A cost effective solution for sustained overvoltage conditions on underbuilt circuits with UltraSIL™ UX arresters

Overbuilt construction is a common practice within the utility industry to alleviate requirements for right-of-ways when building new distribution or transmission circuits. This presents an opportunity for sustained overvoltage conditions to occur on underbuilt circuits in the event of contact between different operating voltages.

Vehicle damage to structures, interference from tree limbs, and natural events such hurricanes, tornadoes, and ice storms are a few of the leading causes for contact between circuits. These overvoltage events represent significant costs to the utility, including replacement of damaged equipment and additional insurance coverage on damages to customer appliances and electronics.

Historical solutions

Traditional means of protecting underbuilt circuits have proven to be expensive, and in some instances cost prohibitive based on the frequency of sustained overvoltage conditions. Solutions such as relocating underbuilt construction to underground circuits or conversion of underbuilt circuits to the same operating voltage carry significant costs. These costs can include material, labor, and equipment in addition to the numerous obstacles for obtaining easements for new construction. Utilities may also choose a "do nothing" approach and allow the insurance company to pay for damages, which may represent several hundred thousand dollars depending on the number of customers affected. Unfortunately, none of the above solutions address the necessity for a reliable and cost effective solution to sustained overvoltage conditions on underbuilt circuits.

A new approach

Dominion Virginia Power (DVP), developed an innovative solution for mitigating overvoltage conditions on underbuilt circuits, which is both simple and cost effective. DVP installed Eaton's Cooper Power series extra-high energy UX arresters throughout several beta sites as conciliatory devices to protect underbuilt circuits from dangerous overvoltage conditions. The strong, extra-high energy UX arresters provide two very important functions for this application. First, the arrester serves as a voltage controlled switch to clamp the voltage below 2.0 PU based on the ITIC* curve, which is a voltage tolerance curve applicable to electronic equipment. In addition, the UX arrester fails short during the first fault condition and remains physically in-tact for two subsequent operations

Photo courtesy of Dominion Virginia Power

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of the switching device. In order for this solution to work properly it is crucial for the UX arrester to remain in-tact to prevent the underbuilt circuit from being energized at the higher system voltage. Because of this, distribution arresters are not suited for this application. The UX arrester exceeded all performance requirements throughout several beta trials at DVP while significantly increasing insulation levels for the underbuilt circuit.

Progressive products

Capable of withstanding severe electrical-mechanical conditions, and uniquely suited for the demands of distribution underbuilt applications, our polymer UltraSIL-housed, extra-high energy UX station-class arrester incorporates a patented manufacturing process. This process utilizes revolutionary high strength composite matrix insulating materials to encapsulate the arrester's internal components. The primary function of the composite matrix to provide structural integrity for the arrester in the event of failure.

Eaton has established rigorous dielectric testing, which surpasses even the most severe tests required by the IEEE C62.11™-2005 design standard, including a short-circuit rating of 65 kA. In addition, our UX design has demonstrated the capability of withstanding three separate short-circuit conditions in excess of 6 kA or greater for time durations up to 0.8 seconds during several beta trials at Dominion Virginia Power. Enhanced durability and reliability reinforce the extra-high energy UX station-class arrester as the product of choice for overbuilt applications.

Installation considerations

Special considerations must be given for prevention of external flashovers of the arrester due to interference from wildlife or contact with tree branches. Aftermarket wildlife protectors are available to insulate the line connection to the arrester.

Station-class arresters are not designed with Ground-Lead-Disconnects (GLDs) so Faulted Circuit Indicator's (FCIs) may be used to help locate failed UltraSIL station arresters if required.

Additional information

To learn even more about underbuilt arresters and arrester applications, please see the articles listed.

The underbuilt line arrester[1]
www.arresterworks.com/arresterfacts/pdf_files/underbuilt_line_arrester.pdf

When overbuild meets underbuild[2]
www.tdworld.com/overhead-distribution/when-overbuild-meets-underbuild

Contact your local representative for further assistance sizing UltraSIL UX extra-high energy polymer station arresters, and additional guidelines for optimum placement of arresters to protect the underbuilt circuit.

Eaton delivers reliable solutions for even the most extreme applications.

Completion of bending moment test per IEEE C62.11 design

UltraSIL™ UX arrester

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*Information Technology Industry Council (ITIC)

[1]ArresterWorks.com, May 11, 2009, By Jonathon Woodworth, Consulting Engineer Arrester Works

[2]Transmission and Distribution World, Mar 1, 2011, By Daniel J. Ward, Dominion Virginia Power

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