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Document Control Desk
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SUBJECT: Power Shield Transformer Saturation at 12X Instantaneous
10CFR Part 21 Report

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In April 2002 ABB SAPD Quality Assurance Department received a notification from Virgil C. Summer Nuclear Station outlining a failure of a Power Shield trip device during surveillance testing. Two of the three phases tripped at more than 20% above the nominal set point of the Power Shield trip device. The Power Shield trip device that failed was a 225 Amp model, Serial number 32301 and was being used in a non-safety related application.

Subsequent testing and troubleshooting by Virgil C. Summer Nuclear Station indicated that during single phase testing when the Power Shield amp tap was set to its highest Setting (225 amp) and the Instantaneous set point was set to 12X (highest instantaneous setting), the transformer board CT (Current Transformer) would go into saturation, causing the trip point to be out of specification. Virgil C. Summer Nuclear Station reported that any lower combination of amp tap and instantaneous pickup yielded results in tolerance. In other words, the problem only appeared at the highest allowable value for the instantaneous trip.

It should be noted that the Current Transformer (CT) design used on the Power Shield that Virgil C. Summer Nuclear Station tested is no longer used in manufacturing the Power Shield Trip Device. ABB Engineering changed this CT design in March of 1991. The design of the transformer was changed to reduce the flux density in order to improve the linearity of the output up through the 12X Instantaneous tap setting. This change involved increasing the primary and secondary turns by 10%.

ABB SAPD has duplicated and verified the test results reported by Virgil C. Summer Nuclear Station on a Power Shield trip device containing the pre-1991 CT design. Power Shield trip devices with transformers installed after March 1991, do not exhibit the problem.

The current transformer used before March 1991 only saturates at the highest Instantaneous setting (12X) during a single-phase to ground fault. The transformer performs properly during a phase-to-phase or a three-phase fault because the two or three transformers that see the fault are sharing the secondary burden.

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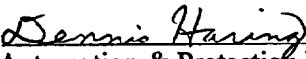
This also means that electrical systems that are ungrounded or high-resistance-grounded, where the ground fault current is limited to a very low value, would not be of any concern for this situation. Solidly grounded systems where additional ground fault protective elements are used would likely not be affected by this situation.

Power Shield Trip Devices that were dedicated as 1E Nuclear Safety related devices and manufactured before March 1991 have the transformer that may saturate at the highest setting of the instantaneous tap (12X). Products with a serial number higher than 82019 were manufactured with the improved transformer and are not affected by this notice. Products with a serial number of 82019 and below may have the transformer affected by this notice.

Testing can be performed at the user's discretion to verify that the Current Transformers are not saturating when using the 12X instantaneous setting.

For units affected by this notice, ABB SAPD recommends that you implement one of the following solutions:

- 1) Review the protection and coordination requirements for any circuit that is using the 12X Instantaneous tap setting. Determine if the circuit could be subjected to high magnitude single-phase-to-ground faults. If this is the case, determine if it would be possible to lower the instantaneous tap to the 10x set point. ABB SAPD recommends avoiding the use of the 12X instantaneous setting regardless of the amp tap setting.
- 2) Replace the transformer board with one that has the improved transformer design. Power Shield Trip Devices can be returned to ABB SAPD to have the transformer board replaced at a nominal charge. Customers choosing this option should contact the RMR department at 1-800-634-6005 or 610-395-7333 or fax 610-395-1055. These same numbers should be utilized if you have any questions regarding this issue.

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