vegas, Carson City or Elko, to provide courses normally given at its facility in Virginia. By sharing the costs, the economics of bringing one instructor out West is significantly less expensive than having the technicians and engineers all travel to Virginia.

The joint radio system has benefited the participants operationally. Most significant is that interoperability is integral to the system. As long as radios are programmed for multiple agencies, all of them have numerous common communications channels with which to work.

Sharing of facilities brings in higher levels of redundancy. Just before New Year's Eve 2004, a snowstorm caused the loss of an antenna at a key Nevada Highway Patrol site overlooking Las Vegas. Nevada Power and DOT techs arrived at the site via helicopter and were able to restore the Highway Patrol's communications by shutting down the Nevada Power transmitters and using that transmitting antenna for the NHP. The power company determined that it could use other sites, and the temporary fix was maintained for several months until access to the site was possible in the spring and a new antenna could be installed.

There have been a few regulatory roadblocks that had to be overcome. Public safety and utilities do not share the same spectrum. Nevada has several special cases which the FCC considered when spectrum for the NSRS was being assigned. Much of the state is empty. One of the largest employers in the state is the federal government with such agencies as the Department of Energy, which operates the Nuclear Test Site; the military, which operate Nellis Air Force Base (Home of the Thunderbirds and the Predator); Fallon Naval Air Station; and, of course, the research facilities of "Area 51." These organizations do not share spectrum with civilian agencies. The 800 MHz Region Plan for Nevada now addresses interagency cooperation, interoperability and the importance of the "critical infrastructure industries" in providing effective communications throughout the state. With the cooperation of all of the organizations and the FCC, the qualifications required for assignment of 800 MHz frequencies within the state have become simplified, and no agency has gone without spectrum.

Nebraska Public Power District (NPPD) Case Study
Another case study in a state-wide shared communications system is in Nebraska. Unlike Nevada, this system operates in the land mobile VHF band (150-180 MHz). Interviews with personnel on the utility side of the network revealed their governance models.

The Governance model used in Nebraska is headed by a board created by the Governor under an executive order. The board includes public safety and utility members. The board is currently under review by the Lt. Governor to broaden governance to include all State interoperability systems under one board. This board is presently called N-WIN.

N-WIN combines network systems between the State and NPPD into a common radio network that is supported by both groups and is monitored by the NPPD Technical Operations Center.

State of Nebraska and NPPD share the support of the Radio system as set by the Interlocal agreement. They have a System Administrator Group (OCIO and NPPD) that meets every week to review procedures, operations, maintenance, and new participants for the system.

The State Radio system is under the shared governance of the State of Nebraska and Nebraska Public Power District. N-WIN does play a part in this governance. The System Operating Group (composed of the OCIO and NPPD) is responsible for providing system support and service levels.

The System Operating Group is responsible for operating and maintaining the network services that provide connectivity to the tower sites and connectivity between the networks owned by NPPD and OCIO. The System Operating Group will share equal access to and operation of the primary and redundant system controllers and all of the base station systems. The System Operating Group will operate, monitor, and maintain the Nebraska Statewide Radio Network and establish a change management process to track system software versions, updates and service bulletins. The System Operating Group will establish service areas based on the resources of NPPD and OCIO to support the service level, and will establish specific tower site agreements to address the service responsibilities for the tower infrastructure.

The System Operating Group is also responsible for reviewing, advising, and approving additions, revisions, and changes to the Nebraska Statewide Radio Network. The System Operating Group is responsible for optimizing the radio network and technology life cycles, by determining whether additional agencies of the State of Nebraska or other political subdivisions, including public utilities, can be added to the Nebraska Statewide Radio Network. In the event other agencies or users can be added to the Nebraska Statewide Radio Network without compromising system interoperability, the System Operating Group will determine which agencies or users can be added to the system and develop the requirements and costs for the additional agencies or users. Additional public agencies, political subdivisions or public agencies may be added to the Nebraska Statewide Radio Network in accordance with the terms of this Agreement.

c. Questions of system funding – who funds what?

