

# TELEVATE



## Minnesota Department of Public Safety Public Safety Wireless Data Network Requirements Project Funding and Grant Requirements Report Phase 1-Task 9/Deliverable 7

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March 26, 2012

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## 1 INTRODUCTION AND EXECUTIVE SUMMARY

This Minnesota Wireless Data Network Funding and Grants Requirement document serves as Task 9 and Deliverable 7 for the Phase I element of Televate’s contract with the State of Minnesota. It summarizes the various network implementation options the State could pursue to deploy the network and details the current landscape for funding the construction and operations of these options. This report is a culmination of the preceding project reports and provides the State a comprehensive perspective of available, and expected to be available, funding models including federal grants.

The original scope of work called for Televate to “develop additional information and narratives descriptions of a statewide implementation of the model developed in Task 7 sufficient to support an application for federal funding for all or a portion of the cost of a wireless public safety data network. The funding requirements will be deemed to be similar to project requirements under the Broadband Technology Opportunity Program (BTOP) grants.” Based on discussions with State staff, the BTOP program was not deemed to be continued. As a result, it seemed to Televate and State personnel to be an unwise use of the final deliverable. Instead, the team focused on building a document that identified the long-term sustainability and viability of a statewide public safety network and the various business models that might be best suited to meet the State’s needs.

This report supports a fundamental goal of the Wireless Data Network Requirements Project to define statewide requirements for the network and to assess all viable implementation models. Based on this insight, the State can further advance its goal to reach agreement on the broadband wireless strategy that best meets the State’s overall objectives.

The report details three high-level business models that are feasible under the recent legislation that enables public safety to establish public-private partnerships that can provide service over the public safety spectrum to consumers. This authority is principally, but not exclusively assigned to the First Responder Network Authority (FirstNet). This report includes a State Public Model, whereby the State would rely only on government funding to build, operate, and maintain the network. It also includes a vendor financed model, whereby the vendor provides any financial shortfall for building and operating the network, with commercial usage serving to fill the gap. Finally, it includes a commercial carrier model, whereby an existing commercial carrier augments its existing network to fulfill the needs of State public safety personnel.

**Table 1: Financial Models Available**

Model	Description
<b>State Public Model</b>	The State builds, owns, operates, and maintains the network. This is analogous to land-mobile radio deployment in the past, such as ARMER.
<b>Vendor-Financed Model</b>	A vendor fills in financial shortfall for building and operating the network by making commercial usage available to the network.
<b>Commercial Carrier Model</b>	An existing carrier augments its network to meet public safety needs.

This report shows that despite substantial leverageable assets the State possesses, a standalone State Public Model is unlikely to be viable. Specifically, a model whereby the State relies on funding expected to be available from Federal sources, and funding expected to be available from State, local, regional, and tribal sources within the state, are not expected to fully build out the system nor sustain its ongoing operations. However, with further study of State and local resources, it may be feasible that portions of the State could be constructed and sustained.

FirstNet has the ability to capture value from unused capacity on the spectrum on a secondary, lower priority basis. It is possible that a full statewide deployment is feasible only through leveraging the value of this unused capacity. The Middle Class Tax Relief and Job Creation Act of 2012 opens the door for private entities wishing to provide wholesale or direct service in addition to public safety grade priority service. In addition to bridging this funding gap, this report underscores the potential value with such private partnerships including the device options and pricing for devices. However, as detailed in previous reports, Televate underscores some of the concerns expressed by commercial carriers in other phases of this project. Such concerns could impact the viability of highly beneficial partnerships.

Finally, this report provides recommended next steps for the State in its pursuit for the State of Minnesota component of the nationwide public safety broadband network. Such efforts include an improved understanding of State and local assets and resources as well as a more detailed understanding of partnership opportunities. Due to its initial efforts in broadband, the State is well positioned to deliver a highly useful package to FirstNet. Continuing those efforts will enhance the State's understanding of its needs and the viability of different partners in addressing those needs.

## 2 STATE BROADBAND WIRELESS NETWORK FUNDING OVERVIEW

Over the course of State of Minnesota Wireless Data Network project, extensive information was documented on the operational requirements and various implementation options available to construct the network. Operational requirements were defined directly by State and local jurisdiction first responders and other perspective end users of the network. Applications types and utilization requirements, coverage area (in-building, on-street, in-vehicle), data throughput, reliability, and other fundamental network performance and availability data was detailed by the perspective end user communities. Based on these requirements, and anchored on the public safety Long Term Evolution (LTE) wireless technology standard, a budgetary broadband wireless network was designed to facilitate capital deployment and operational funding analysis. The preliminary design provides 95% coverage within each State county<sup>1</sup> as defined by end users, and essentially matches the coverage of the State's ARMER radio network. This LTE network design was anchored on existing State and local jurisdiction assets (towers and backhaul) to the greatest extent possible, and supplemented by new and leased facilities where appropriate. The proposed design emulates a deployment strategy that would ideally be undertaken for a new public safety broadband network in the State. This report investigates the various business and funding models available to build, operate, and maintain a broadband wireless solution that satisfies the needs of the State's public safety community.

The recent passage of the Middle Class Tax Relief Act included a provision for FirstNet, tasked with the deployment and operations of a nationwide public safety broadband network. The legislation provides

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<sup>1</sup> See Minnesota Public Safety Wireless Data Network Requirements Project, Wireless Data Implementation Model, p. 9.

FirstNet with 20 MHz of total broadband spectrum, \$7 Billion in capital funding, and the ability to establish public-private partnerships to build and operate the network. The Act calls for FirstNet to offer broadband wireless service to State, local, and tribal public safety agencies on a fee for service basis. The States are responsible for a 20 percent match of the deployment cost of the Radio Access Network and to pay a fee for Core Network services. The Act calls for maximizing the use of public safety and commercial assets such as towers and other equipment facilities. The legislation allows States to “opt out” of a deal presented by FirstNet. Such an opt out would enable the State to separately contract for its own Radio Access Network if approved by FirstNet and the FCC. As a result of this legislation, the LTE sites could be chosen by private partner(s). Since the legislation allows for commercial service over the FirstNet spectrum through covered leasing agreements<sup>2</sup>, a private partner could also require additional coverage or operational requirements that could result in new facilities.

While the specific sites involved in the budgetary LTE network design may or may not be used by FirstNet, it provides a realistic perspective of the actual costs to build and operate the network, regardless of the eventual business model. The budgetary LTE network design requires 521 eNodeB wireless sites to achieve reliable outdoor coverage for every county in the State. Of these 521 sites, 380 sites are incorporated from the State’s ARMER radio network resulting in significant LTE system deployment costs. The investment the State has made into ARMER will continue to pay huge dividends for State citizens and regardless of what eventual LTE implementation model. ARMER assets will significantly reducing the overall LTE system deployment and operational costs. The balance of the remaining 161 sites were assumed to be newly constructed sites in the implementation model. Some of those additional cell sites could come from commercial towers. However, in reviewing the coverage maps of the commercial carriers, they do not serve many of the areas served by these 161 sites. In other words, it is possible that, due to the rural nature of the areas these towers would serve, there are limited available towers and many of towers would have to be constructed to service these areas regardless of the business model.

## 2.1 Statewide Budgetary Overview

The projected cost to deploy an outdoor State broadband wireless network is \$332,136,804. This value includes the cost for 521 wireless sites and two Evolved Packet Core (EPC) nodes required to support all network management requirements. Based in this network option, the annual operational expenditure cost was estimated to be \$14,078.275. The total cost of the Public Service model is summarized in the following table:

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<sup>2</sup> See Middle Class Tax Relief and Job Creation Act of 2012, § 6212. FirstNet is prohibited from directly marketing access directly to consumers but is not prohibited from entering into covered leasing agreements with entities that do directly market access to consumers.

**Table 2: Cost of the Private Implementation Model**

Expenditures	ARMER PLUS (521 Sites)	ARMER (380 Sites)
<b>Radio Access Network (RAN) and Backhaul</b>	\$ 310,717,004	\$ 182,828,703
<b>Core Network</b>	\$ 21,419,800	\$ 19,994,200
<b>Total Capital</b>	\$ 332,136,804	\$ 202,822,903
<b>Annual Operational Expenditures</b>	\$ 14,078,275	\$ 13,077,350

The “ARMER PLUS” model above, with 521 sites on the network, utilizes as much existing ARMER infrastructure as is possible. To meet public safety requirements for coverage that mirrors ARMER today, a statewide LTE network would require 141 additional sites above and beyond those in the ARMER plan today.

