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VPNPD-94-020
NRC-94-013

February 16, 1994

Document Control Desk
U.S. NUCLEAR REGULATORY COMMISSION
Mail Station P1-137
Washington, DC 20555

Gentlemen:

DOCKETS 50-266 AND 50-301
DEGRADED VOLTAGE PROTECTION
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

During our presently ongoing horizontal slice Systems Based Instrumentation and Control audit, a potential concern with the relay setting on the degraded voltage protection for our emergency AC power system was identified. In a discussion with Mr. Dave Butler, NRC Region III, members of your staff requested that we submit our interim operability determination which documents our conclusion that the degraded voltage protection is operable. The interim operability determination supports the ongoing engineering evaluation which will formally resolve the concerns identified by our audit team.

While analysis is ongoing to resolve the issues identified during the audit, we plan to lower the time delay associated with degraded voltage protection to 10 seconds from the existing setting of 50 seconds. This shorter time delay will minimize the time equipment may be operated at terminal voltages less than specified for the equipment. We anticipate performing the change to the time delay setting on February 18, 1994.

Procedures will be put in place concurrent with this time delay change to temporarily disable degraded voltage protection while starting reactor coolant pumps. This will prevent degraded voltage protection from actuating due to expected system voltage transients, thereby ensuring the continuity of off-site power to the emergency AC power system. We also anticipate having these procedures in place by February 18, 1994.

A015
1/1

Attached, for your information, is documentation of the concerns as contained within our corrective action tracking system and our interim operability determination. If you have any questions, please contact us.

Sincerely,

Bob Link
Vice President
Nuclear Power

TGM/jg

cc: NRC Resident Inspector
Mr. Dave Butler, NRC Region III

ATTACHMENT

QCR 94-003
QCR 94-004
QCR 94-005

INTERIM OPERABILITY DETERMINATION, REV. 1

1. Degraded or potentially nonconforming equipment:

   4.16 KVAC Degraded Voltage Relays

2. Safety function(s) performed by the equipment:

   Degraded voltage relays are installed on each of the safety-related 4.16 KVAC buses 1A05, 1A06, 2A05, and 2A06. The purpose of these relays is to sense the presence of lower than acceptable voltage levels and disconnect the safety-related 4.16 KVAC buses from the preferred off-site source, which would then result in starting the emergency diesel generators and connecting the safety-related 4.16 KVAC buses to the emergency diesel generators at adequate voltage levels.

3. Circumstances of potential nonconformance, including possible failure mechanisms:

   QCR 94-003: The time delay for the degraded voltage relays has not been verified to provide adequate undervoltage protection by calculation or other analysis. The existing arrangement allows voltage on the safeguards buses to drop as low as approximately 77% of system nominal voltage for 50 seconds. Downstream safety-related electrical equipment may fail if operated at this voltage level and time duration.

   QCR 94-004: The reset characteristics of the degraded voltage relays have not been analyzed with respect to expected system voltages. The drop out setting of the degraded voltage relays was raised in 1993 as a result of discovering that the degraded voltage relay settings were too low to provide adequate protection for all safety-related equipment. The relay pickup (reset) value was also raised as a consequence of this action. The degraded voltage relays may drop out during accident-associated voltage drops, but may not reset. The result could be the loss of the off-site power source concurrent with the loss of power from the generating unit during an accident.

QCR 94-005: Degraded voltage relay settings may not properly reflect uncertainties pertinent to the protection loop. Calculation N-93-098 determined a TS limit of 3944 volts and a minimum allowable relay as-left setting of 3950 volts. The calculation does not include ambient temperature variations, power supply variations, or drift. A calculation that determined the accuracy of loops containing the older ITE 27D relays could not be located. Calculation N-93-002, which serves as the basis for degraded voltage relay settings, does not analyze motor starting conditions and did not consider increased cable resistance due to elevated temperature inside the containment during an accident. Non-conservatism in the setpoint basis calculations could impact the ability of the degraded voltage relays to protect downstream safety-related electrical equipment.

4. Requirement or commitment established for the equipment, and why the requirement or commitment may not be met:

   Technical Specification Table 15.3.5-1, "Engineered Safety Features Initiation Instrument Setting Limits," Item 9, "Degraded Voltage (4.16 KV)," requires the degraded voltage relay setpoints be set at >= 3959 volts +/- 1/2% with a time delay of less than 60 seconds. The purpose of this setting was to ensure that under the worst case conditions, the most limiting safeguards load would not operate at less than 90% of its nameplate voltage rating (414 volts). The concerns raised by QCRs 94-003, 94-004, and 94-005 indicate that the TS limits may not be adequate for providing adequate undervoltage protection under certain conditions.

