Operators of electrical installations must balance the inherent safety risks with the risks introduced by potentially burdensome protective equipment.

Owners and operators of electrical installations must comply with the requirements of their national standards for safety, for example the health and safety at work act and the electricity at work regulations in the UK. However in EU countries there is no specific legislation or standards for arc flash hazard analysis and protection.

EN 50110-1 - Operation of electrical installations recognises the need for live working (or working adjacent to live conductors) to take place and requires the use of appropriate Personal Protective Equipment (PPE), suitable for the locations and conditions where personnel are working. Whilst the use of PPE is considered to be the ‘last resort’ it is still necessary to establish the extent of the arc-flash hazard so that flash protection boundaries are established and that the appropriate type of PPE is selected. In the absence of specific EU guidance for this type of assessment, American Standard IEEE 1584 - guide for performing arc-flash hazard calculations can be used as the reference document.

Two fundamental building blocks are required to produce an arc-flash study.

- An electrical system short circuit study, identifying short circuit currents at switchboards and MCCs throughout the electrical system
- An electrical protection study to identify anticipated fault durations

Using the outputs of these two studies, arc-flash hazard calculations can be performed to determine incident energy levels and flash protection boundaries.

What we offer
ABB works with clients to determine the most appropriate type of study for their needs and then undertakes the study. The output provides equipment labelling and appropriate categorisation of personal protective equipment.

ABB engineers carry out site visits and surveys to gather the information required to build an electrical system model, ready for further analysis. The survey stage typically captures details of declared fault levels at source, transformer characteristics, cable types and lengths, characteristics of embedded generation (diesel generators / gas turbines etc.) and switchgear specifications. Details of existing protective devices and settings are also recorded for input into the system model.
Using Industry standard software (DiGISENT, Amtech) ABB can model electrical systems to evaluate fault levels and the coordination of all the installed protective devices. System voltages, from 110V AC instrumentation circuits, up to 36kV AC and beyond can be accurately modelled. The outputs from these studies are then used to calculate arc-flash incident energy and flash protection boundaries. The system model can be configured to accommodate multiple modes of operation, with more than one source in operation, and/or bus section switches open or closed. This allows worst case scenarios to be identified for hazard calculations.

Further analysis can be undertaken to identify possible alterations to the electrical system to reduce the arc-flash hazards. This may be by adjusting protection settings or by the introduction of fault limiting devices to reduce the incident energy. Arc detection systems can also be installed, within switchgear, to achieve extremely fast disconnection times on the occurrence of an arc.

ABB can use the IEEE 1584 calculators to establish any requirements for PPE, based on the recommendations of NFPA 70E (2012) - Standard for electrical safety in the workplace.

Benefits
Knowledge of safe working distances and labelling of equipment enables personnel to carry out operations safely using the appropriate personal protective equipment. Arc-flash studies are a means of ensuring that industry best practice is applied to maintenance and operation procedures.

Further benefits arising from this type of study are:
- Up-to-date electrical system model
- Up-to-date electrical system drawings
- Validation of switchgear against fault levels
- Validation of electrical protection system coordination

Why ABB?
ABB has a wide range of practical design and operations experience on almost every type of industrial system. We have considerable experience of surveying electrical systems and of producing electrical system models, including fault level studies and protection coordination studies. Arc-Flash studies are a natural progression of these and ABB have the capability to produce these efficiently for our clients.