EXECUTIVE ORDER: ACCELERATING BROADBAND INFRASTRUCTURE DEPLOYMENT

United States Department of Transportation, Federal Highway Administration,
Office of Policy and Governmental Affairs
Successful Practices of Broadband Deployment in Highway Rights of Way:
Summary Paper
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ABSTRACT

On June 14, 2012, President Barak Obama signed an Executive Order to facilitate the deployment of broadband on Federal lands, buildings, rights of way, federally-assisted highways and tribal lands. This Executive Order has created an interagency working group composed of representatives from various federal agencies, including the USDOT, involved in decisions related to access to Federal property and highway rights of way (ROW). The goal is to reduce barriers to the expansion of broadband services in underserved communities.

As a part of this process, the USDOT-Federal Highway Administration has been requested by the interagency working group to help identify successful practices that may assist State DOTs and local agencies implement policies that facilitate broadband deployment. The USDOT-FHWA has been charged with developing a summary on Federal-aid highway program regulations and policies pertaining to broadband deployment in highway ROW (completed in December of 2012) and a summary on successful practices that includes input from stakeholders (this paper).

In February 2013, after phone contact with several individuals from State DOTs, cities and local agencies involved in broadband deployment, a workshop was held by the FHWA Office of Policy, which included presentations and discussion on successful approaches for deploying broadband. Nearly 40 people attended the workshop, either in person or via Adobe Connect software, from local, state and federal agencies, including the Executive Office of the President, Office of Science and Technology Policy.

This paper presents an overview of successful practices presented in the workshop, follow-up discussions and additional information from a survey to State DOTs by the Wisconsin Extension Service. As part of FHWA's commitment to the Executive Order, it is the agency's effort to reach out to stakeholders and present successful practices of broadband deployment in highway ROW, with a focus on the installation of underground fiber optic facilities and related efforts to minimize excavation of the roadway.

EXECUTIVE SUMMARY

In the discussion of best practices for deploying broadband, there is not one single, best approach that works in all areas of the country. From place to place and network to network, miles of broadband have been deployed through various means to provide the Nation with greater bandwidth capabilities. A broadband connection has shown to be an essential part of developing a region's local economy, enhancing the transportation system and creating a safer and more secure environment for the Nation's citizens. Connecting all areas of the country to reliable services provides opportunities to the general public in education and training and a way to connect with others globally. A good connection can also enhance everyday efficiencies and improve overall quality of life by one's ability to access timely and pertinent information.

In most cases, however, drawing telecoms to underserved areas is difficult because of the lack of a market for services and resources needed to build infrastructure that supports broadband. States and local areas that have been successful in bringing broadband to these areas have engaged in substantial partnering, and have set aside funding for broadband or have received funds from federal grants. Areas with less coverage may have difficulty coming up with the funding and/or personnel needed to deploy the infrastructure and maintain the facilities.

Although there are markedly different approaches to deployment, there is some agreement from stakeholders on the following topics that have been touched upon in the case studies.

Serving Underserved Areas

Due to the lack of a market in underserved and rural areas, state incentives help to encourage the deployment of broadband. The following are examples of state incentives:

1) the installation of empty conduit by the State along major routes,

2) the ability of telecoms to freely access[1] highway ROW to allow for build-outs, and

3) the use of the highway ROW at low or no-cost to non-profit entities.[2]

[1] The ability to request access for new installations is open all the time instead of just during advertised periods.

[2] It should be noted the 23 CFR 710.403(d) states" acquiring agencies shall charge current fair market value or rent for the use of real property interest, including access control, if those real property interest were obtain with the title 23 United States Code (U.S.C.) funding". Under certain circumstances, the FHWA may approve an exception to this requirement when the State shows that the use by public or private utility is in the overall public interest for social, environmental, or economic purposes, nonproprietary governmental use or uses under 23 U.S.C. 142(f), Public Transportation.

Rural communities may also benefit from assistance in understanding how to attract telecoms. Certain states have been innovative in the use of online tools to provide information to the general public on details concerning specific routes, fiber and conduit locations, construction specifications, plans for economic development and contact information.

Terrain issues in rural areas also play a role in how broadband is deployed. In places where excavation would be difficult, such as mountainous regions, or environmentally-sensitive areas, wireless installations may be preferred. Urban areas, in contrast, often have limited space and capacities for broadband infrastructure, which makes excavations more costly due to the need to dig up the road bed to install conduit. Frequent construction also adds to traffic disruption.

Although rural and urban area deployment issues differ, there is some agreement that rural fiber architectures should connect major cities and/or hubs of activities and national interconnection points. This would help to increase the value of the network by attracting customers. City areas may also provide "rings," or existing networks where further development can be linked, creating the redundancy needed to provide more reliable services.

Broadband Deployment Approaches Identified in Wireline Installations

When involving below-ground, wireline installations in the highway ROW, three main approaches by states and local areas have been identified as the following:

1) Publicly-owned and operated network

- The conduit is installed, owned and maintained by the state, and in some cases, fiber optic lines are state-owned and operated.

2) Privately-owned and operated network

- The conduit is installed, owned and maintained by a private entity, and fiber optic lines are also privately-owned and operated with minimal involvement by the public entity. In certain cases, as part of the agreement for using public ROW, the private entity may install extra conduit for the public entity to have for its own use.