The table above also depicts a deployment strategy that uses only the existing ARMER sites (“ARMER” option above with 380 sites dedicated to the broadband network). Such a design provided nearly 95% coverage of the State, but left large pockets of rural areas of the State unserved. However, this option may be a worthwhile transition step towards the full statewide network.

For either model, capital expenditures could be further reduced by leveraging the fiber networks of the State and county agencies; referred to as the “OET” model. The estimates for these scenarios are in the following table and illustrate the capital construction cost of the LTE network at \$314,744,258 with annual operating expenditures at \$15,910,930.

**Table 3: Cost of the Public OET Implementation Model**

Expenditures	OET ARMER PLUS (521)	OET ARMER (380 Sites)
<b>Radio Access Network (RAN) and Backhaul</b>	\$ 293,324,458	\$ 165,436,156
<b>Core Network</b>	\$ 21,419,800	\$ 19,994,200
<b>Total Capital</b>	\$ 314,744,258	\$ 185,430,356
<b>Annual Operational Expenditures</b>	\$ 15,910,930	\$ 14,910,005

For both models, the capital expenditures decrease by \$17,392,547.00; a 6 percent reduction. The operational expenditures increase by \$1,832,655.00, an increase of 12 percent due to the added annual connectivity cost for services provided by OET.

The implementation model includes Core Network elements at a cost of more than \$21 Million. The FirstNet legislation calls for FirstNet to build, operate, and maintain the core network, and therefore, this capital expense will be eliminated. In its place, the State is required to pay for core network services to FirstNet.

The network operating costs for the implementation model are largely fixed. A network that supports 1,000 users will cost roughly the same to operate as a network that supports 10,000 users. As a result, the implementation model presented operational costs per user per month to compare “recovery” of these costs to commercial subscription costs. The following figure represents the monthly costs per

user required to recover network operations and provide an estimate for potential user fees designed to recover operational costs.

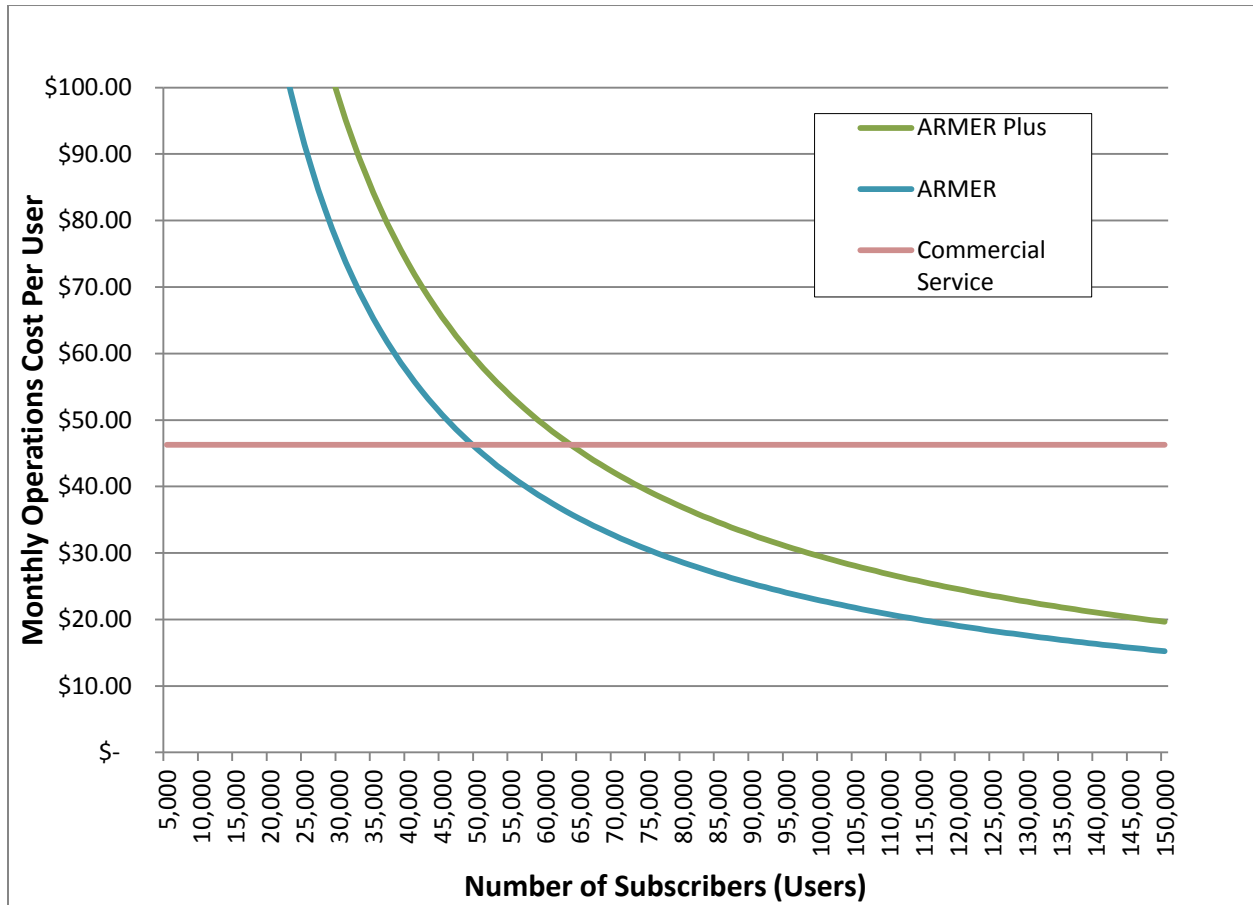


Figure 1: Monthly Operations Cost Per Subscriber – Various Models

The curves in the figure below assume that the build costs are amortized over their respective lifetimes. Such additional expenses would also cover built-in technology and network refresh costs that are likely to be a requirement for FirstNet sustainability. In addition, since “network refresh” costs are included in commercial subscription fees, they provide a better comparison against current spending for cellular services. The chart depicts the fixed monthly cellular services costs of \$46.27 per month for data only services and includes taxes and fees. These services are discounted the maximum amount, and therefore, are estimated to be the same independent on the number of users. This line represents the monthly cost for commercial cellular data only services. Commercial services for voice and data (i.e., smartphone plans) are typically higher. On the contrary, user fees designed to recoup network operations fees for a standalone public safety network will decrease as the number of users increases. The point where the lines intersect is the “breakeven” where the net cost of commercial service equals the net cost for recovering network operations expenses.



However, cellular service fees fund more than just network operations. They fund other activities such as sales and marketing, device subsidies, device testing, customer service, and also drive profit. Clearly, user fee cost recovery does not need to accommodate profit and a purpose built network would require limited sales and marketing expense to help bring State public safety agencies on board. In addition, most governments manage their users centrally, creating limited per user cost for customer service. However, device related costs can be substantial, especially device subsidies. Furthermore, in the event of substantial device premiums, the ongoing operational costs to maintain users on the network could be significantly higher. The following figure provides the user cost curves including different levels of ongoing subscriber device costs.