In a shared system costs are typically shared equally among participants on the network. The utility and the state incur the upfront costs and contribute infrastructure and equipment (including backhaul facilities) towards the build-out. Then, as additional users join the network, incremental costs are recovered from those users on a going forward basis. All of the users on the network maintain their own end-point devices. Repair and maintenance of the network may be carried out by the utility and then the costs are shared at the end of the year with public safety.[15]

The outline below illustrates the network components and the maintenance/repair costs and the extent to which they are shared:

1. Infrastructure available – utilities and public safety contribute infrastructure that is available.
2. Infrastructure equipment – utilities and public safety contribute infrastructure equipment, as provided in sharing agreements.
3. Backhaul – utilities and public safety both contribute backhaul equipment towards the network.
4. End point devices – mobile terminals, handheld radios, laptop network cards, utility end points (each group maintains their own end point devices)
5. Maintenance and Repair – utilities may provide these services and then share the costs with public safety at the end of the year.

d. Operational considerations

When we break down the proposed PSBN into its components, we begin to understand how network sharing between utilities and public safety can be accomplished. At the heart of the network is the LTE management layer. This is where the LTE network core resides and controls fixed and mobile device access to the network and specific application parameters. This layer is also where the spectrum sharing plans are implemented in the network.

The next layer is the fixed communications infrastructure assets. This includes base station transceivers (i.e. an eNodeB), antennas (directional panels or omnidirectional "stick" antennas), feed lines, antenna sites (towers, utility poles and building rooftops), backup power and broadband backhaul (fiber and/or point to point microwave systems).

Finally, the end points of the network are needed. This includes mobile terminals and

[15] Note that public safety may make in-kind contributions, such as backhaul capacity, towards the cost of the maintenance and repair services provided by the utility.

data devices for public safety and utilities, and the fixed assets that both utilities and public safety may use on the network for ancillary communications.

A final consideration in network sharing is the day-to-day maintenance functions needed to keep the network running. These administration costs include full time employees (FTEs) and other typical radio network management procedures. As noted above, utilities have technicians that are geographically dispersed and who are on-call throughout the year and around the clock. Having these personnel available is critical to maintaining reliable communications, including during storms and other events that can affect operations.

The capacity of the LTE core would likely be far greater than needed by regional systems. It is possible that several states can share a single core and for large utilities that span several states, this would not negatively impact network sharing. Regardless of where the core serves one state or multiple states, the basic spectrum sharing methodology should be the same. LTE offers a variety of spectrum asset sharing methods:

Fully pooled spectrum assets: this model allows a complete sharing of all radio resources between the different core network (CN) operators. There are no resources reserved per CN operator. In the extreme case subscribers from one CN operator can use all the resources, a fair access to resources for each CN operator cannot be guaranteed. This strategy can be useful at the early stage of LTE deployments in which the number of subscribers are relatively low compared to the radio resources available.

Fully split spectrum assets: this model allows a strict reservation of resources per CN operator. If resources reserved for a given CN operator are fully used, then a network attachment request or a new connection request from a subscriber of this given CN operator will be rejected even if resources reserved for other CN operators are not fully used. This strategy is more adopted in areas where there is a risk of having subscribers of a given CN operator using all the radio resources. Thus a fair access to resources shall be enforced.

Partial spectrum reservation**:** this model allows to reserve resources per CN operator and to leave a part of the resources unreserved. Thus a fair access to resources can be enforced and non-reserved resources can be used when needed by the different subscribers. This is probably the best comprise in resources sharing.

Unbalanced spectrum reservation**:** this model is a sub case of the “partial reservation” model in which resources are reserved for few CN operators but not for every single CN operator.

