EFFECTIVE UTILIZATION OF DARK FIBER – REPORT AND RECOMMENDATIONS

PRESENTED TO THE COUNTY MANAGER & COUNTY BOARD
PREPARED BY
ARLINGTON COUNTY BROADBAND ADVISORY COMMITTEE

Executive Summary

The Broadband Advisory Committee (BAC) was established by Arlington's County Manager and tasked with the challenge of reviewing the County's current business model and evaluating its strategy for leasing dark fiber infrastructure. The BAC has reviewed the ConnectArlington (CA) business model and analyzed the strategy. The BAC identified **nine actionable recommendations** for the Arlington County Board and the County Manager to consider (Appendix I). These recommendations rely on three parallel tracks which can be based on separate allocations of County fiber assets: (1) promoting economic development by cultivating and leasing dark fiber to Broadband Service Providers (BSPs) and Internet Service Providers (ISPs) who can transform the County's raw, middle-mile, dark fiber asset into a finished, marketable broadband platform useful to residents, businesses, building owners, universities, hospitals, and other entities of Arlington County; (2) providing advanced networking to enable Arlington as a research and education hub; and (3) enabling a collaborative Innovation Platform with access to fiber and physical assets such as streetlights to catalyze innovation and economic development. Both tracks offer significant potential benefits to the County, while their time frames will be different (short vs long), and their impact may be different too. The possibilities are vast and include, to name a few: digital inclusion, economic development, education, innovation, research and development, and Smart City evolution.

Sadly, 22 years after the passage of the 1996 Telecommunications Act, 60% of Arlington's commercial office buildings are still under the monopoly control of the incumbent telephone company, and it is possible that many residential multi-dwelling units (MDUs) are suffering the same monopoly control. In these buildings, commercial and residential tenants have no choice, and the average vacancy rate in the nearly 200 commercial buildings is 39%, twice the county average of 19.1%.[1] While building fiber into each of these buildings (called a "lateral") might be considered expensive, the recurring tax revenue for doing this could be tremendous. According to Arlington's Economic Development Department, each 1% change in the commercial office vacancy rate equates to $3.5 million in annual revenue for the county.

In addition to the County's key roles as "entrepreneurial enabler" and "opportunity leveler" in stimulating the success of BSPs and ISPs, the BAC believes the County's top four initiatives should include:

1. Allowing use of existing, excess dark fiber in existing laterals to connected buildings
2. Identifying a way to allow Arlington County to build additional laterals

[1] See Appendix V – Leveraging ConnectArlington To Reduce Commercial Vacancy Rates Analysis

3. Considering ways to modify the existing (Dark Fiber Lease Agreement) restrictions (laterals, sub-licensing, etc.) for BSPs and ISPs

4. Partnering with academic and other partners to create a collaborative Innovation Platform

Opportunity abounds with the availability of advanced, high-speed broadband services

Background Brief

This Broadband Advisory Committee's Charter sets forth the expectations, as well as challenges and restrictions for the committee to consider. Arlington's County Manager is asking for the Broadband Advisory Committee's assistance in reviewing and assessing the County's current business model and strategy for encouraging the use of excess dark fiber infrastructure as a part of ConnectArlington. To date, the current business model has not been effective in reaching ConnectArlington's potential level of success. Ultimately, the goal is for Arlington County to be an enabler of economic growth and development, a platform builder for technology innovation, and an infrastructure provider to assist commercial property owners in reducing their current high vacancy rates through the creative use of ConnectArlington's unique middle-mile fiber asset.

It is useful to review the initiative that led to the creation of ConnectArlington (CA) and its charge. On February 21, 2015, the Arlington County Board adopted "a Policy Statement Regarding ConnectArlington as an Economic Development Tool." The Board went on to say: "The County plans to make available to others, through License Agreements, for economic development purposes, 'dark fiber' that is part of the County's ConnectArlington network and is not currently needed by the County." The Board's economic development objectives are laid out in this policy statement and clearly established in Exhibit A of the Policy Statement entitled, COUNTY BOARD POLICY STATEMENT REGARDING CONNECTARLINGTON AS AN ECONOMIC DEVELOPMENT TOOL, which may be found in Appendix II attached to this report.

The Board's rationale for making this economic development investment is summarized on page 4 of the February 21, 2015 County Board Agenda Item:

> The licensing of dark fiber to others for economic development purposes is appropriate and beneficial to the economic and fiscal sustainability of Arlington County. The fiber will provide access to a reliable diverse, secure, fiber network that is critical to Arlington's commercial tenant base; it should improve the capacity, redundancy, security, and affordability of the overall telecommunications infrastructure, thus creating a strong locational competitive advantage to Arlington County.

More than 3 years later, this has not happened.

Purpose of the Committee:

- Gain an understanding of the existing ConnectArlington business model and challenges
- Try to understand why the ConnectArlington business model is failing
- Generate ideas and approaches to increase utilization by addressing the current challenges
- Consider potential business models that would expand interest in Arlington's dark fiber
- Provide actionable recommendations aimed at increasing economic development and enabling technology innovation in the County

Broadband Advisory Committee Members

The Broadband Advisory Committee members are listed in Appendix III with a brief biography of each. The Committee Members represent a cross-section of broadband thought leaders, and include individuals from academia, business, think tanks, and associations with significant interest in the development of broadband infrastructure and related services in municipalities.

Summary of the three meetings held:

The committee has held three meetings, averaging two hours each, on February 1, February 22, and March 6, 2018. During the three meetings, committee members had conversations with representatives from the County Manager's Office, Department of Technology Services, Arlington Economic Development, and the County Attorney's Office.

Current Challenges with ConnectArlington Dark Fiber Licensing

Under Virginia law, the County is restricted from offering or providing "lit" fiber optic or broadband services (data, voice, or video) to any entity (residence, business, educational, non-profit, etc.) other than the County itself, (County offices, County facilities, Arlington Public Schools, libraries, fire & police, intelligent traffic systems, etc.) adjoining municipalities and state agencies. The County can only provide "dark fiber" which is purchased by telecommunications carriers (BSPs, ISPs and others) or a very limited set of organizations or institutions with a specific need.