3) Network via public-private partnership

- Through a cooperative agreement between public and private entities to expand the network, stretches of conduit are installed, owned and maintained by either the state or

the private company providing the service. Fiber optic lines are most often privately-owned and operated and resource sharing is often involved.

In most cases, these approaches have been shown to work successfully in the areas where they have been implemented. Wireless installations were not discussed at length in this workshop due to the USDOT's focus on projects that involve significant excavation of the highway ROW.

Resource Sharing

Resource sharing, sometimes referred to as bartering or trading, is a type of agreement that State DOTs make with service providers for the exchange of the use of ROW or existing infrastructure, such as conduit, for the use of fiber optic services. These services often provide State DOTs with connections to ITS infrastructure, such as operations facilities, cameras and message signs along the roadway, and have proved successful in many areas of the country for expanding ITS networks into rural areas.

States that have not entered into resource sharing agreements have identified barriers in state statutes that do not allow for barter arrangements and state utility accommodation policies that discourage the longitudinal installation of utilities in controlled-access highway ROW.

Reducing Deployment Time

A coordinated and consistent sharing of information on policies and practices between public and private entities is essential to developing good working relationships with service providers and helps to facilitate the deployment process. In addition, the availability of online mapping tools that provide detailed information to the general public on state routes and conduit locations, and the ability of agencies to process contracts and payments electronically help to bring efficiencies to the deployment process.

Dig Once

The USDOT has been charged with looking at *Dig Once* initiatives per the Order. *Dig Once*, as defined by the Order, is requirements to reduce the number and scale of repeated excavations for the installation and maintenance of broadband facilities in ROW. Although the USDOT-FHWA does not have a *dig once* policy for federally-aided highway projects, it has policies and procedures that support installation practices that minimize excavation. The agency also

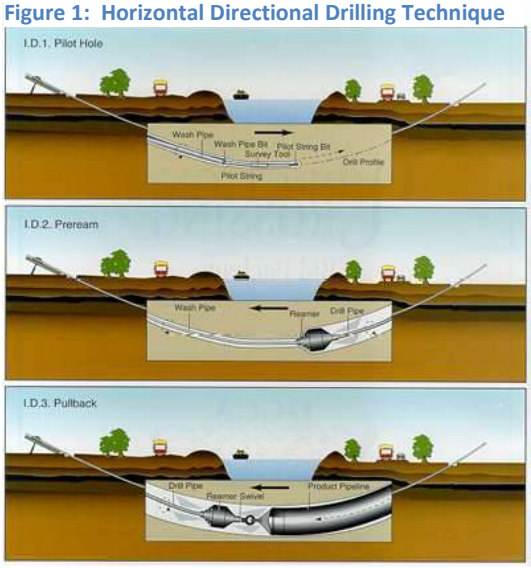
strongly encourages states to work collaboratively with service providers on joint highway and utility planning and development. In addition, the FHWA promotes innovative practices and technologies that align with the *dig once* concept, such as Subsurface Utility Engineering (SUE)[3], which uses 3D modeling to collect subsurface information on utilities, which can be integrated into the planning and implementation of highway projects.

Very few states have implemented statewide *Dig Once* policies. More examples can be found at the local level, but they vary. Some areas have developed policies that require a coordinated effort among public and private entities for installing infrastructure when there are plans for opening up the street. Others have a moratorium on how often a street can be excavated for the purpose of installing utility infrastructure, while still others have little problem with multiple excavations as long as they feel they can benefit from it, such as having the street repaired.

In addition, federal, state and local infrastructures are subject to different laws regulating build-out plans, which add complexity to implementing *Dig Once* policies that span jurisdictions.

New and innovative technologies and construction practices have been shown to minimize the impact of excavation to a surrounding area. *Small cells* are small devices that can be attached to pole structures and/or buildings that can increase network capacity via wireless signal, no digging required. *Micro-trenching* involves digging a small trench just inches under the road surface along the curb line to install fiber optic lines. *Horizontal directional drilling* is a trenchless method of installing underground pipes, conduits and cables along a prescribed bore path by using a surface-launched drilling rig, with minimal impact on the surrounding area. These are known techniques that are used by some construction agencies, though they may require a change in construction staging/techniques in order to accommodate the technology.

Figure 1: Horizontal Directional Drilling Technique



Dig Once and joint-use of trenches have been practices recognized by state and local stakeholders as sensible solutions to expedite the deployment of fiber along main routes when implemented as part of a cooperative planning process. Initiatives that are favored support approaches that encourage cooperation, but do not prevent excavation when needed.

[3] http://www.fhwa.dot.gov/programadmin/sueindex.cfm

INTRODUCTION

On February 14, 2013, the USDOT-FHWA, Office of Policy held a workshop that included presentations and discussions from stakeholders on facilitating broadband deployment in the highway ROW. Five cases were selected based on their unique approaches to successfully deploying broadband in both urban and rural areas of the country.

These cases were discussed in the context of three approaches identified for implementing broadband: a publicly-owned and operated network, a privately-owned and operated network and a network developed and operated through public/private partnerships. The cases are as follows:

1. City of Santa Monica: Publicly-owned and operated network
2. Utah DOT: Network via public-private partnership
3. City of Boston: Privately-owned and operated network
4. Maryland DOT: Network via public-private partnership
5. Virginia Tech, eCorridors: Network via public-private partnerships (as proposed for the Tobacco Region of the state)

Prior to the workshop, speakers were also asked to provide feedback on the following issues: reducing time to deploy broadband, determining fair market value of ROW, working with the private entities, providing incentives for telecoms to serve underserved areas, construction recommendations, and local/state and federal policy recommendations. A summary of notes from the workshop follow.