We have already discussed that aside from emergency response communications needed by utilities and public safety; each sector will have a certain amount of non-emergency ancillary uses for the available bandwidth. If utilities are to use the PSBN to carry critical grid management communications, then a small portion of the spectrum needs to be reserved for that purpose. Public safety may have the same need for applications that need a small amount of bandwidth reserved. And because the primary purpose of the network is emergency response, a large portion of the available bandwidth must be configured so that the network operators and their emergency responders can communicate with each other.

These communications needs rule out the "fully split" configuration described above. The optimal configuration is the "partially reserved" option. We recommend this be the preferred configuration used in the RFP process. Without a detailed review of utility network needs, a relatively small portion of the broadband capacity must be available to utilities despite the emergency communications needs. These utility applications require little bandwidth but are critical to keeping the electric grid operating in the instances of a natural or manmade disaster. The 2003 blackout is an excellent example; this event was ultimately caused by a tree collapsing on utility infrastructure and the utility network not responding in a timely manner to prevent a cascading blackout. We imagine public safety can cite similar cases of communications that could have prevented a serious event. A good example would be applications like traffic signal control that would enable response vehicles to arrive at an emergency unhindered by opposing traffic.

The configuration of a partially reserved network could allocate a guaranteed bit rate of 10% of the available capacity for both utility and public safety applications and the remaining 80% of the capacity could be reserved for emergency communications, as well as those ancillary uses that could be completely preempted until the emergency is over.

This configuration could be the desired end state, but initial installations could employ the "fully pooled" methodology and rely on LTE's network management tools for ensuring that critical applications have access to the bandwidth.

IV. Lessons Learned

a. A critical look at existing sharing arrangements, identifying gaps or challenges.

The shared systems that have been deployed in other bands can serve as models for sharing the 700 MHz PSBN. While past experience demonstrates that utilities and public safety can successfully share, there are certain challenges that need to be addressed in order to ensure that the 700 MHz PSBN can be successfully shared as well.

One of the key challenges for sharing is to get all of the users agencies involved in operations and maintenance of the system. Otherwise a portion of the users of the network incur duties and responsibilities that could be shared by others. Another more fundamental issue is control of the network. Some shared systems have placed control under public safety to manage day-to-day operations, while others have placed control under the utility or a neutral third-party.

One potential solution that has been adopted in some shared systems to get end-users engaged in the operations and maintenance of the system is to form a user's group to provide input into FirstNet on the needs of the users for system operations and maintenance. The Spectrum Act does provide for an Advisory Committee under FirstNet, which is tasked with assisting FirstNet with its duties and which is authorized to establish additional standing or ad hoc committees, panels, or councils. The Advisory Committee could serve as a fall-back for end-users that are not part of FirstNet to have input into the governance of the network.[16]

On the issue of control, one potential solution would be to allow public safety entities to recommend that utilities or neutral third-parties construct, maintain and operate the network on a regional, state, local or tribal basis through the RFP process. This could be permitted consistent with Section 6206(c)(2), which requires FirstNet to consult with state and local designees on similar matters. In any event, control of the network should not be necessarily required by rule or policy to rest in the hands of any predetermined particular partner. Instead, partners should have the flexibility to best determine which partner or partners should exercise operational control of the network.

b. Narrow band voice sharing vs. broadband network sharing

By taking advantage of the capabilities of LTE, utilities should be able to share the broadband network to an equal or greater extent than they shared traditional narrowband voice networks. That is because narrowband voice systems typically require that prioritization schemes must be done at the device level. By comparison, broadband data prioritization can be performed at the application level, and LTE allows for setting up bearers with different priorities for different applications. It is relatively easy to perform prioritization on LTE, and utilities believe that they should be able to develop prioritization schemes on 700 MHz LTE.

