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Document Control Desk
United States Nuclear Regulatory Commission

Subject: Early Trip of J-Core Molded Case Circuit Breakers (MCCB)

This letter provides information regarding a recently discovered deviation impacting the GE J-core Molded Case Circuit Breakers (MCCB). This deviation is an offset in instantaneous (magnetic) trip current when using lug and cable connections as compared to using bus bar connections. This deviation applies to TJJ, TJK, THJK, TB4 and TBC MCCB with both non-interchangeable and interchangeable trip units. GE Industrial Systems (GE-IS) in Plainville, CT manufactures the J-core MCCBs. GE Nuclear Energy (GE-NE) procures these items commercial grade and dedicates them as safety related. The GE-NE dedication defines the trip time versus multiples of the MCCB rated current based on the GE-IS time current curves (TCC) as critical characteristics.

GE-NE identified this offset when calibration testing of J-core MCCBs failed to meet the GE-IS published (TCC). Investigation discovered that the GE-IS calibration testing was performed with bus bar connections while the GE-NE calibration testing was performed using lug and cable connections. A J-core MCCB installed in an application with bus bar connections, that was calibrated using lug and cable connections, will trip at current levels lower than those indicated by the GE-IS TCC for currents greater than 3000A. Such a lower current level trip may or may not be conservative for the specific application.

The J-core MCCB trip unit was redesigned in 1997. This redesign resulted in the orientation of the magnetic armature of the J-core trip unit changing 90° from the original design. In the redesign, the armature pivots on an axis from the bottom to the top of the MCCB. It has been shown, both with modeling and test results, that the redesigned trip unit produces an additional magnetic loop when lug and cable connections are used that affects the magnetic trip function. This additional magnetic loop reduces the amount of available magnetic force on the armature and requires an increase in current to trip. GE-NE dedication testing is performed using lug and cable connections.

When J-core MCCBs that are calibrated using lug and cable connections are accepted based on the published GE-IS TCC, but are applied in applications using bus bar connections the following offset data can be used to evaluate the affect on that application. Note that the bus bar connected J-Core MCCBs will trip at current levels lower than predicted by the GE-IS TCC by the amount shown in Table 1.

Table 1. Offset for Bus Bar Load Terminal Connections (Amps) at a current multiple of 10X

Trip Unit Rating	Offset at 10X
300A	221A
400A	1,728A
500A	2,081A
600A	2,100A

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Most applications of the J-core MCCB are protected from over current conditions by the thermal portion of the J-core trip unit. The thermal trip portion of the TCC is not affected by trip redesign. The 3000A magnetic threshold level required to begin the offset is most likely in the short circuit portion of the J-core MCCB protection. Therefore, this offset, for most applications will be lower than specified and may or may not be conservative.

Since the specific applications and associated safety functions of the impacted J-core MCCBs are not known to GE-NE, we have transferred information pursuant to 10 CFR Part 21.21(b) to those licensees known to be affected. However, since additional licensees may have obtained these devices through other dedicating entities, we cannot assure ourselves that all end-users have been notified. We are therefore providing this information to the NRC for appropriate action.

Based on the previous discussion the following recommendations are made.

1. Determine if the calibration testing and installed application configurations use the same connection method.

If the calibration testing and installed application configurations are the same, no action is required for these installed applications.

If the calibration testing and installed application configurations are not the same, evaluate this installed application in light of the off set data provided in Table 1 to determine if the offset impacts the safety function of the J-core MCCB.

GE-IS is designing a magnetic shunt that will eliminate the additional magnetic loop inherent in the lug and cable connection for future manufacture of J-core MCCBs.

If you have any questions, please call me at (408) 925-5362.

Sincerely,



for Jason. S. Post, Manager
Engineering Quality and Safety Evaluations

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