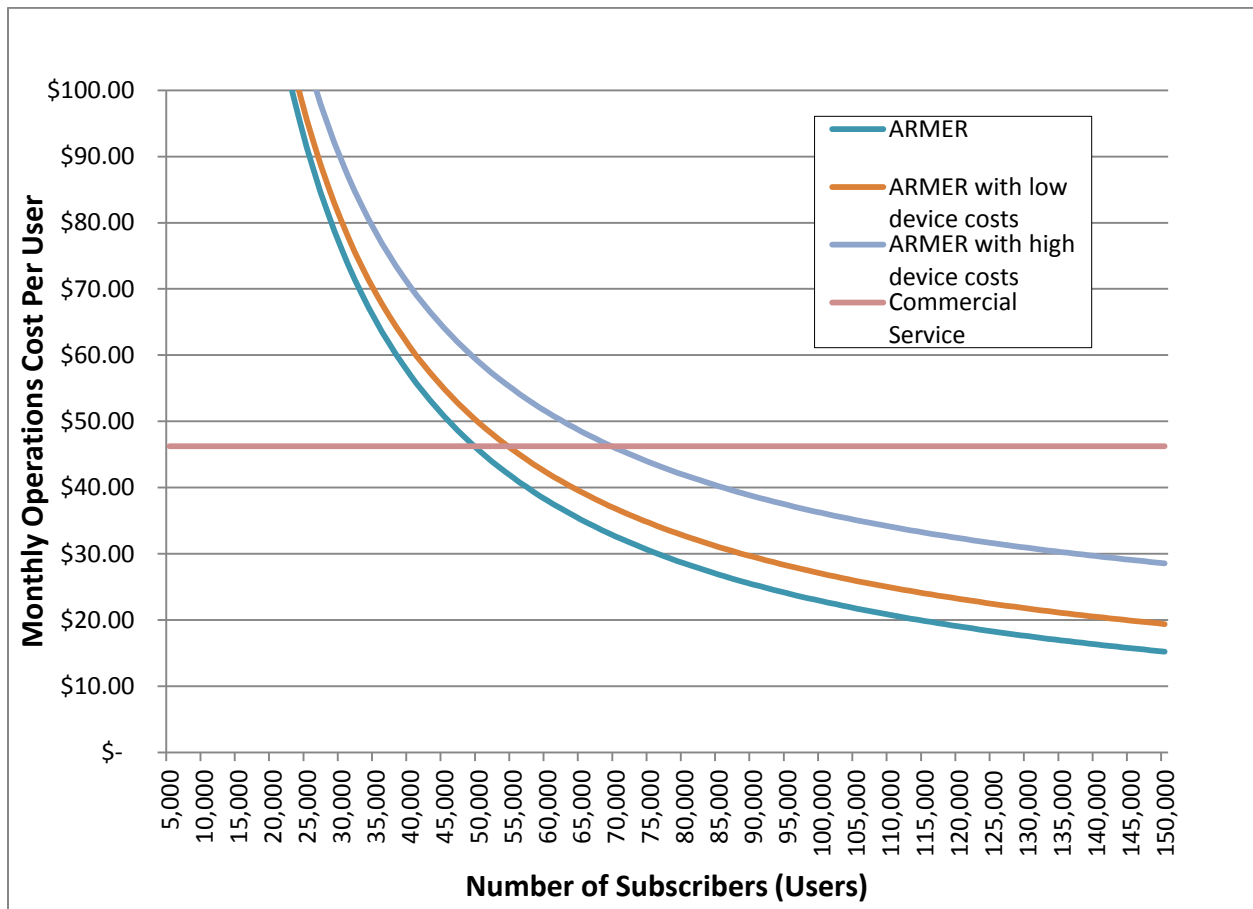


Figure 2: Monthly Operations Costs Per User - Including Device Costs

The figure shows two different device cost scenarios. In both cases Televate assumes a data only modem scenario with a five year replacement cycle. Costs for smartphone devices replaced every two years or so would be higher. The monthly costs are spread equally across this cycle. In addition, the curves assume the carriers subsidize device costs \$200 for each device. On the low end, Televate assumes that there is a \$50 premium that public safety would pay over that of commercial devices. On the high end, Televate assumes devices are four times more expensive (\$800 per device compared to a commercial device at \$200 but subsidized to be provided at no cost). The curves show that factoring device costs requires 5,000 to 20,000 more subscribers to match current commercial rates. However,

these analyses assume static commercial pricing for data services. In addition, commercial service for several carriers are “capped” (e.g., a carrier may offer a monthly maximum of 2 GB total data traffic at a fixed fee, with incremental charges for additional data above that amount), whereas, services for a private model are limited only by the capacity of the system at any one point in time.

Other important aspects of the Implementation Model include:

- The assumption that new sites would be constructed, not leased. Leasing towers would shift costs from capital to operations. There are no technical barriers to leasing sites for public safety, but the lifetime ROI for constructing one’s own dedicated sites, as well as the choice of site location associated with building a new site, is generally favorable to the conditions, limitations, and cost in leasing an existing site.
- The assumption that network operations will leverage existing resources and teams from ARMER. Independent network operations costs that do not leverage these resources, a possible result under FirstNet, could be greater than those in the Implementation Model.
- The value of the public safety broadband spectrum to be used for commercial purposes is not captured in the model. At this point, such value is highly speculative.
- The Implementation Model assumes outdoor coverage is sufficient to meet the needs of Minnesota public safety community in Greater Minnesota and in suburban counties, and that indoor coverage is only required in the cities. If a substantial portion of the rural and suburban user community requires in-building coverage, the cost to construct and operate the network will be substantially higher. Furthermore, urban coverage in-building coverage may not sufficiently cover the required amount of building interiors.
- Public safety subscriber devices are not included as an operating cost in the Implementation Model. As Televate will show in this document, devices operating in the public safety band could be substantially more expensive. Such increases are excluded and would be a function of multiple market dynamics.
- Some computing and traffic generating devices (e.g., cameras, tablets, etc.) are not included in the model.

## 2.2 FirstNet Overview

On February 22, 2012, the President signed into law the Middle Class Tax Relief and Job Creation Act of 2012. Title VI of the Act specifically deals with the creation of a nationwide broadband network for public safety. The Act allocates 20 MHz of spectrum in the 700 MHz band to “public safety entities.” It specifies the creation of an independent Authority, FirstNet. It also allocates funding for the construction of a nationwide public safety broadband network, establishes policies regarding the construction and operations of the network, among other regulations. Use by non public safety entities on a secondary basis is permitted under the law through covered leasing agreements.

Funding for FirstNet begins at \$2 Billion for the nationwide network. If revenues from spectrum auction proceeds are sufficient, a total of \$7 Billion can be allocated to the construction of the nationwide

network. FirstNet will determine funding levels for each state. The Act does not require State matching funds for network construction<sup>3</sup>. It does not specifically address State, local, and tribal investments into the network, and therefore, Televate suspects that such investments would be allowed and encouraged. Given a population based distribution model of funds<sup>4</sup>, Minnesota would see roughly \$120 Million from this fund.

FirstNet can collect fees from public safety entities and secondary users, however, secondary users must be serviced via public-private partnerships<sup>5</sup>. FirstNet can also lease system capacity on a secondary basis and network equipment and infrastructure. FirstNet is required to collect fees that are sufficient to recoup, but shall not exceed, the total expenses of FirstNet for each fiscal year. FirstNet is also responsible for “improvement” of the nationwide broadband network<sup>6</sup>. Therefore, the net fees collected by FirstNet must cover network and administrative operations of FirstNet as well as the deployment of upgrades as necessary as initial systems become obsolete.

The Act requires that FirstNet consult with “regional, State, tribal, and local jurisdictions” regarding coverage, hardening, priority, training, service levels, performance criteria, deployment timetables, operational requirements, and other requirements. FirstNet is required to use “commercial or other communications” and “Federal, State, tribal, or local” infrastructure “to the maximum extent economically desirable.”<sup>7</sup> As a result, State assets identified in the Implementation Model can be offered to FirstNet, but it is by no means a guarantee that those same assets will be used.

The “value” of the excess network capacity to secondary users is unknown at this time. Likewise, the value of leasing network equipment and infrastructure is also unknown. It is possible that due to a high degree of secondary utilization and value on the broadband network, that FirstNet public safety fees could be substantially reduced. Because FirstNet is obligated to reinvest any operational funds into the network, the user fees will likely vary based on these external revenue streams for FirstNet. As a result, the user fees associated with FirstNet are speculative. In addition, a private partner could leverage its own assets to reduce the capital and operations costs associated with FirstNet costs and fees, further reducing the FirstNet fees to Minnesota users.

It is feasible that the user fees may become a national aggregate of the total operational costs (i.e., that network fees are set nationwide). Therefore, lower operations costs per user in dense parts of the country and higher operations costs in less dense parts of the country could affect the final fees to State of Minnesota users. However, because Minnesota is close to the national average in population

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<sup>3</sup> It does, however, specify 20 percent matching funds for planning grants.

<sup>4</sup> Per US Census 2011 data, Minnesota has a population of 5,344,861 and the total United States population is 311,591,917, and therefore, Minnesota represents 1.71 percent of the United States in population. Applying this percentage to \$7 billion total funding would result in \$120,073,805 available to the State of Minnesota.

<sup>5</sup> Section 6212a: “The First Responder Network Authority shall not offer, provide, or market commercial telecommunications or information services directly to consumers.”

<sup>6</sup> Section 6206 (c) (4) MAINTENANCE AND UPGRADES.—The First Responder Network Authority shall ensure the maintenance, operation, and improvement of the nationwide public safety broadband network, including by ensuring that the First Responder Network Authority updates and revises any policies established under paragraph (1) to take into account new and evolving technologies.

<sup>7</sup> Section 6206 (c) (3)

density<sup>8</sup>, it is likely that an analysis of Minnesota would represent the national average. Therefore, we would expect any nationalization of average user costs would have limited impacts.

