



# Increased Service Continuity

## Low voltage ground faults in generating plants

### *Safety, Reliability and Continuity*

*Utility generating plants are home to large arrays of low voltage (LV) electrical distribution and control apparatus that are vulnerable to the effects of high fault currents available from both the utility generator and from the electrical grid.*

Utility engineers choose plant grounding schemes that offer the best balance of cost and reliability for their LV systems. The alternatives for the distribution system are:

#### **Ungrounded**

- Offers minimal disruption to the system when a ground fault occurs because the current has no return path to follow
- Unfortunately, this results in high phase overvoltages during a ground fault

#### **Solidly grounded**

- Controls overvoltages, but results in high ground fault currents and increased danger from arc flash events

#### **High resistance grounded**

- Provides the modest fault current a return path and limits overvoltages on apparatus insulation

#### **Effects of a Ground Fault on an Ungrounded System**

When a ground fault occurs on an ungrounded system, high transient overvoltages can occur, which may cause more frequent equipment failures than if the system were grounded. These transient overvoltages, as high as four times normal voltage, reduce the life of the system's insulation, resulting in:

- Motor failure
- Transformer failure
- Coil failure
- Electronic equipment failure
- Cable insulation failure



Powering Business Worldwide

High resistance grounding would seem to be the solution of choice. However, the problem with high resistance grounded systems is that by their nature, they reduce ground fault currents to the point that they are not sufficient to trip the upstream protective device. So, the fault stays on the system longer. Left uncorrected, this can cause damage to motors and other equipment. And because the relay has not tripped, the faulted equipment is difficult to locate. Typically, plant personnel locate the fault by cycling LV breakers until they locate the problem circuit. This procedure is time-consuming and disruptive to plant processes.

### A Better Way

Eaton's engineers have developed a grounding solution that delivers the benefits of high resistance grounded systems and offers a unique solution for locating the fault. Eaton's C-HRG system uses a multi-tapped resistor bank, so when a fault has been detected, operators can trigger the system to begin a pulsed switching of the resistor bank, yielding a square current wave which is easily traceable using basic clamp-on ammeters.

### Benefits

- Mitigates arc flash events
- Significantly enhances safety
- Maximizes service continuity
- Continuous measurement of ground current
- Integrated fault tracing for easy detection
- Built-in alarm for advanced warning
- Custom applications allow for greater flexibility
- Space savings when integrated into Magnum DS switchgear