Santa Monica City Net

Background: *In 1998, the City of Santa Monica, CA developed a master plan to link public buildings to a fiber optic network with a goal to increase Internet access and bandwidths speeds for city operations, its K-12 school district, and community college. Over the next several years, the City engaged in a comprehensive planning process, which included renegotiating franchising agreements with the local cable provider and establishing new leasing arrangements with them for an institutional network (INET) infrastructure. After realizing significant telecom cost reductions, the City reinvested their cost savings to build their own fiber network, "City Net," in the downtown area. In 2006, City Net began leasing dark fiber to tech and entertainment businesses. In 2010, the City launched a 10 Gigabit network and partnered with ISPs to provide 10 Gigabit broadband to the community.*

Case #1: Santa Monica City Net

Speaker: Gary Carter, Broadband Program Administrator for the City of Santa Monica

A new business model is needed for increasing the nation's bandwidth capabilities. Traditional operating and financial models are structured after old power and telephone monopolies, to service limited territories. Also, given the lack of competition in deploying infrastructure to the last mile, it is common for a monopoly or duopoly to govern access to those areas. Increasing the nation's access to the Internet and broadband capabilities requires a global outlook, and many Telecom firms are reluctant to offer competitive services on a global scale.

The City of Santa Monica owns and operates its fiber network. With a goal to reduce operation costs, the city reinvests the monies from cost savings into building new fiber networks in commercially-zoned areas and areas where there is a need to connect Intelligent Transportation Systems (ITS) operations. In 2006, dark fiber was leased to local businesses and free Wi-Fi offered to residents. In 2010, 10 Gigabit broadband services were offered at a sixty-seven percent reduction in rates. The minimum broadband speed offered is 100MBPS, a tenfold increase over the previous standard of 10MBPS. As rates for services have been reduced and greater speeds offered, an opportunity has opened up for a competitive market to develop. This approach has worked successfully for the city and serves as a model for other U.S. cities on how to foster competitive broadband speeds and rates.

From the view point of *City Net*, a city-owned network is easier to manage the processes of splicing, maintenance and documentation. Also for security reasons, it is easier to limit access to sensitive infrastructure, such as vaults, etc.

Based on their approach, which is applied best in areas where there is significant market demand for services, City Net has

offered the following recommendations:

Increasing competition:

- Limit the number of strands or cap maximum percentage of strands per provider
- Allocate a number of strands to municipal last mile networks
- Offer incentives for cities to build networks for government operations and initiatives
- Place a moratorium on construction permits along ROW, limit them to times of roadway maintenance
- Consider pricing techniques to stimulate demand
- Consider that start-up companies need to have fiber installed within 3 months of operation; this may conflict with construction timelines

Reducing time to deploy broadband:

- Everything should be done electronically; contracts, signatures, payment systems, etc.
- Dual processing: one for initial account establishment (45-90 days), second for additional circuits (7-30 days)
- Establish an approved vendor list for network support, maintenance and documentation of network assets

Determining Fair Market Value: There are a number of factors to consider when determining fair market value or rent for broadband services, including:

- Cost-based: useful life of fiber cable, conduit, operating costs for maintenance, documentation, software purchase, upgrades, contract processing
- Circuit-based: direct route vs. indirect route
- Objective-based: reduce costs to fiber routes terminating in underserved areas
- Market-based: existing market will adjust based on competition

Working with the private sector:

- Allow for white labeling of assets; brand awareness
- No resale policy; it promotes optimal use of the infrastructure
- Do not allow a company to buy all the assets and then squat
- Encourage redundancy
- Establish tie cables for coordination of future connections
- Connect network to major cables; i.e. Pacific and Atlantic fiber cables

Construction recommendations:

- Maximize size of fiber cable to accommodate conduit size, (864 fiber count optional, 288 fiber count minimum)
- Install Schedule 80 (not schedule 40) 4" inch size conduits, at least four conduits per route
- Vault size at least 5 feet by 10" installed 1000' apart on straight runs and 600' if any 90 degree spans are in the path
- Locking lids on vaults to control access; satellite unlocking (optional)
- Install pull tape (may also be referred to as mule tape)
- Plan fiber installations on roadways in proximity to regional data centers

Recommendations for State and Federal agencies:

- Encourage coordination among all agencies
- Designate one agency or vendor to manage national fiber cable operations
- Coordinate timelines for fiber installs with transportation project schedules
- Share a single documentation software
- Consider security/cyber risks
- Hold firms accountable for their use of City infrastructure

Utah DOT

Background: *The Utah DOT (UDOT) has been successful in facilitating the expansion of broadband infrastructure in remote areas of the State. For the past five years, UDOT has facilitated cooperative fiber and conduit trades with broadband service providers to expand its communications network across the state without major capital investment. UDOT's approach to deploying broadband has also advanced ITS initiatives in the state, as well as promoted economic growth by enabling access to broadband in both urban and rural areas.*

Case #2: Utah Department of Transportation

Speakers: Carlos Braceras, Deputy Director, Utah DOT with Lynne Yocom, UDOT Fiber Optics Manager

Utah's goal for the state, relative to ITS, is to connect every traffic signal, as well as equip all roadways with communications infrastructure that can provide information on roadway and weather conditions. The expansion of broadband into rural areas of the state is an initiative strongly supported by Utah's Governor, Gary Herbert.