Problems with the CA "network"

- Nearly all the businesses, residences, commercial property owners, and governmental/nonprofit entities in Arlington cannot use **dark fiber or unlit fiber**.
    - They can only make use of "lit" fiber provided by a BSP or an ISP.
    - Potential customers want the services that an advanced fiber-optic network can provide, they want better broadband services from more responsive providers and competitive choice in their buildings, as well as vendor diversity and redundant, survivable access to the internet/cloud/services.
- As configured and offered, the CA network is essentially "dark fiber to nowhere"
    - The middle-mile dark fiber has no "first mile" and no "last mile" (i.e., it only exists in the public and private right-of-way and does not connect to any serviceable buildings, customers, facilities, other networks/the "Internet", data centers, etc.)
    - So only BSPs and ISPs with a strong vision and potentially help from the County can make use of CA's incomplete dark fiber network.

The Solution:

- The dark fiber needs one or more BSPs/ISPs to give businesses and consumers the services they desire from a sophisticated, highly reliable, lit fiber-optic network.
    - This requires technologically advanced, expensive fiber optic transmission equipment which needs to be installed, maintained, and operated by highly skilled professionals.
- To be useful, the network must be complete. Middle-mile is not enough.
    - First-mile and last-mile are needed

    - BSP/ISP can provide first mile (i.e., connections to the larger internet and data centers, etc.) if the economic incentives are in place
    - Economic incentives might include
        - Quick use of existing laterals
        - Last-mile/lateral grants for new laterals
        - County construction of new laterals
        - Easy building entry ordinances (no anti-competitive agreements between incumbent cable/telephone companies and building owners/developers)

The problem with the CA business model:

- "Build it and they will come" does not always work.
    - Part of the network was built, but not enough to bring the "players" to the game
    - CA needs BSPs and/or ISPs to turn the dark fiber into an economic development, innovation and digital inclusion tool.
- CA started by looking for interested business customers and building owners - that did not work - and CA realized they need BSPs as their primary customers
- The search for potential BSPs has not yet been successful
    - Until recently (in conjunction with the digital inclusion initiative one interested BSP has been identified).
    - The total costs (time and money) of using the dark fiber to serve business and residential customers are very challenging to overcome for any prospective dark fiber licensee.
- CA does not appear to treat new locally-based broadband service providers as an economic development project, but simply a ConnectArlington customer.
- The existing dark fiber license agreement stands as a huge barrier to entry
    - No BSP or ISP will sign in its current form, and not one has yet signed
    - Agreement is one-sided, not reciprocal
    - Agreement is cast as a temporary license not a permanent or sufficiently long term business lease (See Section 18.3 of County License Agreement)
    - E.g. a BSP cannot offer a customer a 3-year or 5-year contract when the County may cancel at any time, with only 12 months (or less) notice (See Section 18.3 of current County Dark Fiber License Agreement)

The Solution:

- Improve the Strategy.
- Roll out the red carpet for BSPs that can provide the services that are in demand.
    - Arlington Economic Development should be courting BSPs with incentives
    - CA should be courting BSPs with incentives
- Treat new broadband service providers as an economic development project
    - The CA fiber needs BSPs to light it and provide needed services
    - BSPs are the key to developing and unleashing the potential of the County's fiber asset.
- Anything the County can do to lower the startup costs (in time and money) and risks/uncertainty for new service providers will result in multiple benefits for CA, the County government, and most importantly its citizens and businesses.
- The dark fiber lease agreement must be raised to the level of commercial contracts

- 10-year and 20-year leases or IRUs that allow BSPs to build a predictable business by offering and signing multi-year contracts are needed.
- The existing agreement must be made service provider friendly and designed based on the concept of "permission-less innovation".
- Fix the "poison pills" and "contract traps" that have been built into the current license agreement. No BSP has signed it for good reason.
- It should be simplified, written in plain English, and significantly shortened.
- It should be responsive to BSP needs in terms of:
  - timeliness of County activity and responses,
  - access to relevant information,
  - quality of the dark fiber network and fiber splicing
  - maintenance and restoration activities
  - provision of adequate remedies, other than contract termination, when problems or issues are encountered
  - escalation procedures and high-level champion(s) within County government to help resolve issues quickly and reasonably when they arise

- Develop a special agreement for research and innovation use of fiber and other physical assets, with coordination through a committee with representatives from County government, academic institutions, the business community, and citizens.

Broadband Advisory Committee Recommendations

The committee proposes that ConnectArlington move forward on three tracks, and by doing so the County can make the best use of it extensive fiber optic network for economic development, innovation, digital inclusion, and university/research projects and strive to establish Arlington County as the Research Capital of the World (or maybe the mid-Atlantic Research Hub).

Three tracks to unlocking the economic development, "public good", and other potential benefits of the latent dark fiber asset:

1. **Entrepreneurial/Economic Development**
   a. Focus on enabling and encouraging the leasing of dark fiber to competitive, entrepreneurial BSPs and ISPs who would be able to complete the network, and provide services to businesses, residences and building owners, universities, hospitals, and other entities of Arlington County.
      i. This step is critical to the success of almost all options that follow
      ii. Can incorporate public-private partnerships to lower risk and ensure success
   b. Enable services in already connected buildings
      i. Share broadband readiness as an attractive feature/benefit to the buildings with existing lateral connections
      ii. Allow dark fiber lessees to utilize, at no incremental cost, the 12-14 existing lateral connections to commercial office buildings and the existing excess dark fiber available in those laterals, which are already built and

managed/maintained by the County. There is zero incremental cost to the County to do this with potential immediate benefit and very low (no) reasonable risk.

iii. Allow dark fiber lessees to use excess fiber in future laterals to be built by the County as well. Again, there is no incremental cost to County to do this.

iv. There are no state or federal laws that prohibit or restrict this, it is strictly an economic development and innovation policy decision for the county to make.