5. By what means and when the potentially nonconforming equipment was first discovered:

   The conditions were discovered during I&C horizontal slice audit A-P-94-01. The QCRs were initiated on February 4, 1994.

6. Safest plant configuration including the effect of transitional action:

   If engineering analysis of the concerns identified by QCRs 94-003, 94-004, and 94-005 concludes that the degraded voltage relays and their settings are not able to provide adequate undervoltage protection, TS 15.3.5 requires that the associated emergency diesel generator(s) be declared inoperable for the affected bus(es). Since all 4.16 KVAC safeguards buses are potentially affected, this could require declaring both emergency diesel generators inoperable and entering the LCO for TS 15.3.0.

7. Basis for declaring affected system operable:

The concerns raised by QCRs 94-003, 94-004, and 94-005 either identify a lack of calculations/analyses or question the conservatism of existing calculations that verify the adequacy of the degraded voltage relay protection scheme. There are three basic questions raised in the QCRs:

1) Are the existing degraded grid voltage relays capable of protecting safety-related loads from operating or starting at voltages less than the capabilities of these loads?

2) Is the present time delay setting of 50 seconds for the degraded grid voltage relay scheme adequate to protect safety-related loads from failure or damage due to starting at less than 80% of rated voltage?

3) Will the degraded grid voltage relays fail to reset after the voltage dips associated with a LOCA and therefore result in a loss of off-site power?

It is our judgment that the existing degraded grid voltage relays and their settings are capable of protecting safety-related loads from operating or starting at voltages less than their demonstrated capability. This judgment is based on the following:

a. Preliminary calculations completed by the auditor indicate that the degraded grid voltage relays will act to separate the 4.16 KV safeguards buses from the off-site source at a minimum voltage of 3929 volts. This is slightly below the previously calculated analytical limit of 3931 volts and could have resulted in the potential operation of two accident fans at voltages less than their rated capability by less than 1%. Administrative actions have been taken to limit the potential maximum loading under accident conditions on the worst case 4.16 KV bus. This has resulted in a reduction of the analytical limit for 4.16 KV voltage to 3926 volts.

b. The administrative controls mentioned above include the placement of an operator aid on the control switch for charging pump 1P2B that restricts pump operation and therefore minimizes the loading on 4.16 KV Bus 1A05.

c. All of the degraded grid voltage relays have been replaced with ITE 27N type relays which have improved accuracy and a more favorable reset characteristic.

d. Preliminary evaluations have shown that safety-related motors are capable of starting with the associated 4.16 KV bus voltage at the minimum operating point of the degraded grid voltage relays (80.2% for Accident Fan 1W1B1).

e. While it is true that the temperature effects due to accident conditions on the resistance of the portion of cables to the containment accident fans was not taken into account in the voltage drop calculations, this effect is expected to be very small and is more than compensated for by the conservative assumption that all cables are operating with a conductor temperature of 90° Celsius.

f. Past testing of magnetic contactors in safety-related MCCs, although poorly documented, indicates that such contactors are capable of operating at the voltages used as an acceptance criterion in Calculation N-93-002 (95 volts required to pick up the contactor). In addition, preliminary evaluations have indicated that the assumption of a 5 volt maximum voltage drop in the control circuit is valid. It should also be noted that the above translate to a requirement that the MCC voltages be held to a minimum of 400 volts to assure proper operation of the control circuits. The minimum MCC voltage with the 4.16 KV buses at the minimum operating point of the degraded grid voltage relays is at least 418 volts.

g. The existing degraded grid voltage relaying scheme will prevent the continued operation of safety-related loads at less than their capabilities if the off-site source should degrade such that the voltage is less than normally maintained operating voltages. They will act to separate such loads after 50 seconds should the voltage drop below the capability of the loads to continue to operate. Should the grid voltage drop to values less than the momentary capability of the safety-related loads to continue operation, the loss of voltage relays will act to separate them from the off-site source in less than 2 seconds. In the event of an accident (LOCA), it is possible that the voltage at selected safety-related loads may be insufficient to start and accelerate the load provided the 345 KV bus voltage prior to the LOCA occurring was less than approximately 352 KV. If this situation is allowed to exist for a significant amount of time it is possible that damage will occur to safety-related loads or the loads may trip on overcurrent and would not be available subsequent to transfer of the safety-related 4.16 KV buses. However, this potential situation requires that an accident occur coincident with operation of the 345 KV grid at less than normally allowed voltages. This situation was not considered in the original licensing basis for the undervoltage protection scheme. In addition, controls do exist which act to maintain the 345 KV bus above 352 KV at all times. Operating Procedure OP-2A requires operators to maintain the 345 KV bus between 356 KV and 358 KV. In addition, the existence of a bus voltage of 354 KV or less is alarmed at Wisconsin Electric's System Control Center. Such an alarm requires system operators to contact the PBNP control room and take actions to restore the bus to normal operating levels.