Finally, since FirstNet will be national in scope, it will be able to reduce costs associated with deployment and operations costs. Because of the volume of its purchases, Televate expects that FirstNet will be able to secure far better equipment pricing than that anticipated in our Implementation Model. Furthermore, commercial grade LTE core equipment can service millions of customers and many thousands of cell sites. The LTE Core built and operated by FirstNet can be shared among multiple states, and therefore, reduce the capital and operating expenses associated with the Core. This is also the case if the State were to “opt-out” of the FirstNet offering. In that case, a State can build its own Radio Access Network (RAN) by selecting its own vendors to build, operate, and maintain, the network. Some level of FirstNet funding would be provided to cover State “opt-out” RAN implementation but it is unclear how this option would be structured. Since the law provides the capability to only build the RAN, it implies that the State RAN must use FirstNet provided core networking facilities.

## 2.3 Implementation Model Overview

The business model chosen for the Implementation Model report was one where the network was built, operated, and maintained by the State. This model represented the only known, and potentially worst-case, scenario that leveraged only State assets and State and local “public safety entities” for construction costs and user fees. The projected cost to deploy the statewide LTE network with outdoor service in the model is between \$185 and \$332 Million. The Model assumes a State provided LTE Core Network. Since FirstNet will supply the core networking equipment this would fully eliminate capital obligations associated with the cores. Such a reduction would result in total capital costs of \$165 to \$310 Million. This cost does not include the cost of User Equipment (UE) such as air cards and smartphones, as well as laptop computers and tablets, mobile cameras, software applications and other ancillary end user equipment and solutions that will be deployed over the State’s wireless data network. The cost estimate of these materials was not within the scope of this project and report, but should not be overlooked when computing the overall funding obligations of the network.

The annual operations cost for the network in the “private” model varied between \$13 and \$16 Million. The operations assumed to leverage existing ARMER operations and existing State facilities. However, this cost level assumes a LTE Core network operated and maintained by the State. Since FirstNet will operate the Cores and pass those operations costs on to public safety entities, the State will experience the core operating costs as part of its user fees. Given FirstNet’s economies of scale with regards to the labor associated with Core Network operations (and the presumed Core operations servicing multiple states), Televate suspects that FirstNet would reduce the total Core Network operating expense to the State<sup>9</sup>.

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<sup>8</sup> Per Wikipedia, the US average is 88.08 inhabitants per square mile and the Minnesota average is 67.14 inhabitants per square mile.

<sup>9</sup> However, it’s possible that FirstNet will deploy multiple interoperable applications for which it will charge FirstNet subscribers. This increase cost offset any cost savings.

## 2.4 Possible Business Models

While the Implementation Model presented a State deployed and operated system, FirstNet may offer a variety of other business models to the State. The legislation allows for public-private partnership models that could minimize the capital costs associated in building the network, reduce the expenses costs associated with operating the network, and leverage secondary use to reduce the public safety portion of the operating costs. Collectively, the various funding models are summarized below and further detailed in subsequent report sections. Funding models available to the State include the following:

- **State Public Model:** The State wireless broadband network would be operated by the State and either funded through FirstNet funding, State funding, local funding, or a combination of the three. In this model, we assume that only government employees contribute towards the operations of the network.
- **Vendor Financed Model:** Capital funding beyond the levels available from FirstNet is provided by the vendor building the network. The deal might be structured such that the vendor provides fixed cost operations or per user fees and would include additional fees to cover the vendor financing. The Act allows the vendor to provide service to secondary users and share those revenues with the State or otherwise reduce usage fees. The vendor may need to identify such secondary users up-front in order to reduce risks to FirstNet and the State.
- **Commercial Carrier Model:** A commercial wireless carrier could bid on the FirstNet or State RFP to offer service over the public safety spectrum. The carrier could leverage the spectrum on a secondary basis for its existing and future user base in the State. The carrier would likely only require “incremental” capital and operating costs based on its existing assets.

Partnerships with private entities could bring further reductions in incremental operating costs associated with a statewide public safety network. For example, a private partner providing commercial service over Band Class 14 might also have statewide operations. Some portion of the operational costs could be absorbed by such a partner’s existing capacity. For example, the additional burden of Band Class 14 eNodeBs might have minimal impact on Network Operations Center resources and the existing field technician team might be able to accommodate the additional Radio Access Network equipment.

## 3 BROADBAND IMPLEMENTATION BUSINESS MODELS

The following sections provide detail regarding the possible implementation models.

### 3.1 State Public Model

The “State Public Model” option refers to a network deployment and operations model that is solely funded by government capital, whether provided by the Federal government, the State of Minnesota, local governments within the State, or through a combination. In this model, FirstNet, in partnership with the State, local and tribal partners, would hire vendors to build, operate, and maintain the network according to the requirements of the State’s public safety users. The State Public Model would require the FirstNet and the State to secure roughly \$300 Million in capital funding to construct the LTE broadband network, and to raise approximately \$15 Million annually to ensure continuity of network operations. This level of Capital Expenditures (CapEx) funding will allow the State to implement a

network meeting end user requirements for 95% reliable coverage within each county. This objective is an extremely aggressive requirement that exceeds coverage offering from the commercial cellular carrier industry. However, this coverage requirement equals the ARMER service offering and typifies first responder objectives to have wireless data wherever they have land mobile radio service.

Funding sources for the deployment costs for this model include Federal, State, and local sources. Federal funding could come from the new FirstNet legislation. Other funding sources for public safety broadband are unlikely in the immediate future. The Broadband Technology and Opportunities Program funded \$300 Million to seven public safety wireless broadband entities throughout the country. But there is no indication that the Federal Government will add more funds to that program. Urban Area Securities Initiatives (UASI) and other Department of Homeland Security (DHS) grant programs are also winding down and are unlikely to generate sufficient funding for a statewide deployment. State funding initiatives could be achieved through the bond marketplace, as was the source of ARMER funding, or from direct State capital allocations spread out over a multi-year timeframe. While outside the scope of this document, it is feasible that individual cities, townships, counties, and other entities may have funding available to augment capital associated with the statewide deployment. Furthermore, the statewide network can be constructed in a phased approach as State and local funds are available. Additional information on these funding sources is detailed below in *Section 4. Potential Sources of Funds*.

## 3.2 Vendor Financed

The concept of vendor financed equipment purchase is quite common in the commercial industry, and, although financing arrangements are also available to government, it is less frequently used as a means to facilitate government technology procurements. Governments more commonly rely on the Bond Market where financing terms are typically more attractive and state and local jurisdiction citizens have an opportunity to approve the Bond. However, vendor financing is likely to be offered by the LTE infrastructure industry and the integrators offering turnkey services. There is competitive incentive for the vendors to offer equipment to meet customer requirements. With the cost of money at an all time low<sup>10</sup>, vendor financing becomes a viable funding instrument to FirstNet and the State to augment Federal funds available through FirstNet.

There are various partnership examples of land mobile radio vendor financed partnerships including the Racom in the State of Iowa. Motorola provides service in the State of South Carolina on a fee basis. Already, one example of a broadband vendor financed model exists in the San Francisco Bay area, Motorola and the BayRICS have entered into an agreement whereby Motorola, with the help of BTOP funding, builds, operates, and maintains a public safety broadband network for a fee.

However, the vendor financed model requires that the business model to sustain the network recoup the vendor's financing fees. The following simple prime and interest rate model assumes an equipment

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<sup>10</sup> See Treasury Direct, Annual Interest Rate Certification. As of this writing, average market yields for a 10-year US Treasury Security is at 2 ¼%. Current information available online at:

[http://www.treasurydirect.gov/govt/rates/tcir/tcir\\_fy2012\\_opdirannual.htm](http://www.treasurydirect.gov/govt/rates/tcir/tcir_fy2012_opdirannual.htm).

finance valued of \$173,250,653 based on a total purchase price of \$307,000,000 and assuming the State receives \$120,000,000 from FirstNet based on a population. The assumed interest rate is 4.5% with a 10 year loan payoff. Annual financing principal and interest are displayed in Table 4. The assumption of 4.5% interest has not been validated and is presented for analysis consideration only.

**Table 4: Vendor Financing Example Costs**

<b>Loan Amount</b>	<b>\$173,250,653</b>
<b>Loan Term</b>	10 Years
<b>Annual P&amp;I Payment</b>	\$21,895,213
<b>Net Total Interest</b>	\$45,701,481

Table 4: Vendor Financing Model illustrates an interest charge of \$45.7 million over the ten year loan period with annual payments of \$21.9 million. The vendor would need to incorporate these costs into the service over the course of the period of performance. These costs are estimated to more than double the net operating costs for the network, and therefore, such costs would have to be recovered by user fees.

