CT-1275

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MR. SAM DARAISWAMY, REACTOR ENG.
NUCLEAR REGULATORY COMM.
ADVISORY COMM ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555

DEAR MR. DURAISWAMY: -

RE: REG. GUIDE: LIGHTNING PROT FOR NUCLEAR POWER PLANTS

SINCE JUNE 15 I HAVE BEEN SERVING ON THE GRAND JURY OF THE SUPREME COURT OF SCHENECTADY COUNTY. THIS PLUS OTHER MATTERS HAVE DELAYED MY CONTINUED COMMENTS ON THE PROPOSED GUIDE.

I HAVE ATTACHED SOME ROUGH DRAFT REMARKS ON P. 5 OF SECTION C IN PART I OF THE GUIDE. THESE AS WELL AS THIS LETTER AND A PREVIOUS ONE WILL BE TYPED AND MAILED TO YOU SHORTLY.

I HAVE ALSO ATTACHED A LISTING OF REF. NOS. 41 - 46, ASSUMING THAT IT HAS NOT ALREADY BEEN DONE.

SINCERELY YOURS

(518) 372-9385

In light of all the foregoing, and in light of the latest revision of ANSI C62.2 (approved and pending publication) values of arrester discharge currents for determining discharge voltages with completely shielded lines are specified as 10,000, 15,000 and 20,000 amperes for 362, 550 and 800 kV systems respectively. For enhanced security of overvoltage protection two or more metal oxide arresters may be recommended as well as additional measures to eliminate possible shielding failures in the zone of lightning protection of the generating station.

Where lines are not completely shielded, a conservative discharge current from the aforementioned revised ANSI C62.2 is specified as 25 percent of a possible stroke current to the line, when shielding is used for at least 1.5 miles from the station. Based on a 1% stroke incidence of 165,000 amperes a discharge current of .25 . 165 kA ≅ 40 kA is obtained. This should be sufficient and applicable to the primary side of the startup and unit auxiliary transformers and switchgear whether or not these are shared or non-shared by redundant systems. It would seem that the shared systems are not truly redundant and should not be permitted. STEP-UP TRANSFORMERS CAN FAIL FROM OIL MOISTURE AND OTHER CAUSES MORE SO THAN OVERVOLTAGE.

P.5 SECT 2.1

IN SUBTRANSMISSION AND TRANSMISSION SYSTEMS, ARRESTER RATINGS ARE EXPRESSED IN PER CENT OF THE MAXIMUM TOLERABLE VOLTAGE SUCH AS 550 RV WHERE NOMINAL VOLTAGES OF 500 OR 525 RV HAVE BEEN SPECIFIED AMONG DIFFERENT UTILITIES. THE NORMAL OPERATING VOLTAGE IS GENERALLY NEAR OR AT THE NOMINAL VOLTAGE. A 100% ARRESTER IN THE FOREGOING SYSTEM VOLTAGE IS UNDERSTOOD TO MEAN AN ARRESTER WITH A VOLTAGE RATING OF 550 RV AND NOT 500 OR 525 RV. NORMAL VOLTAGE NEEDS TO BE DEFINED.

FURTHERMORE,

The ultimate in surge voltage protection is obtained through use of surge arrester voltage ratings as low as system grounding conditions will permit during normal and abnormal system operation. Initially, however, when the surge arrester was adopted as the basic protective device for the design, protection and coordination of major insulation structures, the "ungrounded neutral" or 100 per cent rated arrester was used regardless of system grounding conditions.

In time, after successful service experience with 100 per cent rated arresters (100% of maximum line-line voltage), it was rationalized that lower rated arresters would be suitable on grounded neutral systems wherein the temporary overvoltage on the unfaulted phases during a line-ground fault would bear the same relationship to arrester rating as 100 per cent arrester in an ungrounded system. An arbitrary selection was to define an effectively grounded system as one where the line-to-ground fault current is not less than 60 per cent of the three-phase fault current; or the coefficient of grounding does not exceed 80 per cent; or the temporary overvoltage on an unfaulted phase does not exceed 138 per cent of the prefault voltage at the fault location (80% x 1.73 L-G voltage). Under these conditions an

80 per cent arrester was deemed applicable and was classified as a "grounded neutral" arrester.

The use of a "grounded neutral" arrester with lower protective levels enabled designs in some electric equipment such as transformers to have reduced insulation levels with adequate protection and provide for economies in size, weight, and cost.

Subsequently refinements were made in the application of still lower rated arresters with continued equipment benefits whenever the grounding was significantly better than effective.

Since surge arresters are voltage sensitive devices and are connected line-to-ground, the temporary voltage across the arrester should not in general exceed the arrester voltage rating under any condition of system operation. Some exceptions occur, however, in the application of modern current-limiting surge arresters with sealoff and withstand capabilities above rating for more than one half-cycle combined with certain specific rules of application.[6] ALSO A NEW BREED OF GREATER ENERGY DISCHARGE CAPABILITY HAS EVOLVED, NAMELY: THE METAL OXIDE VARISTOR.[7,8]

SINCE STATION ARRESTERS OF DIFFERENT TYPES ARE AVAILABLE WHICH CAN OPERATE,

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RESEAL AND WITHSTAND 60 Hz VOLTAGES OR THEIR EQUIVALENT IN EXCESS OF RATING, OR CAN BE-IN SOME TYPES- CONNECTED IN PARALLEL FOR A DESIRED ENERGY CAPABILITY, IT WOULD SEEM MORE APPROPRIATE TO SPECIFY THE SYSTEM CONTINGENCIES FOR THE APPLICATION AND OPERATIONAL REQUIREMENTS OF THE ARRESTERS ON BOTH SIDES OF HIGH VOLTAGE TRANSFORMER, NAMELY: SINGLE OR DOUBLE LINE-TO-GROUND FAULT; POTENTIAL OPERATING VOLTAGE IN EXCESS OF THE MAXIMUM TOLERABLE VOLTAGE; SUDDEN LOSS OF LOAD; GENERATOR OVERSPEED; ACCIDENTAL CONTACT WITH CONDUCTORS OF A HIGHER VOLTAGE; AND/OR ETC.

(CHART TO COME)

References

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44 W.C. KOTHEIMER "SHIELDING AND GROUNDING CONTROL CABLES" TRANSMISSION AND DISTRIBUTION, JULY 1974

45 J.R. HOMANN, S.A. MISKE, JR., I.B. JOHNSON AND A.L. COURTS "A ZINC OXIDE VARISTOR PROTECTIVE SYSTEM FOR SERIES CAPACITORS", IEEE PAPER 80 SM 609A-0.

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