It is possible that the degraded grid voltage relays will fail to reset following the voltage dips resulting from LOCA conditions. This will result in disconnection of the off-site source approximately 50 seconds into the accident and transfer of the loads to diesel generators. This will result in re-sequencing the loads onto the diesels. It is our engineering judgment that this scenario is not significantly different from the existing FSAR Chapter 14 analysis, which assumes a loss of off-site power coincident with a design basis accident as discussed below.

For the purposes of this evaluation, off-site power is considered to be available, but degraded, with the discontinuation of off-site power at approximately 50 seconds due to the actuation of the degraded voltage relays and the degraded voltage situation is considered to not impede safety system capability (i.e. the safety systems can perform their function with degraded voltage). The interruption of power to the safeguards buses for approximately 2 seconds at T=50 seconds would cause the high head safety injection pumps to lose power for approximately 2 seconds. Then, one SI pump would restart on the diesel.

<u>Large-Break LOCA</u>

Large-Break Loss-of-Coolant Accident (LB-LOCA) is mitigated by the injection of coolant into the RCS from the SI accumulators, high head safety injection pumps (HHSI) and low head safety injection pumps (LHSI). The degraded voltage situation has no impact on accumulator injection.

The degraded voltage situation (loss of power resulting from degraded voltage for greater than 50 seconds) will stop HHSI flow for a short period of time when the bus supply switches from the grid to the diesel generator. Estimating the interruption to be 2 seconds at a flow rate of 50 lbm/sec means that the total HHSI is reduced by 100 lbm. LHSI flow will stop for the same period of time plus an additional 5 seconds for the sequencer. A 7 second interruption at a flow rate of 200 lbm/sec means that the total LHSI is reduced by 1400 lbm.

The timing of the interruption in flow is important. The interruption in flow occurs 50 seconds after initiation of the event. Fifty seconds into a LOCA the lower plenum has filled with water and reflooding of the core has begun. Accumulators continue to inject water at a flow rate of more than 1000 lbm/sec up to 63.4 seconds into the accident. The accumulator flow rate is much larger than HHSI and LHSI combined.

Equilibrium between break flow and injection flow occurs at about 83 seconds. Prior to 83 seconds more flow exits the break than is injected into the RCS. Most of the flow exiting the break is the ECCS injection flow and a significant portion of it leaves when the accumulator nitrogen is released causing severe oscillations in core and downcomer liquid levels. More than 11,000 pounds of injected water bypasses the core and goes out the break.

Peak cladding temperature occurs at 104 seconds with the reflood quench front four feet from the bottom of the core. More flow is being injected into the RCS than is exiting the break and the reactor vessel is filling.

An interruption due to degraded voltage will have minimal impact on LB-LOCA results for the following reason. When the interruption occurs, accumulator injection is much larger than HHSI or LHSI and will maintain a water inventory in the lower plenum. The interruption occurs prior to the nitrogen release from the accumulators which causes much of the water in the RCS to exit through the break. Water injected prior to the nitrogen release would be lost anyway and the amount of injection flow interrupted, about 1500 lbm, is small compared to the amount of water which bypasses the core, more than 11,000 lbm. Peak cladding temperature occurs much later than the interruption and the nitrogen release during the reflood portion of the transient.

Main Steam Line Break (MSLB)

The Main Steam Line Break event is not affected by a degraded voltage condition because the safety injection system is not required to prevent re-criticality for current PBNP core reloads. Analysis for each core reload is done to show that the core will not go critical with the most reactive rod stuck out of the core at an RCS temperature of

200°F. Boron injection from the SI system is not required to prevent re-criticality, which is the required safety function of the SI system for this accident.

Containment Analysis for LOCA and MSLB

The containment analysis in Section 14.3.4 of the FSAR assumes one spray pump and two fan coolers start at 60 seconds. This assumption is based on a loss of off-site power condition, and the failure of a single diesel generator. The operating diesel would have to start and power the 4.16 KV bus, and SI safeguards sequencing would occur.