The vendor financed model could include multiple variants on the funding of ongoing operations. One such option is an anchor tenant model whereby the State and local entities could be the primary tenant. In such a model, the vendor could request a minimum fixed, annual fee that funds a substantial portion or all of the vendor’s operating costs. The fee could remain fixed above that level or the vendor could charge use fees above that level. If the minimum fee is less than the vendor’s operational costs, the vendor would assume the risk of securing outside revenue streams such as wholesale or direct commercial wireless services.

Such market activity is expressly prohibited by public safety entities, but is allowed through “public-private partnerships.” There is no restriction in the FirstNet legislation on the private entities. They could be non-profit or for profit. The government would likely not be able to play a role in the governance of these “private” entities since the legislation strictly calls for maximizing competition and such activities would be considered a conflict of interest. However, rural telephone companies, long-haul wireline carriers (e.g., fiber optic carriers), utilities, and other private business are viable partners to deliver on such a capability.

There are a number of positive side effects of a model that includes commercial services over the public safety spectrum. First, the increased volume of subscriber devices should reduce the prices of subscriber devices. It should also increase the availability of different types of devices. Ultimately, the amount of device price reduction and the increase in availability will be impacted by the scope of commercial use in the band. The greater the volume, the more device vendors that will enter the market and the more devices over which they can spread their fixed costs for developing and deploying devices. Finally, provision of commercial service over the band could benefit rural broadband and

cellular access. As identified in Televate's previous reports, the commercial carriers do not offer the level of rural coverage required by the State's public safety personnel. Therefore, if FirstNet and the State were to provide such coverage, a private partner could leverage this coverage to provide wireless service where it does not currently exist, in any form, much less for broadband. As a result, the general public could benefit from such a model, especially if the vendor financed solution was made available to all commercial carriers.

### 3.3 Commercial Carrier Model

The FirstNet legislation not only allows for partnership with commercial carriers, it encourages it. The commercial wireless service providers have substantial nationwide infrastructure and according to CTIA, there are 322.8 million subscribers in the United States alone<sup>11</sup>. The carriers have more than 256 thousand cell sites across the country. The commercial carrier partnership model offers a unique opportunity for the State to enter into a mutually beneficial partnership with a commercial entity. The model offers an opportunity to enter into a partnership with national and regional cellular carriers. While these carriers already possess spectrum, the explosive growth in broadband data usage has placed a significant spectrum shortfall for the carriers. Furthermore, the public safety spectrum could serve as an opportunity for a regional carrier to begin operations in the State.

The legislation allows FirstNet to enter into private partnerships where partners could sell commercial services on the D Block. These services would be offered on a secondary basis to commercial subscribers, meaning that in the event that public safety required access to the nationwide public safety network, they would have priority over commercial users. Such priority over commercial users could degrade the value of the spectrum for commercial carriers since non-public safety entities represent more than 98 percent of their customer base. However, public safety emergency incidents are usually isolated to limited geographic areas and would only impact capacity of individual sectors of servicing eNodeB sites. Public safety traffic patterns are expected to be highly correlated to emergency incidents. When they occur, public safety's demand may saturate the network capacity on the cell sites where the incident occurs. However, in the remainder of the network, and for the remainder of the time, public safety's usage is far lower. It is not unrealistic to assume that 99 percent of the network geographic coverage area, over 99 percent of the time, is available for commercial use. And because FirstNet did not dictate how the network should prioritize the primary public safety use over the secondary use, FirstNet may have some degree of flexibility to make the spectrum attractive to commercial carriers, even in situations when there is congestion. Some of the carriers also have substantially more spectrum that would not come with the priority requirements of the public safety spectrum. This would mean that existing commercial carriers would still be able to provide service in those areas where an incident occurred.

The commercial benefit factors described above could be even more substantial with a commercial carrier partnership. Some nationwide carriers have in excess of 100 million subscribers and bring an

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<sup>11</sup> See <http://www.ctia.org/advocacy/research/index.cfm/AID/10323>



incredible amount of buying power to help grab the attention of equipment vendors. One agency interviewed during the needs assessment phase of this project indicated that it wanted to provide every law enforcement officer an iPad. Securing an iPad on the public safety spectrum will require the support of Apple. Such a device first requires Apple's chipset vendor to support the public safety band. Next, the cost of supporting the band in Apple's product line must result in sufficient return on investment. If commercial carriers with tens of millions or a hundred million subscribers require the public safety band in their devices, this should provide sufficient incentive for Apple. However, without these volumes, it is less likely that public safety will secure an iPad in the band, or if it was available, would be offered at an excessive cost.

## **4 LEVERAGE ASSETS**

The State and its local partners have substantial assets that can be leveraged towards the reduction in capital and operating costs for the Minnesota portion of the nationwide network. The implementation model provides details on the State assets leveraged in the fully private model. In addition, as discussed above, the commercial use of the spectrum has substantial potential value in and of itself. This section provides a high level perspective on those assets and the type of partners that may find value in those assets.

The following table represents a summary of the assets, whether they impact capital, operational, or both expenses, and the type of commercial partners that benefit from the assets:

Table 5: Major Assets Available for Leveraging into Broadband Network

Asset	Expense Benefit	Partner Benefit
<b>ARMER and local Sites</b>	<p>Capital reduction – fewer towers to build, fewer generators and UPS</p> <p>Expense reduction – fewer site leases, less equipment to maintain.</p>	<p>State Public Model</p> <p>Vendor Financed</p> <p>Limited commercial carrier model (only where State sites augment coverage or capacity)</p>
<b>State Backhaul</b>	<p>Capital reduction – fewer microwave and long-haul fiber lines to implement.</p> <p>Expense reduction – reduced backhaul service expense</p>	<p>State Public Model</p> <p>Vendor Financed</p> <p>Limited commercial carrier model (only where State sites augment coverage or capacity)</p>
<b>Commercial use of spectrum</b>	<p>Capital: leveraging commercial density build reduces new site needs. Shares density costs. Reduces backhaul costs.</p> <p>Expense: Through commercial sharing of assets, spreads operational costs across more users.</p>	<p>Vendor Financed with wholesale or direct commercial consumer sales. Enables a new potential entrant to market.</p> <p>Commercial Carrier can augment existing spectrum with increased capacity. New carrier can expand into Minnesota.</p>

## 4.1 ARMER Sites

State and local government in the State own 225<sup>12</sup> sites that are conducive to wide area wireless service. The vast majority of these sites are communication towers. The value of these assets to a private partner is highly dependent on the type of partner. A private partner with no infrastructure in the State would find these sites to be highly valuable. Capital costs to deploy the network would be substantially lower and use of these sites would save an estimated \$15,000 per site annually from typical tower rentals. This could save the network operator over \$3 million per year.

But even in the event of a commercial carrier partnership where the carrier has existing service in the State, there are likely to be some percentage of the State owned sites that are useful in the carrier’s network. Other ARMER rented sites would likely incur additional rents for the additional equipment, and therefore, there would be no operational savings, but they could become savings in capital costs. ARMER sites could become useful for both capital and operational cost reduction to a commercial carrier to augment their coverage or capacity in areas where they already provide service. In addition,

<sup>12</sup> These 225 sites account for the sites in Televate’s statewide LTE network design that are owned by the State or its local government partners. Essentially, it constitutes 380 sites less those sites rented from third parties.

the State provides ARMER coverage where no cellular coverage exists today. An estimated 25 of these sites fall outside of the commercial cellular coverage today. These sites should be directly usable to a commercial carrier. If 25 percent of the State's sites were useful to the commercial carrier, or 56 sites, the value to the carrier would be nearly \$1 million per year<sup>13</sup>.

## 4.2 State Backhaul Networks

The Minnesota Office of Enterprise Technology (OET) operates statewide microwave and fiber optic links. Many of these links were used in the implementation model developed by Televate. Available capacity on these links could be leveraged for the statewide public safety broadband network. However, given the expected demand from each eNodeB existing microwave connections of less than OC3 (155 Mbps) may provide little benefit. Instead, these links would need to be augmented with additional or augmented higher capacity connections.

Based on Televate's understanding, the fiber network described in the implementation model is controlled by the State or local governments. As such, even if individual links are highly utilized, they may be inexpensively upgraded to provide substantially higher capacity using dense wave division multiplexing. As a result, fiber transport running through the State is likely to be highly useful to a new carrier. However, an existing commercial carrier will likely, due to high statewide 3G deployments, already have a statewide fiber optic backbone. Therefore, the State's infrastructure will be less beneficial to an existing carrier with the possible exception of connectivity from State provided sites and the carrier's core network.