UDOT is not a provider of telecommunication services, but a facilitator of the telecoms and other state agencies involved in broadband deployment. UDOT meets with the telecoms every 2 months about broadband projects. The state has a single point of contact for all telecoms in the state. Utah also has established a Broadband Advisory Council that coordinates with telecoms yearly to discuss issues relating to promoting broadband and barriers to deployment.

UDOT has very good working relationships with the telecoms and related agencies in the state. This is partly due to the information sharing among all the entities on a regular basis. Yearly, telecoms are able to submit a "wish list" to the Telecommunication Advisory Council, which is overlaid with road projects in an effort to align excavation/implementation activities. Telecoms are also made aware of the availability of facilities in the ROW. UDOT also helps telecoms with their inquiries on ROW acquisition and permitting by directing them to the proper entities.

Information is provided to the telecoms through a variety of interactive online tools. ESRI maps highlight state routes and roads owned by UDOT. Specific details, including fiber and conduit locations, plans for economic development, contact information and weblinks are also available online to provide the telecom with information about the area they are servicing.

Based on their approach, UDOT has offered the following recommendations on deploying broadband:

Make Access to ROW Easier: It may take up to five years to complete the permitting processes of various state and federal agencies (i.e. Forest Service, BLM, School Land Trust, State Parks, and National Parks) whereas telecoms need connectivity quickly when they have a customer. Utah has a policy that the ROW is open at all times, allowing for easy access to complete continuous build-outs, and ensuring that no single company has exclusive access.

Serving Underserved Areas: UDOT installs empty conduit during highway construction. They found that if the state installs small sections of conduit, telecoms have cooperated in helping to extend the infrastructure and provide services to rural communities. By using this approach, the state has been able to provide most of their regions with a connection. In addition, UDOT has been able to leverage their infrastructure by trading it for fiber that has been used to connect state-operated facilities such ITS, cameras, weather stations, etc.; trading assets with the telecoms has resulted in significant payback for the state. UDOT also helps communities understand how to attract telecoms by working with them to learn how to install their own conduit, providing construction standards and contact information.

UDOT Trade and Sharing of Conduit and Fiber Optics: UDOT trades existing or planned conduit and fiber on a foot by foot basis, and trades fiber optic on a foot by foot strand basis. Trade agreements are for 30 years with automatic 5-year renewals. Telecoms are responsible for maintenance of all fiber lines and conduit.

ROW Valuing: The fair market value or rent of highway ROW is calculated per mile. The land is surveyed and an average is taken from an upper bound and lower bound estimate; a discount rate is also applied to 30-year leases.

Policy on Monetary Damages: If a construction company hits a fiber optic line, monetary damages imposed by the telecom should be reasonable. According to Yocom, "you want the fiber to be respected, but not to the point that it prohibits the desire to install it."

UDOT has a much better traffic system today because of the states' success in working with the telecoms. Transportation highways in Utah equate to digital highways. At any point in time, anyone can know what traffic is like because of the connections that exist along the highways (e.g. mobile app: http://udottraffic.utah.gov/mobile.aspx). These connections have also opened the doors for economic development in the state. From this state's point of view, the best approach for expanding and improving services is to, "Be cooperative."

Boston, City Planning

Background: *In an effort to minimize excavations on the busy streets of Boston, the City adopted a policy in 1994 that mandated all telecoms to install their underground conduits "in the same trench, at the same time on a shared-cost basis." The "joint build" policy that was created put the local telecoms in a leading role for planning and providing telecommunication services for the City. Under this policy, a "lead company" is established. The lead company is any company (telecom provider, or not) that approaches the City first for a build-out request and takes the lead in coordinating the construction. The lead company and participating telecoms work together to draft the engineering plans, estimate construction costs and submit the built-out application to the City's Public Improvement Commission, the body that reviews and approves the application.*

Case #3: City of Boston

Speaker: Chong Liu, Senior Legal Analyst for Telecom and Regulatory and Policy

Boston's Joint Build approach for deploying broadband, has worked very well in Boston to minimize street excavation. It has also sped up the deployment process because all companies are required to work together to install their infrastructure at the same time. In addition, construction costs, including digging the trench, installing the conduit and repaving, are shared by all companies participating in the build-out.

One of the requirements under the Joint Build Policy is for the lead company and participants to install, at their own expense, extra conduit alongside the private conduit network. This conduit is referred to the "city shadow," and becomes the property of the City to be used for city purposes. The City might even rent this conduit to private telecoms if conduit space is needed.

The City views the public right of way as a public asset, to be shared equally by all utilities. Often having a company come in to install conduit and do all the repaving work saves the City a lot of money in street repairs.

Maintenance of the conduit is taken care of by lead company; however, the City pays for maintenance and repair of the shadow conduit.

In recent years, innovative and cost effective construction practices for installing conduit have evolved, such as micro-trenching that reduces the amount of excavation needed to install the fiber optic lines. Micro-trenching involves digging a small trench just inches under the road surface along the curb line to install fiber optic lines. Micro-trenching has become a common practice in Boston.