The design heat removal characteristics of two fan coolers and a single containment spray pump are 2x50E6 BTU/hr and 110E6 BTU/hr respectively. This equals a total of 210E6 BTU/hr. The failure assumed in this scenario would interrupt containment safeguards for approximately 1 minute. The heat removal that would be lost by this delay is approximately 210E6/60 = 3.5E6 BTU. By looking at Figure 14.3.4-3 of the FSAR, increasing the internal energy of the steam-air mixture of the containment by 3.5E6 BTUs would increase containment peak pressure by less than 2 psig. If 2 psi is added to the highest peak containment pressure following an accident analyzed in our FSAR, (54 psig), the resulting pressure (56 psig) is still below the containment design peak pressure of 60 psig. After the first two minutes, when a single train of containment heat removal capability is operational, the energy removal rate exceeds the energy addition rate, and the containment pressure and temperature will trend downwards.

The condition being analyzed is in one way less severe than the FSAR accident analysis. The FSAR accident analysis assumes only a single train of safeguards is available. For that case the assumed single failure is a diesel generator. For the scenario being analyzed, the safeguards buses are powered by off-site power, albeit at a reduced voltage, for the first 60 seconds or so. Due to this, the containment heat removal would be somewhat increased over the FSAR analysis once the safeguards sequencing has been completed and the containment spray pumps and fan coolers are operational, since both trains would be operating.

Steam Generator Tube Rupture and Small-Break LOCA

FSAR Section 14.2.4, "Steam Generator Tube Rupture," and 14.3.1, "Loss of Reactor Coolant from Small Ruptured Pipes or from Cracks in Large Pipes which Actuates Emergency Core Cooling System" are very similar in that there is a loss of reactor coolant. The safety systems that are needed to mitigate these accidents are the HHSI system which is actuated on low pressurizer pressure to provide make-up and boration of the RCS and auxiliary feedwater water which is actuated on the safety injection signal and/or the loss of AC power to provide water for the secondary heat sink. Typically, the worst single failure for these accidents is the loss of one train of safeguards due to the loss of offsite power and the failure of one diesel generator. This new scenario would not significantly affect the results of these accident analyses because even if it is assumed that the pump did not provide any flow for those 2 seconds (which is conservative because of system inertia), approximately 42 lbm of SI fluid would not be injected (see attached FSAR Figures 14.3.1-1 and 14.3.1-3), approximately 5 gallons, an insignificant quantity compared to the thousands of gallons of safety injection fluid that is injected. Additionally, more fluid could be injected during the 50 second period because 2 SI pumps could be assumed to run.

The interruption of power to the safeguards buses for approximately 2 seconds at T=50 seconds would cause the electric auxiliary feedwater pumps to stop for approximately 12 seconds and the turbine driven AFW pumps may not have received a start signal if low steam generator level and the loss of voltage start signals have not occurred. Although the Peak Clad Temperature (PCT) is slightly sensitive to AFW flow and temperature (see Reload Safety Evaluations) it is expected that the additional delay in AFW flow would not cause the PCT to exceed the acceptance criteria because the current analysis PCT is 809°F (plus about 70°F in penalties), which is much less than the 2200°F limit.

<u>Other FSAR Chapter 14 Accidents</u>

The other FSAR accidents do not require SI, RHR, containment spray, or emergency fan coolers. The other safeguards loads (eg. AFW, SW, battery chargers) are not time critical so a several minute delay will not be significant.

Based upon the above, it is concluded that the degraded voltage relays are operable. The questions identified by QCRs 94-003, 94-004, and 94-005 need to be addressed further as part of a formal demonstration of degraded voltage relay operability.