## 4.3 Local Assets

The State currently uses many locally owned assets in the ARMER network. As a result, those local assets are partially included. However, local and tribal governments may have additional assets that may be of use for the statewide network. These assets could come in the form of water towers, tall office buildings (four to ten story), and other elevated structures owned by State and local governments throughout the State.

## 4.4 Commercial Use of Spectrum

As mentioned above, the Middle Class Act allows for the commercial use of the public safety spectrum. A nationwide license in the 700 MHz band for 20 MHz of spectrum could be worth \$8.5 billion<sup>14</sup> at auction. Based on population, a Minnesota license for the spectrum would be worth \$146 million<sup>15</sup>. However, the public safety spectrum would come with other obligations, those obligations would tend to decrease the value of the spectrum as compared to spectrum that is free and clear.

One of those "obligations" is public safety priority on the spectrum. It is difficult to determine how much public safety traffic will be generated on the network and how that effects the valuation of the

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<sup>13</sup>  $225 \times 25\% = 56$  sites usable by the carriers.  $56 \text{ sites} \times \$15,000/\text{ea.} = \$840,000$  total savings per year for the carriers.

<sup>14</sup> Verizon Wireless paid \$9.4 billion for a nationwide license of 22 MHz. This 20 MHz of spectrum, using that same valuation, would be worth \$8.5 billion. In 2008, 80 MHz of total spectrum was auctioned for \$19 billion, equivalent to \$4.75 billion for 20 MHz on average.

<sup>15</sup> Based on the Verizon Wireless nationwide spectrum value and Minnesota's 1.72% of the total population. Using the 2008 average of \$4.75 billion for 20 MHz, the Minnesota spectrum value of nearly \$82 million.

spectrum to commercial operations. However, as described above, if congestion is limited to one percent of the network, one percent of the time, then there is likely substantial capacity on the network for commercial operators. The amount of day-to-day traffic on the network depends on how the network will be used in routine scenarios. For example, if video is routinely streamed from police cruisers, as a matter of policy, that could drive the amount of capacity used by public safety and limit the remaining capacity for consumers.

Based on the model presented in the Needs Assessment, Televate estimates that routine demand from public safety will account for less than five percent of the capacity in the urban areas and less than three percent in the rural areas. The remaining capacity of the 20 MHz of spectrum can be made available to consumers, or more than 95 percent of the total network capacity. However, some percentage of that “excess capacity” may exist in areas where the carriers themselves have ample capacity. For example, the carriers are likely to have more limited capacity problems in rural areas, and therefore, because they may have little need for this capacity in the rural areas, this would tend to dilute the value of the capacity.

A side benefit from leveraging the spectrum for commercial use should be a potentially enhanced build. Clearly such a commercial offering would need to offer similar coverage compared to commercial carriers. While the 700 MHz spectrum offers enhanced in-building coverage compared with higher frequencies, many of the carriers have spectrum in this band. Therefore, commercial use of the band could force public safety’s partner to have a build comparable to that of the other commercial carriers.

Finally, in the event that a commercial carrier becomes the partner and leverages its infrastructure for the build, the carrier will bring additional assets to the table. Carrier use of emergency generators varies, however, the carriers will have some generators that can be leveraged. More importantly, the carriers have increasingly more fiber optic backhaul to each of their sites.<sup>16</sup> As seen in the implementation model document, backhaul accounts for more than 20 percent of the capital cost for the statewide network, or more than \$60 million. Leveraging commercial sites and commercial backhaul could substantially reduce this cost.

On the other hand, support for the public safety band (Band Class 14 per the 3GPP) will likely require additional eNodeBs, cables, and antennas. Additional antennas and cables may require carriers to pay for incremental tower space and tower loads. The additional electronics at the site may also trigger more ground space at the existing carrier sites. Band Class 14 is not supported in consumer electronics today, and so manufacturers would have to develop and introduce new chipsets for those devices; this process would delay any value associated with secondary commercial access to the spectrum. Finally, because cellular carriers do not routinely build redundant backhaul from each cell site to their core network, additional capital and operating costs would be required. In other words, that while Televate suspects that existing commercial carriers will be able to leverage the greatest amount of existing assets, there are nonetheless increases in capital and operating costs associated with adding Band Class 14.

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<sup>16</sup> Note that specific information on carrier networks and hardening of specific sites is generally considered proprietary information available only under NDA.

## 4.5 Asset Use Summary

This section has demonstrated that the value of the assets that the State and FirstNet offer vary widely depending on the type of partner. Some of these assets will help to reduce the capital costs for deploying the statewide system, others reduce operating costs, while some reduce both capital and operating costs.

## 5 POTENTIAL SOURCES OF FUNDS

### 5.1 Capital Funding Sources

There are various sources of funds to cover the deployment costs of the Minnesota component of the nationwide broadband network. The following section details those capital funding opportunities.

#### 5.1.1 Federal Funding Options

FirstNet brings with it at least \$2 billion and potentially \$7 billion in capital funding to build the nationwide network. Assuming a distribution by population of those funds, FirstNet would allocate at least \$34 million and potentially up to \$120 million for the State of Minnesota build<sup>17</sup>. Many other Federal homeland security and broadband programs are winding down. For example:

- State Homeland Security Grant Program (SHSGP): 2011 funding was \$526 million nationwide, down to \$294 million in 2012. Interoperable communications qualifies for this grant. However, in most states due to recent reductions in these funds, only existing programs are funded.
- Urban Area Security Initiative (UASI): The Twin Cities metro area is Minnesota's only UASI region. The Twin Cities is a Tier 2 UASI area. Funding was reduced from \$662 to \$490 million between 2011 and 2012. In FY 2011, the 11 high risk Tier 1 cities received \$540 million while, while 20 Tier 2 cities shared \$121 million. In other words, these funds, especially for lower risk cities, are quickly drying up.
- Operation Stonegarden (OPSG): Total FY12 funding is \$46.6 million to enhance cooperation and coordination to secure the United States' borders. Allocations are made competitively and based on risk analysis and feasibility.
- Assistance to Fire Fighters Grants (AFG): In 2009, a total of \$75.9 million in grants for firefighters was awarded to Minnesota entities. The average Federal grant was \$150,000 and the largest grant was \$1.54 million<sup>18</sup> to Minnesota agencies in 2009.

A number of other grant programs have wound down since 9/11 including the Public Safety Interoperable Communication Grant Program (PSIC) and Interoperable Emergency Communication Grant Program (IECGP). Given the current economic conditions in the United States, ongoing reductions

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<sup>17</sup> Minnesota represents 1.72 percent of the total population of the United States. It represents 2.3 percent of the landmass of the United States, and therefore, for a conservative approach, we will use the population based approach.

<sup>18</sup> See <http://www.fema.gov/firegrants/docs/pdf/2009AFGAppStats.pdf> for more information.

or eliminations in grant funding should be expected. In other words, FirstNet represents the lion's share of the funds that would be available to construct the Minnesota portion of the nationwide public safety network. There is no additional funding discussed at a national level behind FirstNet, however, should Congress see that more funding is needed, it is not infeasible that it may allocate additional funds. Given the country's economic state and the passage of the legislation that allocates \$7 billion to public safety, it is clear that the political will for public safety communications is strong and public support for public safety could facilitate additional funding if necessary.

## **5.1.2 State Bond Funding**

The State of Minnesota has historically been successful in securing citizen support for major bonds to provide capital supporting various State initiatives. Among recent State bond funding activities, the ARMER statewide radio project has been supported by \$212 million in bond funding serviced by 911 user fee revenue. The bonds will all have matured in the year 2026. However, the State has little interest in additional 911 bond funding for public safety communications systems at this time if those investments overlap the useful lifespan of ARMER. Therefore, this represents the least desirable option for additional funding. The most feasible state bond financing option is one that supports capital investments in public safety broadband with revenue generated from user fees that are competitive with commercial service offerings. Based on the cost curves in this report, such an option could potentially be cost-neutral based on a certain threshold of user fees and number of users.

## **5.1.3 Local Funding**

Local governments have authority to bond in the State of Minnesota and have fewer barriers to do so. One government has expressed an interest in using local funds to build broadband networks in their areas. However, given the current state of local economics in the State, it would be unwise to assume that a substantial amount of funding would be derived from local governments.