Boston is unique in its authority to manage its streets by the power it can exercise through its City ordinances. The City is also not bound to the state procurement laws and works with the telecoms through license agreements. Because of this Boston, may have less regulatory hurdles to work through than other cities in the country.

Speed in project delivery is of most concern the private industry. A consistent sharing of information on policies and practices between public and private entities is important to building successful relationships.

Maryland DOT-MSHA

Background: *The MSHA has been actively involved in the deployment of broadband since the mid 1980s, when the Coordinated Highways Action Response Team (CHART) was created to improve "real time" information on local travel and weather conditions on Maryland's highway network. In 1994, MSHA piloted its first resource sharing agreement to facilitate ITS initiatives in the state, which included a statewide operations facility and the addition of cameras and message signs along the roadways. Following the Telecommunications Act of1996, the State of Maryland began revising its laws and policies to accommodate broadband. In 1996, Maryland amended its code of regulations to allow for resource sharing, and in 1998, the MSHA revised its utility accommodation policy to allow for longitudinal installation on controlled-access, highway ROW.*

In 2007, Maryland introduced rural broadband legislation. Within the same year the MSHA entered into an agreement with the Maryland Broadband Cooperative (MDBC), a private entity made up of 73 members from local businesses and agencies, to install rural broadband fiber. In 2010, a $115 million Broadband Technology Opportunities Program (BTOP) grant was awarded to Maryland's Department of Information and Technology, which has been used to expand build-out initiatives in rural areas of Maryland. In place today, a broadband network stretches across the state of Maryland, including 1,100 miles of fiber and 140 towers that are shared with the police, emergency management and the Department of Natural Resources.

Case #4: Maryland State Highway Administration (MSHA), of the Maryland Department of Transportation (MDOT)

Speaker: Nelson Smith, Statewide Utility Engineer for MSHA

Maryland has a well-developed resource sharing program, including a separate account created within the state's Transportation Trust Fund to specifically advance IT-related projects. Since 1994, the state has executed 23 agreements with private companies such as Verizon Wireless, Nextel, Cingular, ATT, Level-3 and Fibergate. Agreements are based on sharing highway rights of way for monetary or in-kind compensation. In-kind compensation may include communications or IT equipment provided to MSHA, or exclusive allocation of fiber optic cables to MSHA. In most cases, the private entity installs and maintains the conduit. Through resource sharing, the state has been able to achieve interoperability and reduce capital costs for communications infrastructure.

In an effort to facilitate economic development in rural areas, Maryland established a rural broadband assistance fund and a rural broadband coordination board. In addition, laws concerning highways under construction and maintenance make the use of highway right of way for telecommunication services available to non-profit entities without charge (until 2020).

A number of state and local agencies have been involved in the development of build-out plans to facilitate broadband throughout the state. The MDBC (as described above) has installed 306 miles of its own fiber as well as partnered with its members, including the MSHA, to install additional

817 miles of fiber to further the build out. Much of the build-out was supported by a $115 million BTOP grant. Additional support comes from the Intercounty Broadband Network (ICBN), which manages and administers program monies for fiber optic construction.

Part of the state's build-out plans in rural areas is to connect these services to cities or major hubs of activity. City areas may also provide rings (or existing networks where further development can be linked) for redundancy to increase service reliability. Most fiber plans will follow transportation infrastructure, so determining major interstate routes for connectivity is an initial step towards getting the backbone fiber optic infrastructure in place. Coordinating routes with state and local DOT construction plans is essential, as well as with local economic development groups to determine locations where telecoms may want to expand their services.

The MSHA encourages other states to utilize resource sharing as a way to facilitate broadband deployment as well as investigate further use of the BTOP program when seeking funding.

Additional recommendations by the MSHA include the following:

Minimizing excavation of the roadway:

- Coordinate routes with state and local DOTs
- Encourage the use of trenchless technologies (e.g. Maryland uses horizontal directional drilling methods for most construction projects).
- Limit the number of access points
- Install conduit for future use

With respect to the last point, if the conduit is installed and owned by a private entity, action should be taken to ensure that leasing rates remain competitive. One possible solution may be to request that the private entity install additional conduit to be owned by the city/state (as in the Boston approach), so that the public entity may rent out the conduit at competitive rates.

Reducing time to deploy broadband:

- Coordinate with state and local DOT utility coordinators; permit process and construction details should be spelled-out
- Identify environmentally-sensitive areas early
- Explore the use of existing fiber/conduit for backbone

ROW valuing:

- Maryland did an independent study and found that basically, the fair market value or rent of ROW was not easy to quantify; generally fiber exchanged for use of fiber has worked best for the state

Incentives for providing services to underserved areas:

- Evaluate a business model (s) to determine incentives; an initial question that might be asked is, "who are you trying to attract?"
- Install fiber/conduit (by State)

Working with private entities:

- Clearly define responsibilities
- Communicate, coordinate, cooperate

e-Corridors, Virginia Tech

Background: *eCorridors is an outreach initiative of Virginia Tech with a mission to facilitate and promote the ability for every person, organization, and community in Virginia and beyond "to have the capability, at a reasonable cost, to produce and access high volume information and services in the networked world." Access to advanced communications and network infrastructure is also recognized by the center as critical for ensuring economic competitiveness in today's global economy. It is led by a Virginia Tech faculty member and has a staff of four full time employees.*

Case #5: e-Corridors of Virginia Tech

Speaker: Brenda Van Gelder, Director

e-Corridors is located in Virginia Tech, in the town of Blacksburg. It is the first town in the country acclaimed with making the Internet accessible for its citizens and is also the first town in the country known for making an e-commerce transaction. Virginia Tech has a legacy in the Internet world with being one of the first universities in the country to provide Internet and broadband. The purpose of the e-Corridors initiative is to provide information and outreach to communities, as well as work with the private sector to coordinate efforts for installing broadband infrastructure. This initiative also has a focus on serving disadvantaged populations.