FIGURE 14.3.1-1

HIGH HEAD S.I. FLOW
versus
RCS PRESSURE

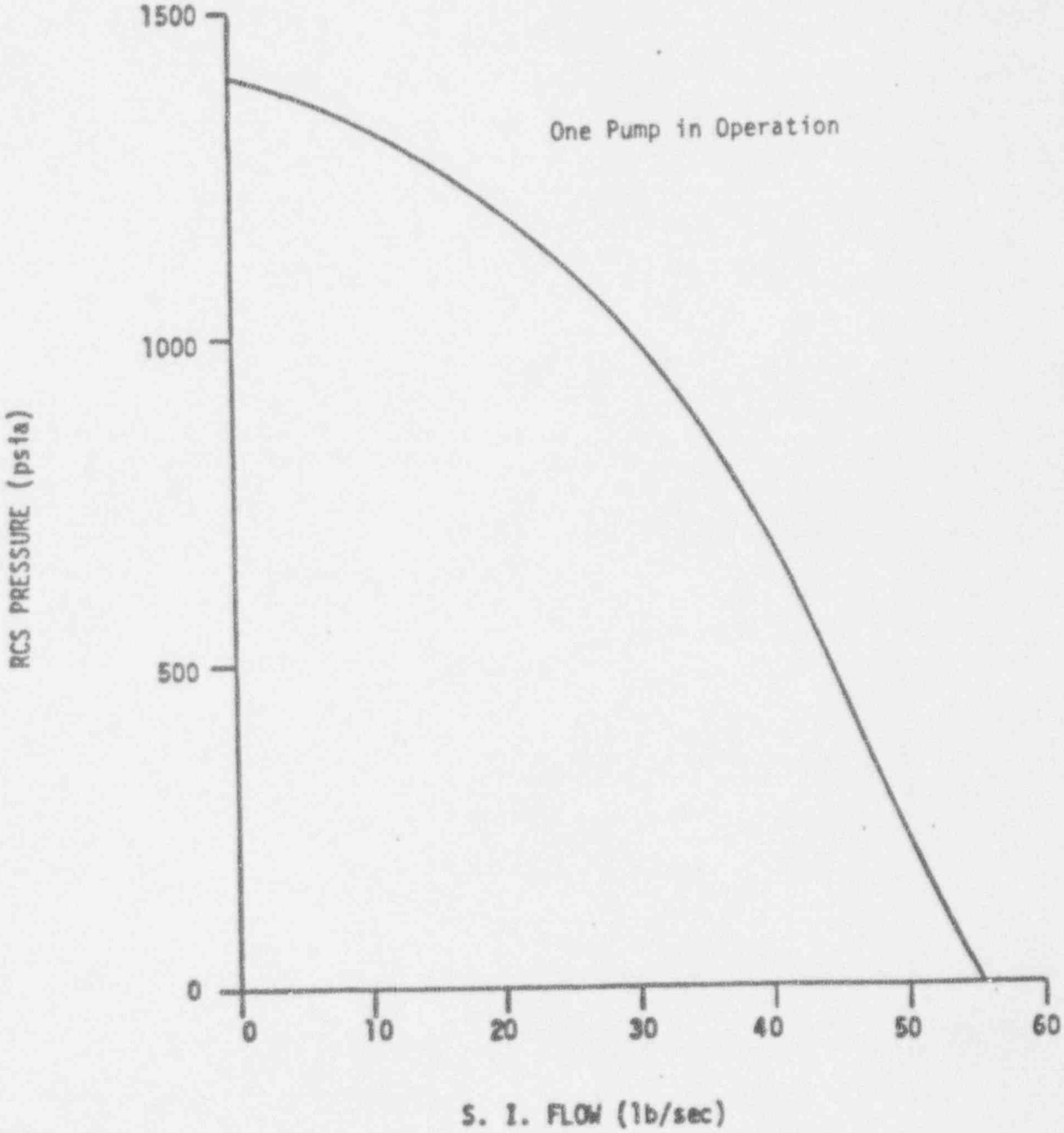
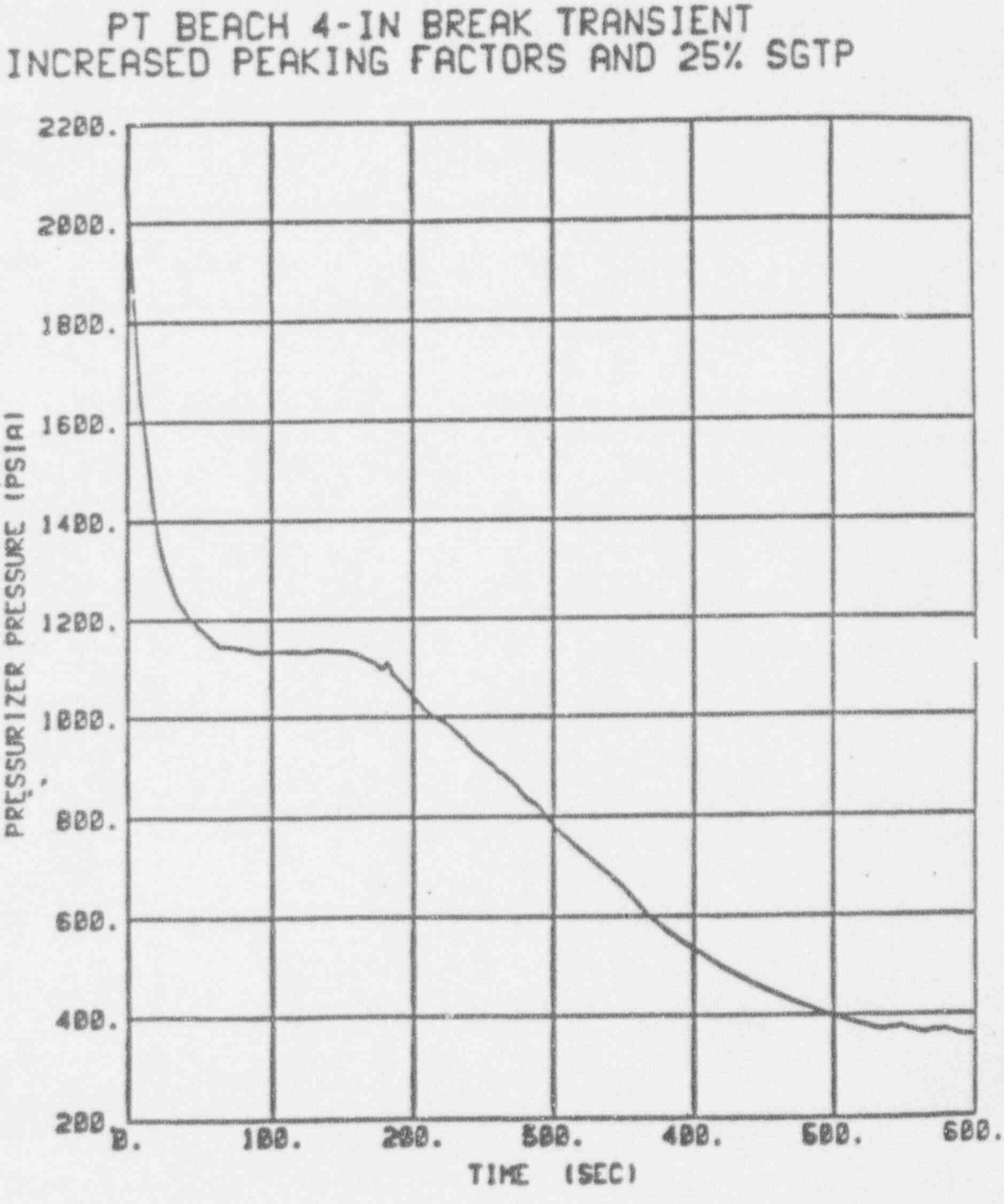