c. Consider ways to modify the existing restrictions (use of existing laterals, sublicensing of dark fiber, indefeasible rights-of-use "IRUs", shorter/simpler dark fiber lease agreement, more responsive time frames, etc.)

d. Allow Arlington County to build and maintain additional laterals to commercial office buildings and residential MDUs that do not necessarily house county offices, staff, or facilities.

i. The County is already building and maintaining laterals for multiple purposes, but not to encourage economic development and innovation.

ii. State and federal laws do not restrict or prohibit lateral construction and maintenance by the County.

iii. The County has built and currently owns and maintains over 13,000 feet of fiber on private property.

iv. Build into economic development agreements that Arlington is flexible on building laterals and assisting BSPs to connect.

v. Work with local BSPs & ISPs.

e. Establish public private partnerships that are willing to build the laterals and provide services

f. Negotiate a long-term fiber lease agreement focusing on solutions that enhance economic development, promote innovation, and foster digital inclusion…

2. University/Research - Leverage ConnectArlington as a "Research Capital" or "Higher Education Research Network"

a. Look at universities as the partner and boost this as a research and innovation hub

i. Universities (Virginia Tech, George Mason University, Marymount University, George Washington University, University of Virginia, etc.)

1. The Platforms for Advance Wireless Research (PAWR) program is an example of this type of opportunity

ii. Defense Advanced Research Programs Agency (DARPA)

iii. National Science Foundation (NSF)

iv. Office of Naval Research (ONR)

b. Integrate university and agency connectivity with economic development (Track 1) and with innovation (Track 3)

3. Innovation

a. Offer a sandbox for furthering innovative research and testing new technologies by leveraging rights-of-way (ROW), intelligent transportation systems (ITS), and ConnectArlington
    i. As an example of a sandbox project, the BAC offers Appendix IV "**Use ConnectArlington as a 'Sandbox' for Smart-Road Startups and Companies"**
    ii. There may still be a need for a 'lit services" backhaul/broadband services provider
    iii. Creates a platform for innovation
b. Develop a strategy and governance mechanisms to create an Innovation Platform, with university and business partners, to leverage County fiber and other physical assets for innovation and economic development
c. Setup a demonstration project to put the possibilities on display as a draw to ConnectArlington
    i. Show Arlington is a high-tech community through establishing a smart communities' corridor for the purposes of demonstrating value
    ii. Through partnerships and collaboration, make Arlington a testbed for research, development, and assessment of new technologies and innovation in wireless communication, networking, and smart community applications

Appendix I
Arlington County Manager's Broadband Advisory Committee
Interim Recommendations

Summary

Committee members were sent a survey to evaluate the recommendations that they had developed throughout the committee meetings. The recommendations were evaluated on the following factors:

- Overall ranking
- Return on investment (ROI)
- Achievability
- Time to complete

The results of the survey were weighted and scored to present the final ranking of recommendations below.

Additionally, the survey asked the committee to determine what role government should play with respect to ConnectArlington. The survey results show that 100% of the committee said that the government should play the role of an "entrepreneurial enabler" and 63% said that government should play the role of an "infrastructure provider."

Result Rankings

1. Allow use of existing, excess dark fiber in existing laterals to connected buildings

2. Identify a way to allow Arlington County to build laterals

3. Consider ways to modify the existing restrictions (laterals, sub-licensing, etc.)

4. Consider focusing on licensing dark fiber to entrepreneurial ISPs and broadband service providers who can "light" and build on the dark fiber and provide services to tenants, building owners, and residents

5. Offer a sandbox for furthering innovative research and testing new technologies by leveraging ROW, ITS, and ConnectArlington

6. Establish public private partnerships that are willing to build the laterals and provide services

7. Partner with local universities to leverage ConnectArlington as a "Research Capital" or "Higher Education Research Network"

8. Setup a demonstration project to put the possibilities on display as a draw to ConnectArlington

9. Select the amount of fiber needed to retain and reserve to achieve County goals, then release the rest to let private industry utilize and leverage, having a 3rd party serve as the in-between in getting the services that people need out to them on the fiber

ARLINGTON COUNTY, VIRGINIA

County Board Agenda Item
Meeting of February 21, 2015

DATE: February 6, 2015

SUBJECT: Adoption of a Policy Statement Regarding ConnectArlington as an Economic Development Tool; Approval of Standard Form Dark Fiber License Agreement for Implementation of ConnectArlington; Approval of a Schedule of Rates and Fees and Related Authorizations concerning ConnectArlington.

C. M. RECOMMENDATION:

1. Adopt the attached Policy Statement Regarding ConnectArlington as an Economic Development Tool. (Exhibit A).
2. Approve the attached Standard Form Dark Fiber License Agreement for use by others of ConnectArlington dark fiber. (Exhibit B).
3. Authorize the County Manager to Execute the Standard Form Agreement(s) and related documents on behalf of the County Board, subject to approval as to form of each Agreement by the County Attorney.
4. Approve the attached Schedule of Rates and Fees. (Exhibit C)
5. Authorize the County Manager to promulgate Administrative Regulations to implement the ConnectArlington program consistent with the County Board's Policy Statement and the Standard Form Agreement.

ISSUES: None identified.

SUMMARY: ConnectArlington fiber is presently used for government purposes such as the Intelligent Transportation System (ITS), Public Safety Radio Ring, and for connection of County and School facilities. The County plans to make available to others, through License Agreements, for economic development purposes, "dark fiber" that is part of the County's ConnectArlington network and is not currently needed by the County. The phrase "dark fiber" means fiber optic cable that is not lighted by lasers or other electronic equipment. Once

County Manager: BMD/mjs

County Attorney:

21.

Staff: Jack Belcher, Department of Technology Services, Marc McCauley, Arlington Economic Development, Loan Hoang, Department of Management and Finance

electronics are applied, the fiber is able to transmit signals and the dark fiber becomes "lit" or "lighted."