In 2002, a study was conducted by e-Corridors to develop an advanced, fiber network build-out plan and architecture for Virginia's Tobacco region (54 southern counties).[4] The build-out plan was developed into a Request for Proposals (RFP) by the Tobacco Commission, and the project was awarded to the Mid-Atlantic Broadband Cooperative to implement the design in the region's south side counties. Obstacles to deploying broadband in rural areas as well as recommendations drawn from the study are noted in the following.

Deployment Obstacles in Rural Areas:

- It is difficult for the telecom to justify business for the deployment of advanced communications when there isn't a market for it.
- Many telecoms are reluctant to provide services to potential competitors in the areas of network content design and commerce.
- Telecoms will continue to focus on top 30 metro areas.

[4] Study is comprised of eleven volumes and is available on the e-Corridors website, Strategic Technology Infrastructure for Regional Competiveness in the Network Economy, http://www.ecorridors.vt.edu

Additional obstacles included the exceedingly high cost of providing high bandwidth connections (which were not available in the Tobacco regions at any price) that could be deployed in a timeframe that would provide the regions with a competitive advantage. As Virginia is also a "Dillon rule" state (local governments have limited powers under the state); local areas are not allowed to build their own broadband infrastructure unless they have an electric service utility. Restrictive laws can be an obstacle for deploying broadband and/or providing dark fiber for lease in other areas of the country.

In an effort to overcome obstacles, public sector goals should be to encourage economic development initiatives for the region and create partnerships between counties and cities to increase the value of the network. They should also work towards "demystifying," the technology for the general public. Helping to establishing anchor tenants is also important, who may include the following: municipal governments, higher education and research institutions, hospitals, corrections facilities, and existing businesses. Private sector goals should be to take the lead in increasing services and bandwidth, developing new and creative uses for broadband, and work with developers to attract large, bandwidth-intensive businesses.

Further recommendations from the case study by e-Corridors, included the following:

- Have a business model
- Re-invest funds to maintain long-term value of the infrastructure
- Do not bypass any community (e.g. in order to attract top-notch faculty and students in university towns, connection to the home is just as important as connection to the institution)
- Connect to strategic national interconnection points
- Utilize grant funds for last-mile demonstration projects
- Address ways in which private sector providers can utilize utility poles, county and state-owned towers and other structures for antennas (e.g. Virginia Tech has a Vertical Asset Inventory Tool that localities can use to identify and access information on structures/towers)
- Allow State facilities to acquire services and infrastructure without being subject to state procurement requirements
- Create incentives for investment in broadband infrastructure (such as tax credits and/or long-term, low-rate municipal bond financing)
- Institute a small "participation fee, " to ensure long-term political support and community buy in
- Allow low- or no-cost access to rights of way for companies providing high bandwidth services to communities

Recommendations from private entities:

- Update guidelines for telecom wiring of new or renovated buildings (CAT5/6 wired directly to central circuit)
- Ensure that grounding codes are up to date
- Review and update permitting policies to facilitate broadband delivery
- Consider utility zoning for telecom equipment, hut, co-location sites (very few VA localities have setup utility zoning)
- Create a local “dig-once” policy and improve local collaboration with service providers

Virginia Tech is a member of GigU and will soon join U.S. Ignite, which focus on increasing broadband capabilities nationwide and attracting private sector telecoms to small communities.

Workshop Discussion Summary:

In the time remaining, a brief discussion took place about topics related to the presentations.

A question was asked by the USDA about outreach efforts to rural utility districts, and their abilities to meet capacity needs through the availability of dark fiber. Both Santa Monica and Utah presenters responded that they have done outreach to these entities. Santa Monica coordinates with water and power utilities in its western region. Utah connects with its rural telephone association and education networks. It was mentioned that bringing connections to rural areas provides opportunities to engage in advanced farming and water conservation activities. Once cities have their networks established, they should look to making connections to their border states. Sharing of co-locations also allow for redundancies.

Boston made a comment about addressing broadband needs when the City engages in planning for housing and other development. It is possible that developers may have not considered installing broadband infrastructure when constructing a new building. Informing developers early on in the design phase may prevent them from having to open up the street again.

Both Boston and Utah affirmed the success of resource sharing in providing greater speeds at lower costs, in response to a question that was asked about it.

The subject of a Dig Once policy was raised again in this workshop for comments. An approach that encourages cooperation was supported. One commenter suggested that there should be a policy that encourages cooperation and efficiency, but not one that would prevent excavation when needed. Another commenter mentioned that the policy should be a part of the cooperative planning process in order to expedite the deployment of fiber along main routes without companies having to acquire multiple permits.

ADDITONAL EXAMPLES

The following are additional examples of approaches to deploying broadband that have been discussed via phone contact with the FHWA Office of Policy.