FIGURE 14.3.1-3

DEPRESSURIZATION TRANSIENT (4 INCH)



CONDITION REPORT
QCR 94-003

STATUS: OPEN PRIORITY: 1 INITIATED: 02/04/94 CLOSED:
MSS #: ADMINISTRATOR: RICHARD CALLAHAN
INITIATOR: RICHARD CALLAHAN CONTACT: RICHARD CALLAHAN
NUMBER OF OPEN ACTIONS: 1 NUMBER OF CLOSED ACTIONS: 0

Degraded Voltage Relay Protection Scheme Time Delays May Not Be Adequate

DESCRIPTION:
A calculation or other analysis that demonstrates the adequacy of the degraded voltage relay protection scheme time delays could not be located by the A-P-94-01 audit team. The team noted that the protection loop will not act to isolate the safeguards buses for a period of approximately 50 seconds following relay dropout. This arrangement could allow voltage on the safeguards buses to drop as low as approximately 77% of system nominal voltage. This voltage could result in inadequate voltage at the terminals of downstream safety-related equipment causing damage or tripping. Also, if an accident were to occur while voltage was in the band between the first and second level protection setpoints, it is conceivable that most of the safeguards equipment load sequencing could be attempted resulting in stalled or damaged safeguards loads. Since degraded grid voltage would affect both trains, this is a common mode failure concern. Significance: a degraded voltage condition settling between the first and second relay dropout setpoint is considered unlikely. The possibility of a coincident accident is considered even more remote. However, the failure to analyze this scenario is significant due to the potential for a loss of critical redundant safeguards loads and the fact that acceptable time delay schemes are available which would eliminate such a possibility without sacrificing either safety or plant operating convenience.

STATUS UPDATE:

SCREENED BY : BRIAN MCLEAN DATE: 02/08/94

REGULATORY REPORTABLE.....(Y/N):	N	TS VIOLATION..............(Y/N):	N
10 CFR 21.................(Y/N):	N	TS LCO....................(Y/N):	N
OPERABILITY IMPACT PER TS.(Y/N):	N	JCO REQUIRED..............(Y/N):	N
MSS REVIEW................(Y/N):	N	ACTION LEVEL............(A/B/C):	A

SUPPORTING DETERMINATIONS:
The issue identified by QCR 94-003 requires analysis to support an operability determination made for the degraded voltage relays and setpoints (see attached). If further analysis reveals that the 50 second time delay could result in safety-related equipment damage, the relays would have to be declared inoperable. Operability/reportability must be reassessed upon the completion of engineering analysis of QCR 94-003.