The fiber available for licensing will be installed as a "middle mile" in conduit located in County rights of way. This "middle mile" fiber is not currently fully installed and will be completely installed by the Fall of this year. This "middle mile" infrastructure is located between fiber provided by "first mile" operators and "last mile" users. "First mile" fiber allows connections from the "middle mile" to other destinations, whether within, Arlington, or elsewhere broadband services are provided. "Last mile" connections are links from the "middle mile" to the Licensee's desired destination.

Under the terms of a standard form License Agreement, Licensees must ensure that last mile users are located in Arlington. Availability of the middle mile dark fiber may increase availability of robust broadband services. In so doing, this will help distinguish Arlington as a "connected community" that will benefit the economic and fiscal health of Arlington's commercial sector.

The County's role and responsibility for the middle mile will be to own and maintain the physical network. The County will provide physical security, manage the assignment of dark fiber optic strands to Licensees, and oversee the interconnections between Licensees and the middle mile. It will be the responsibility of the Licensee to provide for the interconnection with ConnectArlington, and to ensure the security of, and maintain service which the Licensee may agree to provide to first and last mile customers. The terms, fees and use requirements are specified in the attached License Agreement presented for consideration and approval by the Board. Localities, including the County, are prohibited from being involved in the promotion or marketing of a Licensee as a provider of services.

BACKGROUND: One impetus for the initial construction of ConnectArlington was the looming expiration of the cable franchise agreement with Comcast. Through this agreement the County (and the Arlington Public Schools) receive free unrestricted use of a fiber optic "institutional" network which has provided basic network services such as email, data file exchange, in-house developed video productions, and intra-County telephone service. Comcast announced to the County its intention to no longer offer access to the institutional network in an unlimited and free manner as part of any future cable franchise renewal agreement and therefor in 2010, the County Board approved construction of the first phase of ConnectArlington. Upon completion, the first phase will provide a County-owned network that is independent from commercially provided telecommunications services.

To build the network, the County leveraged a number of related initiatives. Specifically,

- ITS (Intelligent Transportation Systems).[1]
- Public Safety Radio Ring.[2]

[1]A three phased project funded by Federal Grants and general obligation bonds. The project will replace the copper wire connected traffic signals with fiber optics to allow enhanced traffic management. Phases I and II have been completed. Phase III funding was approved by the County Board in December 2014.
[2]Funded with bonds, this project uses underground fiber for transmission of public safety emergency dispatch in response to 911 calls. The underground communications replaced microwave transmission that was disrupted by

- Power upgrades undertaken by Dominion Virginia Power (DVP).[3]
- Site Plan approvals [4]

Where possible, four two-inch diameter conduits were placed a minimum of three feet underground in the urban corridors of Arlington County. Two of the conduits were equipped with dedicated fiber optic cable to support ITS, the Public Safety Radio Ring, and necessary telecommunications services of the County and Schools. Two of the conduits were left vacant to provide for redundancy and future expansion. Where undergrounding was deemed unnecessary, fiber optic cables were strung by the County on telephone poles to reach County and School facilities. The County and Arlington Public Schools worked closely together to coordinate funding and protocols for installing the fiber in Schools.

As a result of these efforts, by February 2015, approximately 200 traffic signals, 14 Public Safety Ports (at traffic lights for connection by Public Safety in emergencies), 6 radio towers and 49 County and Schools facilities have been connected to ConnectArlington fiber. By the end of 2016, any remaining traffic signals and County/Schools facilities will be connected to ConnectArlington. At that point, 250 Traffic Signals, 14 Public Safety Ports, 6 Radio towers, and 96 County and School facilities will be connected.

With the majority of the underlying construction designed, funded, underway and soon to be completed, the Manager announced on April 1, 2014, a plan to explore the expansion of ConnectArlington to provide middle mile dark fiber connections for economic development purposes. Since April, the County has engaged telecommunication consultants to review possible approaches and solicited industry views through issuance of a Request for Information.

DISCUSSION: Consistent with guidance provided at adoption of the FY 2015 budget and FY 2015-FY 2024 Capital Improvement Plan by the County Board, fiber has been ordered and construction is proceeding to install 864 strands of dark fiber for ConnectArlington within one vacant conduit. If an applicant desires to initially license strands that are not yet currently available, the strands will be installed by the County as promptly as reasonably possible.

The County installed dark fiber will be used to meet the future communications needs of the County Given that in the near term not all of this fiber is presently needed for County government operations and other public purposes, the fiber can and should be utilized in support of the economic development goals of Arlington County.

After studies, interviews and discussions with commercial and government entities, staff has determined that there is a need and interest in dark fiber by commercial and government entities in primarily commercial areas and corridors at reasonable rates.

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weather or line-of-sight obstructions. The ring connects six radio towers (5 in Arlington and 1 in Fairfax County.) The construction of the ring was completed in August 2014.

[3]The County co-located fiber optic cable in conjunction with two DVP system upgrades in various locations throughout the County. These upgrades were completed in 2012 and 2013.

[4] A standard site plan condition approved by the Board requires developers to construct/install four 2-inch communication conduits and junction boxes along site frontage for the sole and exclusive use by Arlington County.

The licensing of dark fiber to others for economic development purposes is appropriate and beneficial to the economic and fiscal sustainability of Arlington County. The fiber will provide access to a reliable, diverse, secure fiber network that is critical to Arlington's commercial tenant base; it should improve the capacity, redundancy, security and affordability of the overall telecommunications infrastructure, thus creating a strong locational competitive advantage to Arlington County. This phase of investment in ConnectArlington is consistent with Arlington Economic Development's Strategic Plan, *Arlington's Framework for Prosperity*:

- Arlington will be recognized for its superior business environment which includes world-class facilities, infrastructure and systems;
- Arlington will support a sustainable and flourishing economy which will contribute meaningfully to a fiscally sound and healthy community;
- Arlington will be an inclusive and interconnected community that fosters an innovative and creative workforce, supported by effective workforce development programs; and,
- Arlington will enjoy high quality places that ensure an exceptional quality of life and offer amenities that are valued by residents, businesses, and visitors.

