

- + Improve Safety
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- + Selective Instantaneous
- + Avoid Hazard Area
- + Increased Security

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## Relay and Metering Upgrades

### Faster Detection Adds Safety

#### Improved Safety

On average, five to ten people are injured every day in the US as a result of arc flash burns. The intensity of an arc flash is measured by incident energy which is a calculation that determines the Hazard Risk Category and PPE requirements for personnel working on affected electrical equipment. Because incident energy is directly proportional to the total arcing time, most strategies for arc flash mitigation focus on faster detection and clearing times of the arc flash. The two main components of this time are the protective relay and the circuit breaker interrupting times. By interrupting the arc flash energy wave early, the hazard to personnel can be greatly reduced.

#### Arc Flash Detection

The purpose of detecting the arc flash is to minimize the time needed to trip the circuit breaker and interrupt the fault. The light emitted during an arc flash event is significantly brighter than normal substation light. Therefore, the initial light surge from an arc flash can be easily detected using modern fiber optic light detection sensors. During an arc flash event, fault current travels from the source, through the arc flash, and in to the ground. Shortly after the fault current begins, the arc flash produces a very bright flash of light, which the relay's light sensor picks up. Sensing the flash and the overcurrent condition simultaneously, the relay issues a trip signal to the circuit breaker in as fast as two milliseconds to clear the fault. **CONT**

# Substation Metering Upgrades | Faster Detection...

## Reduce Arc Flash Energy

Arc flash energy is a function of three factors: the amount of available fault current, the distance from the electrode, and the duration of the arc. By reducing the time it takes for the fault to be interrupted, the arc flash energy can be significantly decreased. Adding new arc flash detection technology to a feeder protection relay dramatically reduces the time it takes for the relay to detect and send a trip signal to a circuit breaker, thereby interrupting arc flash current in as fast as two milliseconds.

## Selective Instantaneous

While the best way to reduce arc flash hazards is to work on de-energized equipment, another solution that protection engineers have implemented to improve personnel safety is selective instantaneous. This is a switch, usually located on the relay, that while activated changes the relay settings to disable the time coordination and allow the breaker to trip without and delay. This is a cost-effective scheme that can usually be added to existing installations and reduce arc flash energy and improve worker safety.

## Avoid the Hazard Area

NFPA 70E, Standard for Electrical Safety in the Workplace, has defined three approach boundaries (limited, restricted, and prohibited) required to be observed in order to reduce risk of injury to workers from arc flash hazards. Technology can offer several ways to reduce the category 4 PPE required to work these hazard areas. Reducing the PPE requirements can make working in these areas much safer and more productive. Modern relays with ethernet or serial communication can gather maintenance information remotely and often times eliminate the need all together for personnel entering the hazard area.

## Increased Security

By combining both highspeed overcurrent protection and light detection technology the security of the system is enhanced due to parallel action of two separate protection systems. This dual protection eliminates nuisance trips that could result from non arc flash sources. **NATL**