## **5.1.4 Other Partner Funding**

It is feasible that the State could develop partnerships with other entities to help fund the deployment. Utilities are often mentioned as natural partners for public safety due to their common needs for highly reliable communications. Furthermore, utilities have increasing needs for broadband communications and have a mission that is important to emergency response. Therefore, utilities throughout the State could contribute capital and operational funds to further develop the state component of FirstNet. However, the law states that service to consumers can be provided over the public safety network only through lease agreements<sup>19</sup>. Furthermore, the law requires that FirstNet and States "[issue] open, transparent, and competitive requests for proposals to private sector entities for the purposes of building, operating, and maintaining the network." Therefore, FirstNet or a State must integrate an external utility partner through the RFP process. It is feasible that public safety could partner with

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<sup>19</sup> Section 6212 of the law states "In General- The First Responder Network Authority shall not offer, provide, or market commercial telecommunications or information services directly to consumers." And it further elaborates " [n]othing in this section shall be construed to prohibit the First Responder Network Authority and a secondary user from entering into a covered leasing agreement pursuant to section 6208(a)(2)(B)." The same language is used in the law with regard to State opt-out.

utilities in a way that integrates utility assets into the RFP process and also establishes utilities as a special user on the network through “leasing agreements.” Partnerships between utilities and other “private sector entities” is also a way to integrate utilities as partners, however, such a partnership may not be established with the winning private entity, and therefore, is not realized.

## 5.1.5 Capital Funding Summary

The most likely source of funding for the Minnesota portion of a nationwide public safety network is FirstNet. Unfortunately, the cost to build the statewide network for the State Public Model exceeds the expected availability of funding. The shortfall is on the order of \$45 to \$173 million depending on the build level and use of existing OET assets. Clearly the additional grant programs above cannot completely fill the gap in funding. However, these funds could augment the Minnesota build, perhaps in the border region with Canada where rough terrain requires a substantial quantity of sites to provide reliable service. Given the current debt in the State for the ARMER system and seemingly unlikely occurrence of substantial local funding, the build that strictly relies on government capital funding would likely have to be executed in phases. And given the near-term uncertainty of the national economy, follow-on phases to complete the statewide construction may be significantly delayed.

As a result, it may become necessary to leverage private capital funding sources. These could take the form of vendor financing, or via a higher degree of leveraging of commercial carrier assets.

## 5.2 Operational Funding Sources

A number of potential funding sources exist to fund the ongoing operations of the network. A variety of models exist to spread the costs of ongoing operations. Section 2.1 depicts applying monthly user fees to the network. If such a model were applied, participating agencies would consider the public safety user fees against those of commercial carriers. And, because operational costs are largely fixed, the costs would decline as the number of users increases. Alternatively, costs could be shared based on the quantity of cell sites in a given area. With this method, each entity would have incentives to maximize the number of users on the network. Nonetheless, in some way, the State and its partners must develop some method for covering the operational costs for sustainability. The following section details the potential sources, their amounts, and feasibilities of funds to cover such operational costs.

### 5.2.1 Divert Spending from Commercial Services

The State of Minnesota and the local governments within the State could divert current spending on broadband wireless services to the new FirstNet service. The following table provides the spending for the past three years for commercial wireless services.

**Table 6: Total Annual State Commercial Wireless Spending**

	Altell	Verizon	Sprint	Total
<b>2009</b>	\$ 476,910.87	\$ 598,808.56	\$ 10,453,707.20	\$ 11,529,426.63
<b>2010</b>	\$ 317,314.04	\$ 752,823.88	\$ 14,629,597.52	\$ 15,699,735.44
<b>2011</b>	\$ 69,826.88	\$ 1,572,291.65	\$ 11,761,063.10	\$ 13,403,181.63

The table shows that the vast majority of State spending is with Sprint although spending with Verizon has climbed substantially each year. The average annual spending among the carriers is \$13.5 million. Importantly, this spending represents the total spend for wireless services. This includes broadband

data services, cell phone services (voice minutes), text, devices, and other services. It also represents the total spend for the State, including first responder and non-first responder related. At present, it appears that the Middle Class Act would classify all State government employees as representing a “public safety entity”, and therefore, all State employees would be permitted to use the network and to be serviced directly by the State (rather than through a private partner).

However, the implementation model assumed outdoor coverage for areas outside city boundaries<sup>20</sup> that is more conducive towards a broadband modem (e.g., USB modem plugged into a laptop computer). Televate suspects that indoor service would be required for handheld devices that deliver voice and data services. As a result, the network proposed in the implementation model may not have sufficient coverage to deliver voice and data services that are comparable with the commercial carriers. While FirstNet may establish roaming agreements with commercial carriers to deliver this in-building coverage, such roaming could dramatically increase operational costs for users that spend the majority of their time indoors. Therefore, some percentage of State users, and their spending, would need to remain on commercial networks, or alternatively, local units of government would have to make investments in the existing infrastructure to meet their specific needs.

There are additional risks for capturing this spending for the statewide broadband network. It is unclear at this early stage that a State Public Model would have the volume to deliver all of the device form factors required by these commercial users. For example, if Apple Corporation does not build an iPad that supports the public safety broadband frequencies, agencies that use the device would be forced to find alternative solutions. Embedded broadband modems are built directly into notebook/laptop computers and incorporate built-in antennas. If devices do not materialize that fully meet the requirements of this user community, they may opt to remain on commercial networks. However, Televate suspects that the more problematic issue for a tablet computing environment would be in-building coverage. Commercial users may have other requirements that may become challenging for FirstNet and the State to deliver. For example, some users may require international roaming or some very specific capability of a particular device to perform their duties.

The challenge of subscriber device costs could also impact the business model due to device costs. As detailed in Section 2.1, the commercial carriers subsidize subscriber devices. In addition, public safety band devices are expected to cost slightly to significantly more than carrier prices. In non-commercial carrier models, someone must cover these increased costs in some way. It could be that user agencies are required to cover these costs, however, such a policy could hamper diverting funds from carriers. If FirstNet or private partners subsidize device costs, such costs would need to be built into user fees or the equivalent making the service more expensive and potentially impacting migration of users from commercial carriers.

In addition to State spending for commercial services, local and tribal governments may opt to migrate spending from commercial networks to the public safety network. While these local users will have the same requirements issues as stated above, it is anticipated that substantial funding could be migrated to

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<sup>20</sup> The cities of Minneapolis, St. Paul, Rochester, Duluth, and St. Cloud were designed for in-building coverage (20 dB of building loss). The suburban counties (outside the cities) of Hennepin, Ramsey, Washington, Anoka, Isanti, Sherburne, Wright, Carver, Scott, and Dakota were designed to outdoor portable coverage. The remaining counties were designed for mobile levels (external, roof mounted antenna). Commercial networks are likely designed to accommodate more losses than these levels.



FirstNet. Finally, Federal users operating within the state would be likely to migrate to the nationwide broadband network. The Federal employee census in Minnesota is unknown, however.

In order to fully assess the total available operating funds, the State would need to further understand its spending with the commercial carriers. A comprehensive assessment of public safety data and voice and data users should be undertaken together with a similar calculation of non-public safety commercial government users and annual spending across these segments. In addition, the State should work with local and Federal agencies to determine their interest in the project, identify the requirements for various user groups, and identify the current spend where FirstNet could reasonably meet their needs. In other words, the State would need to identify the requirements associated with those funds (e.g., what performance levels, devices, etc.) are required in order to move that funding over to FirstNet.

## **5.2.2 Additional General Funds**

Given the state of economy and taxpayer demand for reducing taxes, there is a general “tightening” of government spending nationwide, including Minnesota. As a result, securing additional State general operating funds to sustain the network is unlikely. In addition, there are other potentially self-sustaining and/or cost-neutral models available for public safety broadband Minnesota.

## **5.2.3 9-1-1 service fees**

The State could increase 911 fees and apply the increase towards operations of the statewide network or its user fees. There are approximately 6.1 million telephone subscribers in Minnesota paying into the 9-1-1 fund. The existing 911 fees are \$0.86 for wireless subscribers, \$0.92 for wireline subscribers, and \$0.80 for packet based wireline subscribers per line per month. Fees range from \$0.25 to \$3.00 throughout the United States and the national average is \$0.72 per line.

Assuming that of the \$15 million per year in network operating costs, roughly 50 percent of those expenses can come from State and local user fees, the incremental fee increase required to close the gap is slightly more than \$0.10 per month per line. This would represent an 11 percent increase in 911 fees. The willingness of Minnesota consumers to pay for such an increase is unknown at this time, however, Televate suspects that any increase in 911 fees would be difficult. We note that the Minnesota 911 fees exceed the national average today, albeit only slightly, and would become more than 20 percent higher than the national average in order to generate an additional \$7.5 million. Furthermore, 911 fees were recently increased to accommodate ARMER bond repayment, and therefore, taxpayer tolerance for further increases is likely low.

