C37.04 TF on 3 Phase Line Faults and Critical Currents Synopsis of Meeting on 2012 1 May St Pete Beach FL

Attendance: 14 Members and 38 Guests

3 Phase Line Faults

Based on the meeting discussion and review at the HVCB Subcommittee:

Forward these requirements to the C37.04 WG:

To accommodate 3 phase line faults, The Out of Phase test at 25% of rated current with the minimum time to TRV crest is mandatory.

"Explanatory Note: *Three Phase Line Fault TRVs*

CIGRE Brochure 408 deals with this subject in detail. The Summary pp. 8,9; Risk Tolerance pg. 99; Long Line Fault conclusions pg. 106; and General Conclusions pg. 109 give a good view of industry expert opinion.

Synopsis: The Standard SLF (Short Line Fault) test protocol is based on single line to ground faults. However, keeping fault current constant, a 3 phase line fault will exhibit a TRV first peak (peak value of the sawtooth wave) about 1.5 times higher than a single phase line fault. The slope of the TRV (dV/dt) will be only about 80% of the phase to ground fault TRV. For various reasons presented in CIGRE Brochure 408, the slope of the TRV is considered a more onerous requirement than the magnitude of the first peak. Many experts believe the higher first peak is of little consequence, and no direct test is necessary demonstrate that this is so.

The probability of getting the worst case line fault TRV first peak is small because

1) *3 phase line faults are less likely than 3phase faults by at least an order of magnitude.*
2) *Having a 3 phase line fault with more than 80% of the rated short circuit at the supply bus is highly unlikely.*

There are no known cases of circuit breaker failure ,where inability to withstand a 3 phase line fault TRV is the cause of the failure.

The high TRV peak due to long line faults is considered to be adequately covered by the T10 test (which requires a 1.5 first pole to clear factor) and for higher currents the OOP

test with the shorter time to peak. (A T30 with a 1.5 first pole to clear factor would also cover most all long line fault TRV peaks.)"

Critical Currents

There was considerable discussion around the IEC method for finding critical currents. One approach is to introduce a mandatory SLF test at 30% and 15% to assure there are not critical currents at these values.

The proposed course by the chair is to adapt the IEC approach for identifying breakers with possible "holes" and then add an SLF or ITRV test at the identified critical current.

However based on information received after the meeting, It appears that truly no present day production breakers have met the critical current criteria.

So as was suggested by Ken Edwards at eh meeting, the IEC approach doesn't add anything. It could be that the "critical current days are over for the self - blast technology, and that no breake3r manufactured by one of the major reputable manufacturers will have critical currents, even though these did exist in past designs.

I believe at least one more meeting to discuss critical currents is required.

Perhaps we should develop an optional test such as the 30% and 15% SLF tests with zero time delay on TRV, if the user suspects critical current behavior.

Respectfully submitted, and offering the reader Grace & Peace

Roy Alexander
Chair 3phase line fault and Critical currents TF