

# Arc flash

## Analysis of incident energy and recommendation of proper personal protective equipment

### At a glance

Arc-flash and shock incidents are major sources of severe employee injuries in the electrical industry. An arc flash is caused by short circuits over the air or other gases which create plasma of heated gas, melted conductors and small shrapnel. These short circuits lead to plasma flashes to other conductors and equipment, as well as the workers standing nearby.

Siemens Power Technologies International (Siemens PTI) analyzes all kinds released energy levels in any feasible arc-flash incident in electrical power systems. With the aid of electrical system calculations based on national and international standards, Siemens PTI consultants identify the arc current and incident energy released during an arc flash. Siemens PTI provides solutions and recommendations for:

- proper personal protective equipment (PPE) for employees working on live equipment
- safety boundary distance for electrical equipment
- optimization of short-circuit level and protection relay settings to achieve lower / targeted PPE levels

### The challenge

An electrical power system is to operate in a safe manner at all times. However, no matter how well designed the system is, faults are feasible to happen during operation or maintenance work on or near live equipment.

There is a high risk for severe injury or even death for employees exposed to arc flashes resulting from such faults. To reduce the risk of personal injury, electrical equipment must be well designed. In addition, employees should wear proper PPE during work.

Minimization of risk for employees depends on a proper coordination of the short circuit level in a plant, the protection relay settings, the calculation of the arc-flash incident energy and the identification of the proper PPE for employees.



Figure 1: Working on live equipment

### Our solution

The Siemens PTI team consists of highly skilled experts on all aspects of power system calculations and simulations. By linking short-circuit calculation and protection relay coordination, they identify proper PPE for employee security during work on or near live equipment and determine the safety distance for equipment under maintenance or operation.

Siemens PTI provides:

- support during data collection from the study experts
- a close link between all departments involved in electrical system planning

All Siemens power system simulation tools consider the latest national and international standards for arc-flash calculations. Siemens PTI provides customized PPE equipment labeling, meeting the customer requirements as well as the IEEE and NFPA standards. Additionally, Siemens PTI offers an optimization of the respective power system to achieve a lower risk class.

### Arc-flash study step-by-step

After gathering all necessary data, two studies are required before an arc-flash analysis can be performed: short-circuit calculation and protection coordination. On the basis of these results, the arc-flash energy can be calculated and the required PPE can be defined. In a final step, the required labeling for the plant is generated. Figure 2 shows a schedule of a typical arc-flash study.

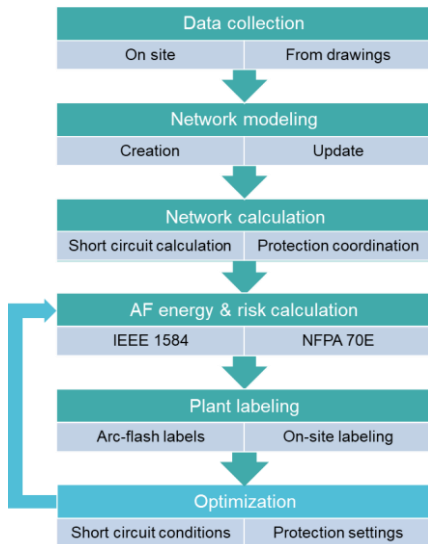


Figure 2 Steps in a typical arc-flash study

### Application examples

#### Example 1: Existing plants

Once in a while, parts of existing electrical equipment are changed or replaced. During the planning, several studies are performed. Arc-flash analysis should be part of this package. Following changes to the equipment, an arc-flash analysis should always be per-

formed to determine the new incident energy and the required PPE.

Siemens PTI services include:

- integrated load-flow, short-circuit, protection and arc-flash analysis
- recommendations for power system design

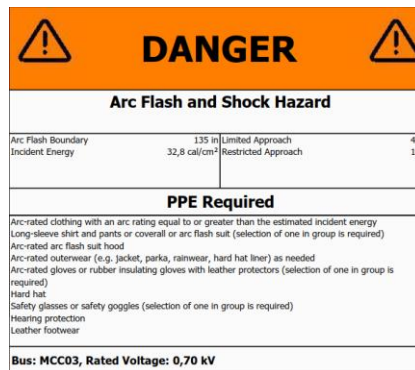


Figure 3 Arc flash label

#### Example 2: Optimization of existing equipment

Sometimes the design of a plant needs to be changed in order to make it possible to work on or near live equipment. In this case, all fields influencing

the arc-flash energy need to be adapted.

Siemens PTI services include:

- analysis of existing equipment
- recommendations for switching configurations
- recommendations for protection settings
- optimization of plant design regarding arc-flash risk

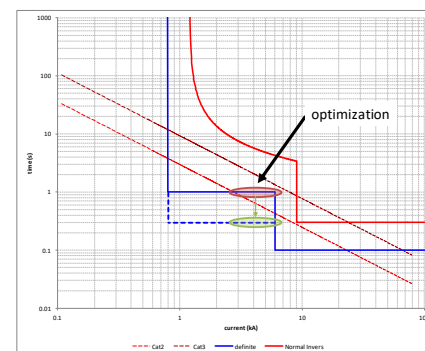


Figure 4 Optimization of equipment

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