The Utility Industry and Arc-Flash Hazards

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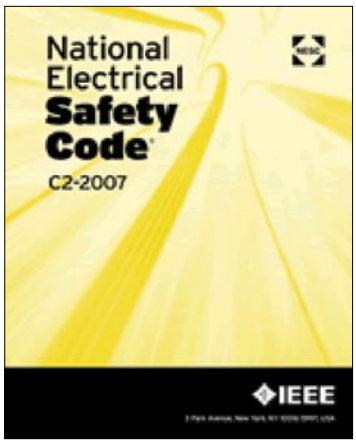
Every industry in the United States has been struggling to meet the requirements of NFPA 70E, except the utility industry. This just doesn't sound right. According to the US Bureau of Labor Statistics for the period from 1992-2002, 3,378 workers died from on-the-job electrical injuries with electrocution accounting for 99.1 percent of those deaths. Contact with overhead lines was the cause of 42 percent of those on-the-job deaths. Further, an additional 46,600 injuries were attributed to electrical incidents. With those statistics, why wouldn't the utility industry, the industry that works with electricity more than any other industry, be forced to comply with the standard entitled *Standard for Electrical Safety in the Workplace*?

The discussion above is somewhat misleading since it implies that the utility industry is not supporting safety in the workplace. In fact, the utility industry has been diligently addressing electrical safety issues in the workplace throughout its history. However, the utility industry doe not use the National Fire Protection Associated (NFPA) standards as their industry consensus standard for electrical safety. The utility industry uses the Institute of Electrical and Electronics Engineers, Inc. (IEEE) standard C2, which is entitled the National Electrical Safety Code (NESC). The NESC can trace its origins back to 1913 and work at the National Bureau of Standards. In 1970, the standards were effectively separated into NFPA's National Electrical Code (NEC), or NFPA 70, the standard for general industry design and construction and the NESC, the standard for utility and communication industry design, construction, operation, and maintenance. Ultimately, NFPA 70E was developed to accommodate the general industry requirements for operation and maintenance activities as a companion document for NFPA 70. The sponsoring institutions, NFPA and IEEE, are fiercely independent in the development of standards, yet cooperative and even collaborative in implementing consistent requirements for electrical safety.

The Occupation Safety and Health Association (OSHA) has accepted this independence since its inception in 1970 in that it has separate subparts of its standards, 29CFR1910, dedicated to these industries. The utility industry electrical safety requirements are found in 29CFR1910, Subpart R (1910.269), while the general industry electrical safety requirements are found in 29CFR1910, Subpart S (1910.303-308 and 1910.331-335). These subparts are interrelated to some degree in that compliance with 1910.269 is required for "equivalent installations of industrial establishments" with respect to installations similar to generation, transmission, and distribution installations of the utilities.



As clarification, utilities are required to meet NFPA 70E requirements for some of their facilities (i.e., warehouses, office complexes, etc.). This includes the requirements associated with arc-flash analysis, personal protective equipment (PPE) requirements and special precautionary techniques pro-

vided within NFPA 70E. However, given the above discussion, it is true that utilities are not required to comply with NFPA 70E requirements for their generation, transmission, and distribution systems. These requirements can be found in the NESC (ANSI/IEEE C2-2007). The NESC, Section 41, includes employer and employee conduct with respect to electrical hazards of electric shock and arc flash. Specific to arc-flash hazards, NESC, Section 410A3 states:

"Effective as of January 1, 2009, the employer shall ensure that an assessment is performed to determine potential exposure to an electric arc for employees who work on or near energized parts or equipment. If the assessment determines that a potential employee exposure greater than 2 cal/cm^2 exists, the employer shall require employees to wear clothing or a clothing system that has an effective arc rating not less than the anticipated level of arc energy."

For circuits in excess of 1000 V, the NESC, Section 410A3, further delineates clothing requirements based on voltage level, fault current, and fault clearing times through its Tables 410-1 and 410-2. The standard further states that:

"When an arc-flash analysis is performed, it shall include a calculation of the estimated arc energy based on available fault current, the duration of the arc (cycles), and the distance from the arc to the employee."

For circuits which are less than 1000 V, applicable work rules and engineered controls are required to limit worker exposure to arc flash, particularly since it is noted and recognized that arc-energy levels with secondary systems can be excessive. At a minimum, clothing with a 4 cal/cm^2 arc rating should be used.

With these NESC requirements in mind, it is paramount that the utility industry perform arc-flash analyses for their facilities, particularly those facilities which include electrical circuits where arc-energy levels can be excessive. Arc-energy levels are somewhat affected by voltage levels; however, arc-energy levels are a function of available fault current and fault clearing times. For many transmission and distribution systems, typical fault currents are in the range of 10 to 15 kA, but experience in performing arc-flash analysis dictates that fault currents in excess of 50 kA can be found with lower voltage distribution systems (i.e., less than 1000 V) such as is found supporting equipment within generation facilities. In many cases, these arc-energy levels can exceed 40 cal/cm^2. At a minimum for the utility industry, generation facilities should be analyzed to determine employee exposure to arc-flash hazards. Subsequent to these analyses, appropriate clothing system requirements can be identified and implemented so that the requirements of NESC 410A3 can be met.

Although the utility industry is only required to meet NFPA 70E requirements for its warehouses and office complexes, the utility industry is required to meet the comparable NESC requirements for its transmission, distribution, and generation facilities. NESC requirements include the assessment of arc-flash hazards for these facilities. Generation facilities include lower voltage electrical infrastructure which is recognized as being susceptible to having excessive arc-energy levels. Therefore, it is highly recommended that the arc-flash hazard assessment include a detailed arc-flash analysis of their generation facilities. The arc-flash hazard assessment shall be used to determine and minimize employee exposure to arc-flash hazards through the appropriate application of PPE and special precautionary techniques.

As Operations Manager of ESCO Energy Services Company, Lynn brings over 25 years of working knowledge in design, permitting, construction, and startup of mechanical, electrical, and instrumentation and controls projects as well as experience in the operation and maintenance of facilities.

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