V. Creating the Sharing Roadmap

a. Summary of existing governance examples

In summary, existing governance models should work for sharing the 700 MHz PSBN with utilities and public safety. These governance models are simple and are based upon cost-sharing principles and network policies that develop prioritization and other

[16] For example, the state of Nebraska has established a State Radio Users Group, and each full time user of the system has one vote in user group decisions (if a vote is needed). The user group recommends procedures for operations and maintenance. They also recommend new sites for additional coverage of the system. This group would be very instrumental in determining how the system will operate including radio operation priorities, QoS, emergency operations, network operations, and talk groups.

performance requirements through a negotiation with end users. There are also formal user groups that are created as part of the process in order to get them involved in the network and take their input.

b. Summary of gaps and challenges

There are potential gaps and challenges for developing a governance model for the 700 MHz PSBN as a practical matter. As noted above, one of the main challenges is getting all of the end-users involved in the process. However, this challenge can be overcome relatively easily by developing a user group as a forum for dialog, as is the practice in existing shared systems. In the case of the 700 MHz PSBN, the FirstNet Advisory Committee could fill that role, providing a fall back for end users that are not on the FirstNet board to provide input into the governance of the network. Another challenge is control of the network, which varies in existing shared systems. Similarly, in the case of the 700 MHz PSBN, the decision over control of the network should be left to the parties of the partnership to decide, rather than predetermined by FirstNet.

c. Creating a roadmap or vision of "how is this going to work?"

Benefits of Sharing with Utilities
Ultimately there are a variety of benefits that will flow from sharing the 700 MHz PSBN with utilities, which is why such sharing should be encouraged through policies and processes that promote partnerships between utilities and public safety.

As the FCC recognized in its National Broadband Plan, utilities have similar communications needs as public safety and are compatible users of the spectrum, such that there are synergies that can be gained through sharing the 700 MHz PSBN. They each need reliable communications, particularly during emergencies. Hence, coverage, capacity and availability are critical functional requirements for utility and public safety communications.

Utilities have extensive communications systems and infrastructure, as well as rights-of-way and other resources that can contribute towards the construction, maintenance and operation of the 700 MHz PSBN. This would help reduce the capital costs of the 700 MHz PSBN and accelerate deployment of the network.

In addition utilities could share capacity on the network for a variety of different applications that can be accommodated through network prioritization schemes enabled through LTE technology. In turn, this will promote the economic sustainability of the network because the large number of end-use devices for utility applications on the network will create economies of scale that will help to drive down equipment costs and increase equipment availability.

Next Steps to Encourage Sharing with Utilities
To that end, utilities should engage with public safety to determine network policies, such as priority access and network capacity, infrastructure/equipment and user fees.

These policies should be developed through mutual negotiations between utilities, public safety and other partners. Further, these policies should be adopted by FirstNet as part of the state and local consultation process. To the extent that these policies are adopted by FirstNet, it will encourage utilities to partner with public safety to construct, manage and operate the 700 MHz PSBN through the RFP process set out under the Spectrum Act.

On that point, the RFP process must be flexible and be "open, transparent and competitive," so that utilities have a meaningful opportunity to partner with public safety on the 700 MHz PSBN. In terms of flexibility, the RFP process must permit utilities to bid on some or all of the products and services that are required by regional, state, local and tribal jurisdictions. It should not impose a one-size-fits-all centralized approach that limits the number of potential partners to a handful of national commercial service providers as a practical matter.

VI. Conclusions

For all these reasons, UTC submits that sharing the 700 MHz PSBN between utilities and public safety would serve the public interest by promoting public safety communications and the deployment of smart grid systems on a cost-effective and expeditious basis. At the same time, it would promote efficient use of the spectrum and potentially interoperable communications between utilities and public safety, which would be particularly important during emergencies.

It is urgent that policymakers promote sharing the 700 MHz PSBN with utilities, which are already in the midst of a spectrum crisis, which is made only more dire by the additional demands from smart grid. Public safety, as well as critical infrastructure reliability and security is at stake. Therefore, UTC urges immediate action on this proposal.