The investment in this phase of ConnectArlington continues a long history of Arlington making significant, visionary investments in the future growth and sustainability of Arlington which has allowed for a commitment to smart growth land use planning that has made Arlington a national and regional model for fiscal balance, stability and growth. The economic development benefit from the use of dark fiber will help enhance future health and vitality of higher-density, mixed-use urban villages, particularly the commercial real estate sector, that is the foundation of Arlington's fiscal stability and growth.

Major Provisions of Draft License Agreement: If approved by the County Board, the attached Standard Form Dark Fiber License Agreement could be entered into by any potential licensee and the County without further action required by the Board[5]. The major terms of the Agreement include that:

- Dark fiber shall be licensed and the County will not be involved in any manner with promoting, marketing or providing of services to end users. This avoids County involvement in direct provision of telecommunications services.
- The County Manager, or her designee, will administratively process a License Agreement with the County and the Licensee using only a County Board approved Standard Form License Agreement and Schedule of Rates and Fees.
- The Licensee must license the entire available fiber loop ("the Middle Mile") for each strand of fiber licensed. This requirement will ease administration of ConnectArlington.

[5] 696 of the total 864 strands of fiber to be installed in the County conduit will be available for licenses using the Standard Form Licensing Agreement. Another 168 strands of dark fiber will be available for use through a different License Agreement to persons and entities to which the County is permitted by law to make donations and contributions. Terms and provisions of the licensing of these 168 strands may be guided by a different set of rates and conditions. The non-standard Form License Agreements will be brought to the Board, periodically, for approval.

- Licensed fiber must have at least one connection to a building or facility in Arlington County. This ensures that the Licensee's use of the County dark fiber will inure to the benefit of the County. An applicant may obtain, if available, and upon paying the appropriate fee, interconnections at multiple locations along an individual dark fiber strand licensed to the applicant.
- A Schedule of Rates and Fees will be approved by the County Board periodically. A maximum number of fibers (48) can be licensed to any single licensee at any time, in order to avoid hoarding of and squatting on County fiber.
- The County will retain ownership of, control of, access to, and responsibility for maintenance of the Middle Mile fiber loop and direct points of access to the middle mile ("joint use boxes"). Licensees will be responsible for physical access to buildings and facilities (the Last Mile), unless determined in separate agreement with the County, and for connections to any telecommunications network (the First Mile). Licensees will not have access to the Middle Mile or joint use boxes without approval and supervision of the County. This is intended to provide the safety and integrity of the system.
- The Licensee will be licensing specified dark fiber strands, and will have no rights over, or access to, Middle Mile conduit through which all the County's ConnectArlington fiber runs.

Limitations on Use

Making County dark fiber available to others, until the County needs to use it, is intended to support the County's economic development goals, by providing high speed, reliable fiber optic lines whih are vital to commercial and governmental entities and will enhance of the economic and fiscal health of Arlington's commercial cores. The dark fiber licensed to others shall not be used:

- To provide cable services, unless such Licensee has obtained a franchise agreement with the County;
- To provide a connection(s) to others outside of Arlington County, without a physical connection to a building or facility in Arlington; and,
- For sub-licensing by the Licensee to others.

Terms and Pricing Structure: The Schedule of Rates and Fees has been constructed by the AED, DTS and DMF staff after working with consultants. The objectives include:

- Recovery of the County initial and ongoing financial investments in ConnectArlington;
- Encouraging use by multiple licensees;
- County ability to recapture use of any licensed fiber once the County needs require it. As such, under the initially proposed Schedule of Rates and Fees, licenses for the use of dark fiber by private business Licensees cannot exceed a term of 10 years.

Status of Construction

If the Board approves the form Dark Fiber License Agreement attached, the County will then install middle mile fiber for licensees. In so doing, the County will be able to satisfy licensee need in an expeditious manner. The remaining installation of the 10 mile network infrastructure will follow the route described in Exhibit D. By the Fall of 2015, the infrastructure will consist of 864 strands of single mode ribbon optical fiber laid underground in a designated conduit. To satisfy Virginia Department of Transportation requirements and to accommodate expected demand for access, infrastructure enhancements will be necessitated along the route. Specifically, larger junction boxes will be installed by the County to accommodate the amount of fiber being deployed. Additionally, to satisfy physical security requirements desired by potential licensees, each junction box will be secured with a locked cover.

Once the 10 mile infrastructure is completed and is being used by Licensees, staff will monitor and evaluate the effectiveness of the project. Depending on experience and value analysis, staff may seek additional funding (through revenues from the first 10 miles and additional appropriations if needed) to expand the network. An expanded network would connect all the urban corridors of the County, including, East Falls Church, the Columbia Pike Corridor, South Four Mile Run and Shirlington. In total distance this would provide an additional 12 miles of network infrastructure. Construction on this stage would not begin until County Board approval and funding has been approved.

ConnectArlington Implementation

The ConnectArlington infrastructure will also be used as part of the in-building wireless systems being adopted by developers and the County and Schools. Prior to and following the adoption by the County Board in October 2013, of a Resolution Advancing New Public Safety Technology, several properties and new County and School construction will avail themselves of ConnectArlington fiber. The buildings with the wireless systems are using the "robust fiber optic network" (ConnectArlington) referenced in the Board resolution.

In addition, the County Manager, may, in the future, suggest as economic incentives for businesses, funding for their last mile connections to ConnectArlington. The advisability of using any fund for economic development incentives will be measured primarily through two metrics: amount of occupied office space and overall fiscal impact. Any investment should include a cost-benefit analysis to the County. Any funds for economic development incentives will be appropriated by the County Board to the Industrial Development Authority (IDA), who will then execute the agreement and appropriation for the last mile connections.

If the County Board approves the Manager's recommendations, then DTS staff is prepared to promptly receive applications from interested persons or entities. The applications will be processed by DTS staff. An administrative process for processing, receiving payments and the necessary physical interconnection work is in place. It is estimated that no more than 90 days will be needed for review, acceptance of an application, issuance of a Notice of Availability, execution of an agreement and physical interconnections of the First and Last Mile to ConnectArlington.

