WHITE PAPER

ADSS Advantages Over Strand and Lash Fiber Cables for Building an Electric Utility Network

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ABSTRACT

All-dielectric self-supporting (ADSS) fiber cables provide advantages over strand and lash fiber networks for electric utility applications in many cases. Some of these advantages to ADSS cables include:

- No metallic components – can install in supply space and grounding is not required
- Little to no "make ready" costs
- Lower hardware costs
- Speed and ease of installation
- Minimal long-term maintenance
- Longer expected design life

In most scenarios, these advantages lead to a lower total cost for the electric utility. This paper will further explore some of the advantages of using ADSS cable, as opposed to a strand and lash fiber cable for aerial electric utility applications.

INTRODUCTION

Electric utility companies are faced with a dynamic energy landscape that brings increasing complexity to upgrading the electrical power grid. Industry trends and developments pose what can be seen as both challenges and opportunities for these companies. Today's Emerging Grid is a highly distributed, bi-directional mesh network that is designed to address this dynamic energy environment.

As electric utility companies are considering expanding or starting fiber networks and enhancing their power grids, there are two primary alternatives for aerial fiber cables, both of which AFL manufactures: steel messenger wire supported (strand and lash) loose tube fiber optic cable and all-dielectric self-supporting (ADSS) fiber optic cable.. ADSS cables can span pole to pole without the need of a messenger support, while the strand and lash methodology lashes a fiber cable to a messenger wire for support between poles.

Whether the utility is using the fiber system for internal supervisory control and data acquisition (SCADA) or a revenue generating fiber-to-the-x (FTTx) solution, there are a number of considerations when deciding between these two fiber cable methods. Each application and system is unique, but in many cases an ADSS cable is advantageous to a strand and lash cable for both cost and convenience.

POLE PLACEMENT FLEXIBILITY

ADSS cable is all-dielectric, which means that it does not contain any metallic components. Due to its dielectric nature, utilizing ADSS cables eliminates safety concerns since installers don't have to worry about overhead lines inducing a charge to any metallic cable components. The National Electric Safety Code (NESC), the authoritative body that defines the aerial distribution pole line design and application rules, made significant changes related to the use of ADSS cables in the mid-1990s. At that time, new definitions of fiber optic cables and clearance requirements allowed the use of ADSS cables in the supply space of an aerial distribution pole. NESC section 235 defines that there is no clearance specified between ADSS cables and conductors. Installing an ADSS cable in the supply space offers a higher level of physical protection than a strand and lash cable installed in the communications space of an aerial distribution pole.

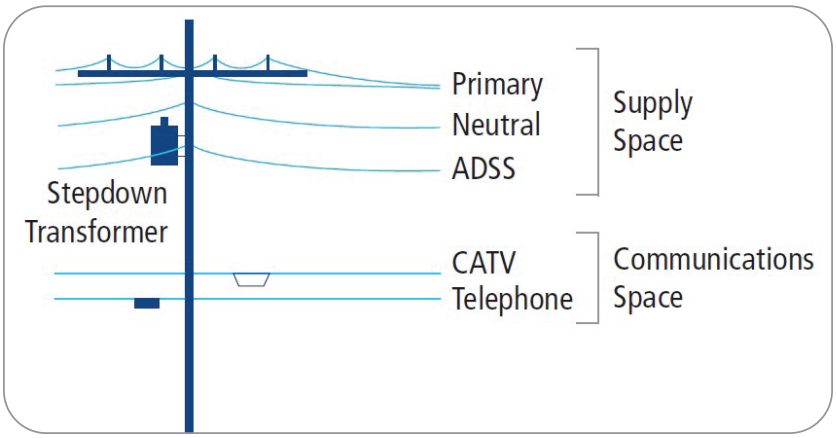

Figure 1: NESC Joint Use Pole Diagram. Depending on the location of the neutral, ADSS can go above or directly below.