## **5.2.4 Operational Funding Summary**

The most viable source for funding the operations of the statewide public safety network is by diverting existing operational funds from the wireless carriers to the new system. State spending is not expected to sufficiently cover all operational expenses as Televate expects that many of the users would not have their requirements fully satisfied on a network built only to outdoor coverage. As a result, a portion of the commercial spending could move to the State Public Model. While local funding can also be diverted to the statewide public safety network, it too would be reduced based on those users whose needs can be met by the statewide network. Altogether, these sources of funding are not expected to completely close the gap for statewide network operations. However, given the capital deficiencies identified above, it is feasible that State and local commercial spending could be diverted and sustain

network operations if the build areas occurred where the commercial spending was dense (likely in the metro areas throughout the state). This too could impact subscribership if roaming was not available or if roaming costs on commercial networks were too high. Finally, 911 and other general fund operations sources are also not viable sources of revenue given the expected shortfalls.

## 6 SUMMARY

This document outlined the potential funding requirements for a statewide public safety broadband deployment. Such a deployment should occur using the FirstNet spectrum, funding, and nationwide leverage. Deployment of a State of Minnesota public safety broadband network would come at a substantially increased cost due to the cost of the spectrum and lack of any funding for other models. This document shows that the available capital and operational funding from FirstNet and other likely operational funds is unlikely to cover the full costs associated with a “public safety only” State Public Model. While we cannot predict the impact of the buying power of FirstNet in comparison with the implementation model developed by Televate, we do not expect the difference to allow for full coverage of capital build and operational expenses. A sustainable, statewide deployment requires private partners that will otherwise benefit from a statewide public safety grade network.

Furthermore, this document outlines some deficiencies in the State Public Model’s ability to meet the State and local requirements for coverage, devices, and other needs currently met by commercial carriers with a State Public Model. Rather than a model with a potential user base in the millions, the State Public Model would have a viable subscriber base in the hundreds of thousands. And therefore, the State would not leverage the full buying power of consumers. Furthermore, this document outlined other benefits of increased commercial coverage in the State for currently unserved areas. As a result, the benefits of partnerships with entities providing commercial service to consumers becomes even more significant.

The synergies with private partners seems the greatest with a new market entrant in the State. In those cases, the State’s assets become the most useful and can potentially contribute to lower overall costs. However, the incremental capital and operating costs are likely the lowest with an existing commercial wireless service provider. In that case, existing cell sites, backhaul, and operating staff should be highly leveraged. But the reality is that the commercial carriers are unlikely to cover Minnesota to the levels required by the State on their own. It is unclear if the opportunity with FirstNet will provide the incentive to do so.

However, a key requirement for the nationwide public safety network is public safety priority. As indicated in the Commercial Carrier report, the carriers were reluctant to provide such priority over their networks and instead preferred purpose built public safety networks. Such a separate network would be unable to spread operating costs between public safety and consumers that may be required to close the gap on a fully sustainable business model. Furthermore, a separate network would also not deliver the economies of scale necessary to provide the device availability and pricing that public safety seeks on the network.

Clearly understanding the business objectives and deal parameters from potential private partners then becomes a critical component for the public safety broadband network. Solving this “problem” will fall squarely on the shoulders of FirstNet for the entire country, and including the State of Minnesota. However, it is important for the State to understand the business issues that FirstNet will face and help FirstNet to ease the burden of a State of Minnesota deployment.

## 7 RECOMMENDED NEXT STEPS

The Middle Class Tax Relief Act calls for a grant program for States to “identify, plan, and implement the most efficient and effective way for jurisdictions to utilize and integrate the infrastructure, equipment, and other architecture associated with the nationwide public safety broadband network to satisfy the wireless communication and data services needs of that jurisdiction, including with regards to coverage, siting, and other needs.” Televate believes that Phase I of its contract with the State, of which this document is the final deliverable, largely satisfies most of the intent of the grant program. However, this document also outlines additional efforts that can be made by the State to enhance the probability of success for FirstNet. This section identifies Televate’s recommended next steps for the State.

### 7.1 Further Assess Regional and Local Requirements

In Phase I of this project, Televate collected user needs for broadband. However, given the results of the funding model analysis, it is clear that a viable and sustainable statewide broadband deployment is a challenge. Therefore, the State may benefit from additional exploration of user requirements to determine the nuances of those requirements and their impacts on a viable business model. For example:

- A statewide deployment covering 95 percent of every county is extremely expensive. What are the impacts of a deployment that seeks to cover 95 percent of the State and potentially with speeds that are less than those specified by the FCC waiver orders (768 kbps downlink and 256 kbps uplink)?
- The State contains 11 tribal governments. These tribal governments largely did not participate in the needs assessments. The Minnesota Indian Affairs Council should be engaged to help reach out to the tribal governments to better understand their needs, their resources, and willingness to participate.
- The implementation model assumed outdoor coverage for most of the State and the in-building coverage levels in the cities may not be sufficient. The needs assessment collected high-level requirements for in-building coverage. A greater understanding of the users’ needs regarding coverage, including specific identification of in-building coverage areas will help to understand the expectations of the users. Rather than specify blanket statewide in-building needs, the State could fine-tune coverage requirements to specific areas. Such an assessment could factor in the types of devices needed for each scenario and to fully understand all of the requirements for diversion of funds from existing commercial wireless services.

### 7.2 Assess Resources More In-Depth

This funding assessment predominately reviewed the State resources available for inclusion in the statewide network. This document sheds light on other areas that would help to solidify the potential business models for the Minnesota portion of FirstNet:

- Determine the full breakdown of State spending on commercial services, by device type, agency and other factors that would assist in determining the feasibility of funding diversion.

- Determine the availability of local assets, especially in the build-out to 95 percent per county. Additionally, identify local assets that can help deliver in-building coverage needs as identified by local agencies in 7.1 above.
- Determine the potential operational funding sources of regional, local, and tribal agencies that can feasibly be diverted to FirstNet. In addition, identify the functional and performance requirements associated with those users.

### 7.3 More Detailed Financial Modeling

After many of the above assessments are made, the State can engage in additional financial modeling to better understand the sensitivities of the business case against the variables. For example, if recent rulemaking efforts by the FCC to force all carriers building devices in the 700 MHz band is enacted, it would tend to reduce the costs of devices available to the state. As discussed herein, devices without these commercial volumes are expected to be more expensive. Therefore, the types of devices and their cost premiums should be considered in full financial modeling. Additionally, the State could investigate partial build or phased build models and integrate other expected sources of funding.

### 7.4 Meet With Potential Private Partners

While Televate suspects that FirstNet will meet with major nationwide private partners and will primarily lead all discussions with major commercial partners, Televate suspects that FirstNet would appreciate some State due diligence on local partners. This includes identifying methods to make it conducive for valuable local partners to participate in the FirstNet RFP. Furthermore, while FirstNet will eventually meet with the major nationwide partners, it won't do so for some time. In addition, if the State develops a better understanding of the concerns of various private partners, the State can provide input to FirstNet on how these concerns impact the State. As a result, such interactions will help FirstNet understand the parameters in which it can develop viable business models for the State. And importantly, due to the State's lead in these activities, Minnesota can become a test bed for vetting various models for FirstNet.

### 7.5 Begin Preparing For FirstNet

Finally, Televate believes that the State should begin now to prepare for all phases of FirstNet. Initially, the State will need to articulate its requirements to FirstNet. Phase I of this project delivers an initial set of requirements. But those requirements can be improved as discussed above and prepared as a deliverable to FirstNet – perhaps providing it with a blueprint for future state involvement. Next, the State can create an environment of continuous information flow with local entities to continually refine and articulate the State's broadband assets available to FirstNet. The State should likewise become a more active participant in national efforts to advance public safety broadband standards by participating in the National Institute of Standards and Technology (NIST) - Public Safety Communications Research (PSCR), in the National Public Safety Telecommunications Council broadband requirements efforts, and in other national broadband activities. Likewise, based on the depth of knowledge that the State has amassed through this initiative, WE encourage the State to be more active in sharing their broadband insights across the country.

Finally, the State can begin a full assessment of its infrastructure. In the implementation model, a variety of high-level assumptions were made regarding the feasibility and costs associated with sites. At this point, it is unclear if those assumptions are conservative or aggressive. A more detailed analysis of

the State and local sites can provide additional information to prospective bidders to the FirstNet RFP and enhance vendor proposals.