FISCAL IMPACT: The expansion of ConnectArlington, including the addition of 864 strands of dark fiber within ten miles of existing conduit, has a capital project budget estimate of $4.1 million. This was funded partially during the FY 2015 adopted budget at $1.6 million and presented in the adopted FY 2015 – FY 2024 Capital Improvement Plan (CIP). The remaining funds were identified from FY 2014 closeout of $2.5 million and will be presented as part of the allocation of the FY 2016 PAYG proposed budget. Capital costs include amounts to be paid to the Federal Highway Administration (FHWA) to reimburse a portion of the Federal funds associated with the purchase and installation of the conduit the County will utilize for Connect Arlington, as well as various junction boxes installed as part of the ITS Phase I and II projects. This payment to FHWA will ensure the conduit is available for the purposes described herein.

Operating expenses are estimated at approximately $700,000 - $800,000 annually to pay for a business/project manager and an accounting/administrative specialist, contractors to manage the construction and inspect the work, software to maintain geographic systems related to the fiber, monitoring costs for the overall network and contingencies for fiber repairs. The FY 2016 proposed budget includes $500,000 which covers full year costs for the business manager, half year funding for the accounting specialist, contractor costs as well as some fiber mapping and monitoring costs. Staff will reevaluate the project needs as ConnectArlington gets underway and will identify the balance of funds needed at the fiscal year end closeout review process.

As ConnectArlington is implemented, staff will gather data about the supply and demand economics for the leasing of the dark fiber. The investment in ConnectArlington enhances the County's fiber network and economic infrastructure. Thus, like most public infrastructure investments, it has broader goals and impacts than merely direct revenue cost recovery. The licensing of dark fiber will generate direct revenue and will likely lead to increased economic activity and other indirect revenues. At this time, no revenue is budgeted since it is too early to make a projection. Staff does estimate, based upon conservative market assumptions about the number of strands to be licensed and resulting revenues, that the costs of the capital investments and the early-year operating and maintenance costs will be recovered over an 8 to 10 year period. This payback does not include the revenue realized from additional tax payments from development spurred by this initiative. Any license revenues received will be appropriated and recorded in a separate cost center which will be tracked separately.

The following is a history of previous Board budget actions on these items:

Appendix II

ConnectArlington Timeline		
Date of Board Action	Project	Amount Authorized, Funding Source
June 26, 2004	Public Safety radio system & infrastructure	$4.0 M, 2004 IDA Lease Revenue Bonds
June 3, 2010 - Schools CIP FY11-FY16	ConnectArlington	$1.9 M, 2010 School GO Bonds
June 15, 2010 - County CIP FY11-FY16	ConnectArlington, ITS	
July 21, 2012 - CIP FY13-FY22	ConnectArlington, ITS	$13.475 M, 2012 County GO Bonds; $15.3 M, federal grants; $9.1 M, other local funds
July 18, 2014 - CIP FY15-FY24	ConnectArlington, ITS	$3.5 M, 2014 County GO Bonds
Recent Contract Authorizations	Contract	Amount Authorized, Funding Source
February 21, 2009	award of DVP construction at Kirkwood/Lee Hwy - install CA fiber	$0.4 M, funded by IDA bonds
January 22, 2011	award of ITS Phase I construction, CA fiber	$4.7 M, funded by federal grants, IDA bonds
May 19, 2012	award of ITS Phase II construction, CA fiber	$8.0 M, funded by federal grants, IDA bonds
October 20, 2012	award of CA last mile construction - phase I	$5.4 M, funded by GO bonds
December 13, 2014	award of ITS Phase III construction, CA fiber	$8.8 M, funded by federal grants, GO bonds

EXHIBIT A

COUNTY BOARD POLICY STATEMENT REGARDING CONNECTARLINGTON AS AN ECONOMIC DEVELOPMENT TOOL

Consistent with guidance provided by the County Board at the adoption of the Fiscal Year 2015 budget, and the adoption of the Fiscal Years 2015 to 2024 Capital Improvement Plan; and

Consistent with the goals in Arlington Economic Development's Strategic Plan, *Arlington's Framework for Prosperity* (including the goal of creating an interconnected community); and

Consistent with the County's investments in long-term infrastructure needs for the County and Schools; and

Consistent with the plan to lay 864 strands of dark fiber in a conduit traversing our major business corridors; and

Consistent with a desire to provide access to dark fiber that will result in secure and affordable access;

The Arlington County Board finds that the licensing of dark fiber for economic development purposes is beneficial to the economic and fiscal sustainability of Arlington County.

Appendix III - Committee Members

Jonathan S. Adelstein, President & Chief Executive Officer, WIA- Wireless Infrastructure Association, Arlington County resident

Jonathan S. Adelstein is the President & Chief Executive Officer of WIA–The Wireless Infrastructure Association. WIA represents over 200 companies devoted to building wireless broadband facilities that connect every corner of America. Since he became President in 2012, over 100 new members have joined the association, the annual wireless infrastructure show has broken participation records, a new association was formed in Europe, and a new nationwide training initiative and WIA PAC were launched. Mr. Adelstein served as Commissioner of the Federal Communications Commission (FCC) from 2002 to 2009, for which he was twice nominated by President George W. Bush and confirmed by the U.S. Senate. At the FCC he achieved bipartisan progress on issues including broadband expansion, widening access to the Internet and media diversity.