MAKE-READY COSTS AND INSTALLATION

One of the biggest advantages of ADSS cable compared to strand and lash cable is that ADSS requires very minimal "make-ready" costs, which encompass the necessary steps to ensure a pole is primed for cable installation. These costs can vary but are typically much higher for strand and lash applications due to the need of guying existing structures, pole change-outs to maintain ground clearance, moving existing telecommunications cables, among many other potential changes. Make-ready savings from using ADSS in the supply space can generally be 15-20% of the total construction cost, although in some cases the savings can be even higher.

Figure 2: ADSS cable above neutral (left) and strand and lash cable installation (right).

Additionally, the reduced make-ready costs associated with ADSS cable installation can be closely linked to the flexibility in pole placement. ADSS cables, positioned higher on the poles to access the power supply space, minimize the need for pole change-outs to maintain ground clearance. By being elevated, these cables avoid many of the complexities associated with altering existing structures, relocating telecommunication cables, and requiring guying of poles, which are common requirements for strand and lash applications.

Speed of installation can be significantly improved for ADSS cables when compared to strand and lash loose tube cables. As its name indicates, ADSS is self-supporting, meaning it does not require messenger wire, which results in a more efficient installation. These cables are installed in a single pass, while strand and lash loose tube cables must be installed in two passes. Due to its quick installation, ADSS also offers a more cost-effective solution. The rapid deployment of these cables enables fast delivery to customers, achieving your return on investment.

Cable installation steps for each method are shown below.

ADSS Cable

- Pole "make ready" (pulley placement)
- Cable Installation
- Cable Sagging
- Hardware Attachment

Strand and Lash Cable

- Pole "make ready" (pole change out, guying, moving cables, etc.)
- Messenger Placement
- Messenger Pre-tensioning (creep)
- Messenger Hardware Attachment
- Cable Placement
- Lashing Wire Placement and Termination
- Bonding and Grounding

The two-pass installation method of strand and lash cables, as well as additional steps for bonding and grounding of the steel messenger, often result in installation rates that cause installations to take approximately twice as long when compared to ADSS cables. Even when considering higher skilled labor costs for qualified personnel (working in supply space), total installation costs can be lower in many cases for ADSS cable when considering installation speed. It should also be noted that "qualified" crews only require one Class A lineman on-site. Additionally, portions of the network, such as the splice enclosures, slack storage and multiport terminals, can be installed within the communications space without any need for specialized labor.

Total hardware costs are typically higher for strand and lash networks as well, due to an increase in the number of parts needed to support the cable. ADSS hardware is primarily just tangents and deadends, meaning that it requires fewer components and reels, which also accelerates the installation process. Some ADSS tangent hardware can be used in place of pulleys (sheaves) for installation, further increasing installation speeds and convenience.

LONG-TERM MAINTENANCE AND RELIABILITY

Long-term maintenance costs of ADSS cables are minimal. Annual route inspections and intermittent slack storage during the initial installation can further minimize long term maintenance costs from weather damage, road moves, and other factors.

If properly maintained, the design life of both ADSS and strand and lash cables are comparable. Compared to ADSS, which requires little to no maintenance, strand and lash requires regular maintenance to achieve the desired lifespan. Lashing wire needs to be repaired periodically to properly support the cable. Also, bonding and grounds degrade over time, which requires repair and upgrading for safety. Cable damage requires additional maintenance in the form of de-lashing to move spare cable to the damage point.

Figure 3: Loosening of lashing wire

ADSS cables should be designed for the span length and loading conditions of the application, which allows low strain on the fiber at the maximum operating tension. A strand and lash loose tube fiber optic cable relies on a steel messenger for support during its design life. The maintenance of the lashing wire is imperative because it is a crucial aspect in supporting strand and lash cables. Figure 3 is an example of where lashing wire is loosening, making the cable more susceptible to strain on the fiber. ADSS is seen as a more suitable choice due to its durability as it requires fewer rebuilds and replacements. Sustainability should be a key consideration for electric utilities who want to keep ongoing costs to a minimum.