REFERENCES:
TS TABLE 15.3.5-1 AUDIT A-P-94-01

TRENDING INFORMATION:
WHEN__: NON-OUTAGE
WHO___: ELECTRICAL SYSTEMS ENG
WHY___: ADMINISTRATIVE CONTROLS (SPAC) WERE CONFUSING OR INCOMPLETE
WHAT__: SETPOINT RELATED
TECH SPEC RELATED
SYSTEM: 4.16 KVAC ELECTRICAL

ACTIONS	PRI	ACTION STATUS	RESPONSIBLE PERSON	DUE DATE
1	1	EVALUATION NEEDED	PAUL TINDALL	03/07/94

CONDITION REPORT
QCR 94-004

STATUS: OPEN PRIORITY: 1 INITIATED: 02/04/94 CLOSED:
MSS #: ADMINISTRATOR: RICHARD CALLAHAN
INITIATOR: RICHARD CALLAHAN CONTACT: RICHARD CALLAHAN
NUMBER OF OPEN ACTIONS: 1 NUMBER OF CLOSED ACTIONS: 0

Reset Characteristics of Degraded Voltage Relays Have Not Been Analyzed

DESCRIPTION:

The reset characteristics of the degraded voltage relays have not been analyzed with respect to expected system voltages so that the availability of the preferred source at the initiation of an accident is unknown. The drop out setting of the degraded voltage relays was substantially raised in 1993 as a result of concerns over adequacy of system voltage (LER 266/93-001-00). As a consequence of this action the relay pickup (reset) value was also raised. This increased the chance that the safeguards buses would be inadvertently disconnected from the preferred (offsite) source following a voltage transient such as caused by starting a large motor. This is because the safeguards bus voltage would have to recover to the DVR reset value to prevent isolation, and the higher the reset point, the more likely it is for isolation to occur. The plant staff recognized this condition and initiated SPEED 93-067 to replace the existing ITE 27D relays with Type ITE 27N relays which exhibit much more favorable reset characteristic. However, the staff did not formally evaluate the effect of the revised reset value to determine whether the performance of either the old or new relays was acceptable. In addition, while the staff recognized the increased likelihood of inadvertent isolation of a safeguards bus, they apparently did not recognize that this was very likely to occur concurrent with an accident. This likelihood exists because the main generator will be tripped during an accident, possibly causing the switchyard voltage to drop, and the safeguards buses will experience severe voltage dips and drops due to the application of safeguards loads. The degraded voltage relays will drop out but may not be able to reset due to the factors noted above. The result could be the loss of the offsite power source concurrent with the loss of power from the generating unit during an accident. Because of the substantial increase of the degraded voltage relay reset value, and the unfavorable reset characteristics and accuracy of the ITE 27D relays, this scenario could occur under normal grid voltage conditions and should have been investigated.
Significance: failure to evaluate relay reset characteristics could result in loss of offsite power concurrent with the loss of power from the generating unit during an accident. This potential is much greater for buses protected by the ITE 27D relays. BDM Note: ITE 27D relays associated with Train A were replaced during the week of January 31, 1994. Train B relays are being replaced this week.

STATUS UPDATE:

SCREENED BY : BRIAN MCLEAN DATE: 02/07/94

REGULATORY REPORTABLE.....(Y/N):	N	TS VIOLATION..............(Y/N):	N
10 CFR 21.................(Y/N):	N	TS LCO....................(Y/N):	N
OPERABILITY IMPACT PER TS.(Y/N):	N	JCO REQUIRED..............(Y/N):	N
MSS REVIEW................(Y/N):	N	ACTION LEVEL............(A/B/C):	A

SUPPORTING DETERMINATIONS:

The issue identified by QCR 94-004 requires analysis to support an operability determination made for the degraded voltage relays (see attached). The Train A relays were replaced last week, and the Train B relays will be replaced this week during diesel outages. This makes the concern much less likely to create an operability problem. However, operability of the old ITE 27D relays must also be investigated to address the reportability of the condition that existed prior to relay replacement. Operability/reportability must be reassessed upon the completion of engineering analysis of the QCR 94-004.

REFERENCES:

LER 266/93-001-00 SPEED 93-067
CIM 000405 ABB IB 7.4.1.7-7, ISSUE D
AUDIT A-P-94-01

TRENDING INFORMATION:

WHEN__: NON-OUTAGE
WHO___: ELECTRICAL SYSTEMS ENG
MANAGER'S SUPERVISORY STAFF
WHY___: DESIGN SPECIFICATION WAS LESS THAN ADEQUATE
CORRECTIVE ACTION WAS NOT THOROUGH OR WAS NOT TAKEN
WHAT__: SETPOINT RELATED