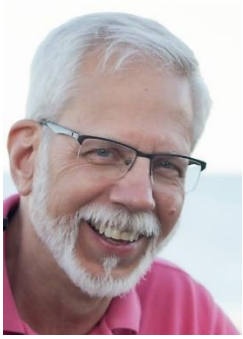
Mary Crannell, President of Idea Sciences, Arlington County Information Technology Advisory Commission member, Arlington County resident

Mary Crannell is president and founder of Idea Sciences, a company that helps organizations map strategy, leverage talent and transform organizational culture. Mary's organizational systems background coupled with her global work experience provide a robust backdrop for creating human and information systems that support the strategic goals of an organization. Idea Sciences offers "decision assurance" to enterprises -- government, non-governmental organizations, and commercial. Ms. Crannell serves as the Vice Chair on the Arlington County Information Technology Advisory Commission (ITAC) and is a member of the Kogod School of Business, Information Technology Executive Council. Ms. Crannell is an adjunct professor at The George Washington University, and holds a M.A.T. from Colgate University and a B.A. from Eisenhower College of Rochester Institute of Technology.

Scott F. Midkiff, Vice President for Information Technology and Chief Information Officer at Virginia Tech

Dr. Scott Midkiff serves as the Vice President for Information Technology and Chief Information Officer at Virginia Tech. In this role, he has overall strategic and operational responsibility for the university's IT infrastructure, IT services, enterprise systems, advanced research computing, teaching and learning with technology, identity management, and cybersecurity. Dr. Midkiff is also a Professor in the Bradley Department of Electrical and Computer Engineering, where he has been on the faculty since 1986. Dr. Midkiff received the B.S.E. degree in Electrical Engineering and Computer Science from Duke University (1979), the M.S. in Electrical Engineering from Stanford University (1980), and the Ph.D. in Electrical Engineering from Duke University (1985).

Chris Rozycki, Chief Executive Officer of Potomac Fiber



Chris is CEO and Founder of Potomac Fiber, LLC and a Broadband Entrepreneur with over 30 years of experience in the telecom/broadband sector. Born, raised, and educated in the Northern Virginia/DC area, he has a BA in Economics from Georgetown University and a MA in Economics from George Mason University. Chris's experience includes positions at AT&T, and with competitive Telcos and Broadband companies like TelCove, ITC^DeltaCom, and Carolina Broadband at the VP level. Most recently, he served as Director of Telecommunications for the State of South Carolina (ORS). He has helped launch new telecom companies and has testified as an expert telecommunications witness in 13 states.

Brent Skorup, Senior Research Fellow in the Technology Policy Program at the Mercatus Center at George Mason University, Arlington County resident

Brent Skorup is a Senior Research Fellow in the Technology Policy Program at the Mercatus Center at George Mason University. His research areas include wireless policy, new media regulation, telecommunications, and driverless cars. He serves on the FCC's Broadband Deployment Advisory Committee and is the vice chair of the Competitive Access subcommittee. Brent has authored pieces for law reviews, *National Affairs*, *The New York Times*, *The Chicago Tribune*, *Wired*, *Reuters*, *Reason*, and elsewhere.

Brent has a BA in economics from Wheaton College and a law degree from the George Mason University School of Law, where he was articles editor for the *Civil Rights Law Journal*. He was a legal clerk at the FCC's Wireless Telecommunications Bureau and at the Energy and Commerce Committee in the US House of Representatives. Before joining Mercatus, he was the Director of Research at the Information Economy Project, a law and economics research center.

Deb Socia, Executive Director of Next Century Cities

Deb Socia is the Executive Director of Next Century Cities, a nonprofit membership organization that strives to support community leaders across the country as they seek to ensure that all have access to fast, affordable, and reliable Internet. More than 180 cities strong, Next Century Cities is committed to celebrating city successes, demonstrating the value of truly high speed broadband, and elevating the importance of next generation broadband as essential infrastructure.

Appendix IV
ConnectArlington Smart Roads Sandbox
Brent Skorup

Proposal: Use ConnectArlington as a "Sandbox" for Smart-Road Startups and Companies

Background

"Smart roads" and "connected cars" are large and growing fields drawing investments from device companies, artificial intelligence companies, cellular operators, auto manufacturers, transportation startups, and national and state governments. Smart roads are data networks and roadside infrastructure that will power everything from infotainment (like WiFi in a moving car) to video recording of driving for insurance purposes to remote-controlled steering of driverless cars.[1] Many connected applications can be provided via conventional 3G and 4G wireless networks but companies are looking for roadside infrastructure and devices for dedicated, higher-bandwidth transportation uses. Fiber-connected poles and "street furniture"—which ConnectArlington offers—allows companies to deploy roadside devices (like cameras and sensors) in order to test their applications.

Providing supplementary information for driverless car systems, like the presence of road construction miles ahead, is one commonly-cited use of roadside units but there are others. Companies could test other vehicle-to-infrastructure uses. Currently, for instance, there is a split between "DSRC" and "cellular V2X" and no one knows which technology will become dominant (think: VHS-Betamax). Both technologies could benefit from more real-world testing. Roadside sensors could also be used for pushing real-time mapping updates, public transit improvements, or dynamic parking fees. Then there are more exotic purposes like remote-controlled steering of driverless cars when the driverless systems need assistance.

I. Upsides

ConnectArlington is a uniquely valuable opportunity.
It's the rare city that can offer ROW access, a fiber network, and an ITS network. A company focused on roadside device development probably won't be turned off by ConnectArlington's notable limitations. Transportation and smart road companies may actually view some of these limitations (a non-Internet connected network, few laterals, nodes around major roads but not in many residential areas, etc.) as a benefit.

ConnectArlington, via its location, also offers "soft" factors to transportation startups and companies like high quality-of-life, proximity to DC and USDOT, and an educated workforce.

[1] https://spectrum.ieee.org/cars-that-think/transportation/self-driving/ces-2018-phantom-auto-demonstrates-first-remotecontrolled-car-on-public-roads

Wide variety of potential users.
This is a relatively new area for real-world testing so there are many companies and startups with possible interest, including device companies, ITS companies, auto companies, mapping companies, and artificial intelligence companies. There are some smart road testbeds and pilots in cities, including in Atlanta, Austin, and Singapore, but it is still early days for smart road applications.

Federal funding available (possibly).
There are at least two possible sources of federal funds for smart road infrastructure. Both the National Highway Performance Program[2] and the Surface Transportation Block Grant Program[3] fund of "infrastructure-based" capital improvements to ITS systems like the one Arlington has.