Approach: Privately-owned and operated network

Columbus, OH

Fiber Net is a subsidiary of a 77-year old construction company in the Columbus, Ohio area. In response to the Dotcom boom in the late 1990s, the company, in anticipation of meeting the future need of telecoms, built an 82-mile conduit system around the Columbus area. They have more recently built a conduit system for Dublin, a suburb of Columbus.

Fiber Net leases the conduit to telecom providers to run fiber optic cable. The company owns and maintains the conduit system, ninety-nine percent of which has been installed in public ROW. The company utilizes mostly city-owned ROW and has a yearly leasing arrangement with the City.

The company also has an online tool called Fiber Locator, in which an interactive map that shows the location of all conduit in the City.

Riverside, CA

Riverside has an extensive fiber network. The City has joint trench agreements and pole attachment agreements with the telecoms. The telecoms install stacked conduit and allow for a portion of it to be used by the City. There is an issue specific to Riverside in which electricity cannot be run in the same conduit as the fiber because the voltage is too high. Most of the ROW is owned by the City. The City always contacts the telecoms when opening the ground.

American Association of Railroads

There are fiber optic easements on "thousands of miles" of railroads. Each railroad has its own contract with the telecommunication company to provide service. The lines are owned and maintained by the communications company; however, there are restrictions imposed by the railroads about what the communication company can do. Heavy work is often needed on railroad ROW in order to maintain the track. This sometimes is an issue as track work may disrupt broadband services.

Very similar to highways, the railroad sets up a leasing arrangement with the company to occupy the railroad ROW. The revenue that is generated from the leases is very small.

Communication companies like to work with the railroads because it is usually a very straight-forward arrangement as the land is privately owned, and not as many permits are needed. There is also an advantage when providing services across state boundaries as the land is free from having to go through multiple permit processing as it passes from state to state.

Approach: Publicly-owned and operated network

Arizona

In 2012, Arizona passed legislation to promote high-speed Internet access to citizens statewide. Arizona Digital Highway Bill (SB1402) makes provisions for the state to install empty conduit in connection with rural highway construction. The installation of the conduit would be funded by a state program (which receives federal funding) managed by the Arizona Strategic Enterprise Technology (ASET)'s Digital Arizona Project. The state then leases the conduit to all telecoms. It is expected that this approach will significantly lower costs to providers of service in rural communities; however, so far, no telecoms have shown interest.

In the City of Flagstaff, empty conduit is installed whenever there is new street construction.

Minnesota DOT

MN DOT has a utility accommodation policy and formal policy for telecoms. The Telecom Act was passed allowing for conduit to be placed in Interstate ROW (2006); ATT sought legislation to put fiber in the Interstate. The telecom company running fiber in I-94 went bankrupt and the state ended up owning the facilities.

Through Minnesota's broadband initiatives such as Connect Minnesota and the creation of a Broadband Task Force, the state is widely looking at the implementation of broadband. A study is underway on developing a statewide infrastructure that supports broadband; it is being proposed that future highway construction would include the installation of conduit.

Michigan DOT

The Department of Natural Resources (DNR) has initiatives to expand broadband into rural areas of Michigan. Senate Bill 499 authorizes the installation of fiber optics facilities in rail-trail corridors. The DNR has ownership of the conduit and no resource sharing is involved. There is a flat fee for use of the land and a streamlined process for obtaining permits. Expanding services into rural Michigan is difficult, as it mostly inhabited by moose and trees.

Approach: Network via public-private partnership

Vermont DOT

Vermont allows for the installation of fiber on the Interstate. Using funds from NTIA grants, the State recently installed 14 miles of conduit along the Interstate, which has been leased to a telecom for a 20-year period at $5000 per year, and lateral connections for $1000 per year. The DOT also has a barter agreement in place with the telecom for the use of one conduit.

A public-private agreement is in negotiation to add conduit along the entire Interstate. One hundred and forty-four strands would be installed and used for ITS purposes and excess capacity for the State.

Virginia DOT

Virginia DOT is considering installing conduit with any new road construction. If a service provider installs it, they would also own the conduit. VDOT owns conduit in Nova and Hampton Roads. In the 1990s, VDOT went out with a request for proposals to place broadband in the ROW and did not get a response. As a result of the Creosol settlement, the General Assembly required that some of the money be used to place broadband along several rural corridors. VDOT worked with two "authorities" that were created for that purpose and laid the conduit. As part of the arrangement VDOT was able to get fiber placed that was able to connect the Salem traffic center with the main operations center in Richmond.

WISCONSIN SURVEY TO STATE DEPARTMENTS OF TRANSPORTATION ON BROADBAND AND HIGHWAY ROW ACCOMODATION

In February 2013, the WisDOT Research Program deployed an on-line, six-question survey through the AASHTO Research Advisory Committee listserv (five questions of which have been summarized below). The survey was designed to find out if state DOTs have specific policies and practices for minimizing excavation of the ROW, including the installation of utility infrastructure to meet anticipated future needs, approaches for determining fair market value of the ROW, and shared resource agreements.

Results and Key Findings

Feedback was received from eleven State DOTs and one Canadian highway agency, including: Wisconsin, Alaska, Connecticut, Georgia, Idaho, Louisiana, Mississippi, Montana, Nebraska, Texas, Vermont, Wyoming and SK, Canada. Answers to the questions below are provided in summary.