TECH SPEC RELATED
SYSTEM: 4.16 KVAC ELECTRICAL

ACTIONS	PRI	ACTION STATUS	RESPONSIBLE PERSON	DUE DATE
1	1	EVALUATION NEEDED	PAUL TINDALL	03/07/94

CONDITION REPORT
QCR 94-005

STATUS: OPEN   PRIORITY: 1   INITIATED: 02/04/94   CLOSED:
MSS #:   ADMINISTRATOR: RICHARD CALLAHAN
INITIATOR: RICHARD CALLAHAN   CONTACT: RICHARD CALLAHAN
NUMBER OF OPEN ACTIONS: 1   NUMBER OF CLOSED ACTIONS: 0

Degraded Voltage Relay Setpoint Justification Not Found

DESCRIPTION:

Calculations performed by the I+C SBICI audit team indicate that the settings of the Degraded Voltage Relays do not properly reflect uncertainties pertinent to the protection loop. In addition, system voltage calculations may not be conservative. As a consequence, existing relay settings may not be high enough to assure that Technical Specification limits and minumum safe voltage requirements for the safeguards busses are not exceeded. At this writing there are two different styles of relays installed with different accruacy ratings, ITE 27Ds and ITE 27Ns which are discussed separately after discussion of voltage calculation concerns. Voltage Calculation: The team noted that calculation N-93-002, which served as a basis for degraded voltage relay settings, contained the following non-conservativisms: a.The calculation did not analyze motor starting conditions. Apreliminary calculattion provided by Engineering in response to the team's concerns indicated that the Containment Accident Fan 1W-001B1 would have 80.2% of rated voltage at its terminals versus the 80% required. Engineering believes this case to be bounding but this has not been confirmed by the team. b. The calculation did not consider increased cable resistance due to elevated temperature in the containment during an accident. This factor is expected to be small but may affect the limited margin noted in (a.) above. ITE 27N Accuracy: The team reviewed calculation N-93-098 which determined a Technical Specification limit of 3944 volts and a minimum allowable as left relay setting of 3950. The team noted that calculation N-93-098 was non-conservative in that it did not include the following uncertainties: and ambient temperature variations, power supply variations,and drift. In addition, the term used for M+TE accuracy may not be conservative. A preliminary calculation performed by the team including these factors indicated that the current allowable setpoint could cause both the current Technical Specification limit of 3939.21 volts as well as the proposed limit of 3944 volts to be exceeded. A bounding calculation performed by the team indicated that the safety limit of 3931 volts could also be exceeded. ITE 27D Accuracy: The team could not locate any calculation that determined the accuracy of loops containing the older type ITE 27D relays. A review of the component Instruction manual CIM-405 revealed incomplete accuracy data, but available data indicated worse accuracy that the type ITE 27N relay discussed above. Consequently, the team believes that the trip values of these relays will exceed both the Technical Specification limit and the safety limit. Significance: The voltage calculation non-conservativisms are believed to be small based on preliminary data from Engineering. However, because of the very small or nonexistent operating margins afforded between the relay settings and safety and technical specification limits, the non-conservativisms in the accuracy calculation could be significant with respect to these limits.

STATUS UPDATE:

SCREENED BY : WALLY SPRANG   DATE: 02/07/94

REGULATORY REPORTABLE.....(Y/N): N   TS VIOLATION..............(Y/N): N
10 CFR 21.................(Y/N): N   TS LCO....................(Y/N): N
OPERABILITY IMPACT PER TS.(Y/N): N   JCO REQUIRED..............(Y/N): N
MSS REVIEW................(Y/N): N   ACTION LEVEL............(A/B/C): A

SUPPORTING DETERMINATIONS:

The condition described in QCR 94-005 on the degraded voltage relay settings cannot be verified without further evaluation (see attached). The Train A relays were replaced last week, and the Train B relays will be replaced this week during diesel outages. This makes the concern much less likely to create an operability problem. However, operability of the old ITE 27D relays must also be investigated to address the operability/reportability must be reassessed upon the completion of engineering analysis of the QCR 94-004

REFERENCES:

N-93-002   N-93-098
TS 15.3.5-1   COMP INST MANUAL 000405
IB 7.4.1.7-7   A-P-94-01

TRENDING INFORMATION:

WHEN__ : NON-OUTAGE
WHO___: ELECTRICAL SYSTEMS ENG
WHY___: ADMINISTRATIVE CONTROLS (SPAC) WERE CONFUSING OR INCOMPLETE
INADEQUATE CORRECTIVE ACTION CAUSED RECURRENCE
WHAT__ : SETPOINT RELATED
TECH SPEC RELATED
SYSTEM: 4.16 KVAC ELECTRICAL

ACTIONS	PRI	ACTION STATUS	RESPONSIBLE PERSON	DUE DATE
1	1	EVALUATION NEEDED	PAUL TINDALL	03/07/94