Ice loading is another advantage for ADSS cables when compared to strand and lash cables. ADSS is a smaller overall diameter, with a circular cross section that loads less ice and more uniformly and results in less ice loading compared to strand and lash cable. Heavier ice loading affects the cables as well as the poles. The non-uniform ice loading of a strand and lash cable can make the cable more susceptible to wind loading issues and galloping on longer span lengths, especially in heavy ice loading areas.

ADSS cables can be designed for all kinds of environments, and AFL has manufactured ADSS cables that are capable of span lengths over 6000 feet. ADSS cables should be engineered to meet the strength requirements, environmental loading (ice/wind), and sag conditions to ensure that the cable does not fail, clash with other cables, or violate clearance requirements. AFL's engineering team can provide assistance in designing the correct ADSS cable for the intended application.

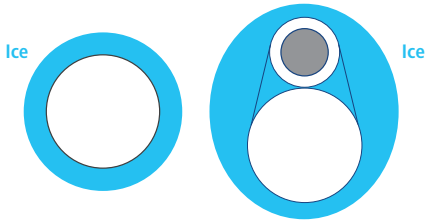

Figure 4— Ice loading comparison for ADSS cables to strand and lash or Figure-8 cables.

CONCLUSION

Due to the changing environments and increasing complexity of utilities, when an electric utility is considering adding aerial fiber optic cables to their system, it is important to understand the total cost of ownership. There are certainly scenarios where the total cost of ownership of a strand and lash loose tube cable is lower than an ADSS cable, such as over-lashing a cable to an existing and available messenger wire. However, in many situations, the total cost of ownership can see savings for an ADSS system in the 17-20% range with just the direct cost elements. Apart from these direct cost considerations, the preference for ADSS cable over strand and lash is also influenced by several other factors, including its lack of grounding requirements, training ease, extended service life and higher reliability.

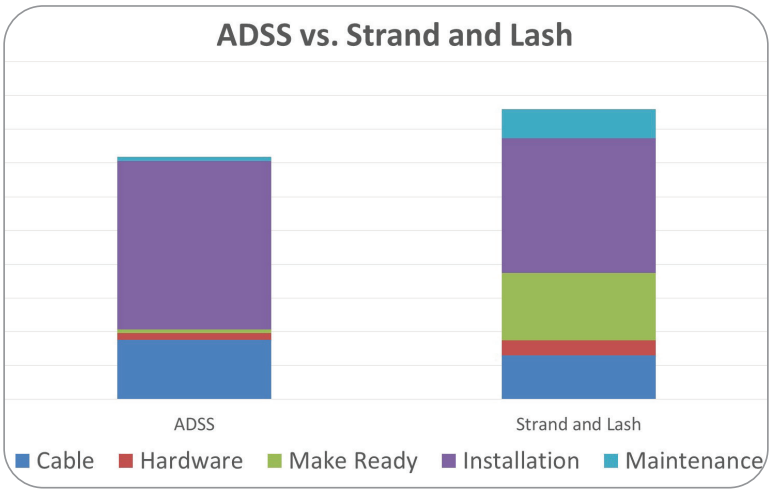

Figure 5: Graphical cost comparison ratio for ADSS verses strand and lash in new fiber builds. Although this is intended to be a general comparison, this scenario is for 100,000 feet of 72 fiber cable in a 500 foot max span length, NESC Medium loading condition.

BIO

Austin Farmer is the Solutions Manager for the Energy Market Applications Engineering team. Austin and the AE team provide support on all fiber optic cable, hardware and connectivity items for AFL's utility end users. Austin has more than 10 years of experience working with utilities and has been with AFL since 2016.

Carson Joye is a product manager at AFL. After more than 10 years at AFL, Carson has held various positions in manufacturing, applications engineering and product management. He has experience with electric utilities and internet service providers designing fiber optic solutions, supporting the installation of fiber optic cable networks in the field, training installers on the use of fiber optic cable and accessories and now overall product line responsibilities. He is an ETA certified Fiber Optics Installer and a certified FTTx outside plant designer. Carson holds a BS in Mechanical Engineering from Clemson University.

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