Richmond has encouraged cutting-edge transportation projects.
Governor McAuliffe "spen[t] the last nine months of his term trying to make Virginia 'the capital of automated vehicles'" and boasted last year of Virginia's light-touch approach towards driverless cars.[4] Arlington County could also leverage the acquired knowledge from the Virginia Tech Transportation Institute's smart roads and "connected corridors" pilot programs[5] and their experts (VTTI has over 475 employees).

II. Downsides

Privacy concerns from the public.
Some drivers and pedestrians may oppose always-on cameras and sensors and data collection.

Requires outreach to nontraditional commercial partners.
There are many companies testing and investing in smart road technologies but it's hard to know which ones would most be interested in real-world testing in a place like Arlington. Many companies are startups and many are international and may be difficult to identify and vet.

Novelty.
Without consulting companies, it's hard to know how much commercial interest ConnectArlington would attract. Further, many of these systems use cutting-edge technology and applications and there's little precedent for the County to look to.

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[2] National Highway Performance Program ($22.8 billion in FY 2017). Funding for:
> Infrastructure-based intelligent transportation systems capital improvements, including the installation of vehicle-to-infrastructure communication equipment.

23 USC 119(d)(2)(L)

[3] Surface Transportation Block Grant Program ($11.4 billion in FY 2017). Funding for:
> Construction of . . . infrastructure-based intelligent transportation systems capital improvements, including the installation of vehicle-to-infrastructure communication equipment.

23 USC 133(b)(1)(D)

[4] https://www.washingtonpost.com/local/trafficandcommuting/virginia-wants-to-steal-some-of-californias-driverless-thunder/2017/04/23/a4bc6b54-206c-11e7-a0a7-8b2a45e3dc84_story.html?utm_term=.89888df510ba

[5] https://www.vtti.vt.edu/facilities/virginia-smart-road.html

Appendix V

Leveraging ConnectArlington to Reduce Commercial Vacancy Rates Analysis

Background

Arlington County has installed a fiber optic network for its own use, which includes fiber capacity designated for long-term expansion, but not currently required by the County. This network is referred to as ConnectArlington. The County has made the additional "excess" dark fiber capacity available to third parties and the business community (via licensing) to enable high-speed, secure data transmission. The County anticipated that this dark fiber would support economic and community development. To date, the current business model has not been effective in reaching ConnectArlington's potential level of success. Ultimately, the goal is for Arlington County to be able to provide a platform for economic growth and innovation through ConnectArlington (CA).

Arlington County Government's Department of Economic Development (AED) is tasked with stimulating economic growth in the County by leveraging County features and services that make the area a competitive location that attracts and retains businesses. The trending high vacancy rate of commercial properties is generating a negative impact on the County's tax revenue, and causing AED to look for new and innovative ways to address the vacancy rate challenge.

The connectivity infrastructure of an office building is critical to current and prospective tenants and they are generally willing to pay more for better broadband service. Universally, the message from tenants is clear: technological infrastructure and connectivity are far from afterthoughts – they're priorities for companies seeking office space, now and in the future. As the County looks to lease excess dark fiber capacity on ConnectArlington to innovative and entrepreneurial Broadband Service Providers ("BSPs") so they, in turn, can offer internet service and data connectivity over the ConnectArlington fiber network, there is also an opportunity to help these BSPs and AED find underserved commercial properties with strong candidate customers who occupy space in buildings that are not well served by competitive BSPs. These commercial property owners and their tenants could benefit from more choice in broadband service, diversity of options, redundant connectivity, and more responsive customer care.

Overview

The goal of this project was to identify commercial properties with high vacancy rates, large leasable square footage and few existing high-speed data service options that are also near the ConnectArlington fiber network. This information will be provided to AED and any BSP that licenses dark fiber over ConnectArlington. The goals include identifying the commercial buildings (and their owners and tenants) near the county's excess dark fiber and most in need of the additional connectivity options. This data can be used to enable beneficial use of the

latent dark fiber asset while helping to reduce commercial vacancy rates and promoting an innovative technology economy in the County.

Deliverables

1. Compiled ConnectArlington fiber data and map
2. Compiled commercial property data including use, size, age, leasable capacity, leased capacity
3. Calculated proximity of all commercial properties to ConnectArlington fiber network (in estimated feet "as the crow flies" as a proxy for true distance/costs to connect)
4. Analysis – list of properties that meet various criteria, ability to adjust the criteria

Datasets Used

- Commercial buildings, commercial use (e.g., office, retail), vacancy rate, total leasable square footage, total leased square footage, year built, owner, management company
- Competitive (non Verizon) fiber connectivity options for all commercial properties
- ConnectArlington excess fiber capacity map/locations
- Estimated distance, "as the crow flies", to ConnectArlington dark fiber (calculated)

Summary of Key Findings and Highlights

- There are approximately 330 commercial office buildings in Arlington County
- The average vacancy rate in these buildings is 19.1% (as of April 18, 2018), an increase from 18.1% in April 2017
- Each 1% change in office vacancy rate equates to $ 3.4 million in annual tax revenue for Arlington County
- 40 buildings have a vacancy rate of 40% or more
- 60% of the 330 buildings have no competitive, fiber based service provider options (i.e., they are only served by Verizon)
    - This 60% of buildings has an average vacancy rate of 38%
- 25% of the 330 buildings have multiple (2 – 6) competitive fiber based providers
- Zayo is the largest "competitor" to Verizon and they have fiber connectivity to 66 buildings
- Other competitors include: Comcast (58 buildings connected), Pilot Fiber (51), Level 3/CenturyLink (50), Atlantech Online (27), Fiberlight (19), Lightower/Crown Castle (18), Cogent (10), Windstream/Broadview Networks/cavalier (12), Cox (3), Yellow Fiber (3), RCN (1).
- These commercial buildings are a median distance of approximately 217 feet from CA dark fiber, with the closest being approximately 12 feet away and the furthest being approximately 3,307 feet away