ABB Power Consulting & Incident Energy Analysis

EEI Breakout Session – Arc Flash Safety Compliance

October 15, 2018
Where it all starts

SAFETY FIRST
Hazards Involved in Working On or Near Energized Electrical Equipment

Dangers associated with working on or around exposed energized conductors or parts:

**Electrical shock**  -  Becoming part of the circuit.

**Arc Flash**  -  The violent release of superheated gases caused by an electric arc.

**Arc Blast**  -  The blast effects from the pressure wave associated with an arc flash occurrence.

**Shrapnel**  -  Ejection of projectiles or bits of metal.

**Noise**  -  From initial explosive expansion of air.
Energized electrical equipment causes

>150 DEATHS annually in the US

>1500 Injuries in US caused by improper contact with energized electrical equipment

$15M Potential loss to businesses in direct costs and production time as a result of energized electrical equipment

View Sources
Arc flash by the numbers

1. U.S. statistic cited by CapSchell, Inc. in a study for the Electric Power Research Institute, 1999

$16mm
Average costs for each arc-flash incident

5 injury types: burns, blindness, hearing loss, concussions, shrapnel

1-2 deaths per day

8 Arc flash explosions per day

A low probability but high cost event
The Arc Flash Hazard

Shock Wave

- < 740 mph
- Copper Particles

Radiation Wave

- 15000 °C (165 db)
- 1000 °C (Visible, UV, IR)

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Activities which Involve Arc Flash Risks

- Racking in or out of drawout circuit breakers.
- Removing or installing circuit breakers or fuses.
- Working on control circuits with exposed energized primary parts.
- Applying safety grounds.
- Removing panel covers for inspections or other activities.
- Low voltage testing and diagnostics.
110.16 Flash Protection.

Electrical equipment, such as switchboards, switchgear, panelboards, industrial control panels, meter socket enclosures and motor control centers, that is in other than dwelling units and is likely to require examination, adjustment, servicing, or maintenance while energized shall be field or factory marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.
Data we need to perform a study

Utility Transformer Data
(Size, Primary Voltage, Secondary Voltage, Impedance)

Utility Transformer Primary Protection

Utility Impedances Values

Both of these are needed to calculate the Arc-Flash value on the primary side of the service entrance equipment.
# Incomplete Data Often Received from Utilities

<table>
<thead>
<tr>
<th>Data Received</th>
<th>Issue with the Incomplete Data</th>
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<tbody>
<tr>
<td>Short Circuit current on the transformer secondary using infinite bus.</td>
<td>Currents are artificially higher causing the customer to buy equipment with a higher short circuit withstand rating than necessary.</td>
</tr>
<tr>
<td>Short Circuit current on the transformer secondary using infinite bus.</td>
<td>The higher currents could cause the calculate Arc-Flash values to be lower than in reality. The higher currents could mathematically allow the protective devise to open quicker than reality, which will lower the Arc-Flash value. This put electricians at risk.</td>
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<tr>
<td>A typical transformer impedance value</td>
<td>Unless the typical impedance value is close to the actual value, the short circuit current will be artificially higher or lower than actual, which will make the Arc-Flash values artificially higher or lower than actual.</td>
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<tr>
<td>Not supplying the utility protective device</td>
<td>The utility impedance and the utility protective device is needed to calculate the Arc-Flash value on the service entrance equipment.</td>
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</table>
ABB focuses on Arc Flash Solutions to create effective and efficient solutions for you in the areas of:

- Safety - Arc flash mitigation – PSS
- Reduce Operating Costs
- Improve Productivity
Appendix
ABB has dedicated Power Systems Engineers to support Incident Energy Analysis and Remediation Projects.
ABB Power Consulting Resources

Our global presence

- **175+** employees
- **1,000+** reference projects throughout the world
- **3 main** regional hubs with **8 main** offices throughout the world
- **30+** years of experience and knowledge

ABB Power Consulting has a unique global team with local presence everywhere.
Incident Energy Analysis (aka Arc Flash Study) Solutions

Helping our partners enact safety and compliance

1. Assessing the risk
   - Update or review current study
   - Recommend changes for compliance & increased safety
   - Supply and apply new warning labels

2. Providing solutions
   - Develop and conduct employee training
   - Safety related upgrades
   - Multi-site partnerships

Understanding 2018 NFPA 70E Changes
Incident Energy Analysis

1. **Customized for each site:**
   - Single-line diagram (development if needed)
   - Incident energy analysis (aka Arc Flash Study)
   - Site safety electrical plan

2. **Recommend changes for compliance and increased safety**

3. **Employee NFPA70E training**
   - 8 Hr – Electrical Safety and NFPA 70E for Qualified Individuals
   - 4 Hr - Fundamentals of NFPA70E

4. **Apply new warning labels as required**