Question 1 -- *Does your state have a "dig once" or "joint use" policy that addresses utilities that provide broadband services?*

"Dig once" means requirements designed to reduce the number and scale of repeated excavations for the installation and maintenance of broadband utilities in highway ROW.

"Joint use" means mandating that broadband utilities install at the same time, in the same trench, or in the same conduit(s). It may also mean the first utility in places extra conduits, and subsequent utilities must negotiate with that utility to occupy one or more of the empty conduits.

Answer:

None of the states that responded have *dig once* or *joint use* requirements that are mandated.

Idaho is in the process of developing *dig once* and *joint use* policies and Wyoming stated that it has related policies that encourage dig once and joint use practices, but has found that companies often do not want to share trenches and conduit.

Most respondents stated that *joint use* practices are encouraged to get the utilities to work together and reduce cost, as well as efficiently utilize space. Texas, for instance, uses *joint use* agreements for all utilities, limited not to just broadband providers.

Question 2 -- *Has your state developed a policy or approach for determining the overall value of broadband communication?*

This may include ROW pricing or lease rates, the value of the infrastructure, and/or the benefits of providing broadband to homes, businesses, governmental agencies and educational facilities that currently do not have it or have poor or limited access.

It may also include the "opportunity value" of the infrastructure, i.e., the value of connecting customers who currently are not connected to the infrastructure that runs past their property.

Answer:

None of the states that responded have developed a way to determine the value of broadband (as defined above). A few states mentioned the use of permit fees or flat fees for use of ROW; the Canadian province allows access to their ROW free of charge recognizing the fact that if there were to be a charge, the utility companies would pass the cost on to the public.

Question 3 -- *Does your state allow barter arrangements in which it obtains the use of dark fiber or bandwidth in exchange for the longitudinal occupation of controlled-access highway ROW or other ROW, or charge a fee for longitudinal use if a barter arrangement cannot be made?*

Answer:

Five states (Wisconsin, Georgia, Idaho, Louisiana and Vermont) responded that they have entered into various shared-resource agreements with service providers and/or are in the process of negotiating their first agreements.

Seven states (Alaska, Connecticut, Mississippi, Montana, Nebraska, Texas, Wyoming, as well as the Canadian Province) have not engaged in shared-resource agreements. A few reasons given include barriers set by state statute or that the states' Utility Accommodation Policy discourages longitudinal installation of utilities within the Limited Access Highway ROW.

Question 4 -- *Does your state own or lease dark fiber and/or conduit for its highway operations, e.g., intelligent transportation systems (ITS) [ramp metering, ramp gates, traffic cameras, incident management], weigh scales, weigh in-motion, automated toll collection, etc?*

Answer:

Most of the states that responded own or lease dark fiber and/or conduit for highway ITS operations. Only three states did not, including Alaska, Mississippi and Wyoming, and the Canadian province.

In the case of Wyoming, radio transmitters are used instead; additionally, Wyoming notes that it has limited resources: *We have no intentions of obtaining fiber for our own use. We do not have the equipment or personnel to maintain these types of facilities.*

Question 5 -- *Does your state construct broadband infrastructure (including conduit and/or fiber) as part of highway improvement projects, which is then made available to other broadband providers?*

Answer:

Five states have installed broadband infrastructure in conjunction with a highway project, primarily to provide service to their own ITS operations rather than with the intent to lease service to other providers. Of the five states, Idaho and Vermont have named specific initiatives:

Vermont--*In preparation for installing fiber along VT's limited access ROW, we are installing conduit on all bridge replacement and ROW reconstruction projects.*

Idaho--*ITD is in the early planning stages of creating a fiber bank with our communication service provider. We will lay extra conduit and fiber whenever possible for ourselves and the service provider and they will do the same for ITD.*

Link to the survey: The survey is currently not available online, but the FHWA Office of Policy-Transportation Studies can provide the results of the survey upon request.

NEXT STEPS

FHWA is proposing the following next steps for agency action to help facilitate the deployment of broadband:

1. Prepare a letter from the FHWA Administrator to the Chief Executive Officers of the State Departments of Transportation to encourage State DOTs and local agencies to work with stakeholders in developing broadband policies, if appropriate.
2. Coordinate with AASHTO to host a webinar that includes presentations from the Utah and Maryland DOTs on their approaches for deploying broadband in the ROW.
3. Provide links and materials related to broadband on the Interagency Working Group OMB Sharepoint site and appropriate FHWA websites.

WEBLINKS

Presentations from the Stakeholder Workshop available for download at:
https://connectdot.connectsolutions.com/broadbandeo

A list of average internet connection speed by state:
http://www.statetechmagazine.com/article/2013/02/average-internet-connection-speed-every-state-america

e-Corridors Vertical Assets Inventory Tool:
http://www.vait.gis.bev.vt.edu/

Santa Monica City Net and related articles:
www.smcitynet.com

http://www.governing.com/columns/eco-engines/col-public-or-private-sector-who-controls-broadband.html

http://www.prlog.org/10580399-santa-monica-launches-10gb-broadband-initiative.html

http://www.nlc.org/build-skills-and-networks/education-and-training/event-calendar/how-broadband-access-in-santa-monica-has-impacted-local-economic-development

http://www.wired.com/business/2010/04/google-fiber-losers/

More to come…