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SHOREHAM NUCLEAR POWER STATION

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VICE PRESIDENT - NUCLEAR OPERATIONS

June 28, 1984 SNRC-1060

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Low Power License Submittal
In Response to May 16, 1984 Commission Order
Shoreham Nuclear Power Station - Unit 1
Docket No. 50-322

Dear Mr. Denton:

The Commission's May 16 order concerning LILCO's low power license motion set out the standard to be applied in judging LILCO's exemption request. The Licensing Board must determine whether the operation of Shoreham at 5% power with temporarily installed onsite diesels that have been seismically evaluated and with its enhanced off-site power system is as safe as operation of a Plant at 5% power with qualified diesel generators without enhancements of offsite power. Our basis for stating SNPS at 5% thermal power with the abovementioned power enhancements is as safe as a plant at 5% power with qualified diesels is that the deterministic thermal and radiological success criteria are met given the assumption of no qualified diesels.

In practical terms, this determination is based on acceptable deterministic methods which prevail as the Commission's primary means in addressing safety questions. The safety standards to be used in making this comparison between Shoreham and a plant licensed for 5% power with qualified diesels are the plant's ability to demonstrate its compliance with the objectives set forth in the Commission's regulations. The evidence presented in LILCO's affidavits, testimony, and responses to NRC Staff requests provides sufficient information to conclude that Shoreham meets the objectives of the regulations as it is currently configured for low power operation. To assist the Staff in preparing for the resumption of hearings, however, this letter outlines the facts supporting the comparison of Shoreham's proposed operation with a plant having a qualified onsite power source.

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This comparison can be performed by looking at a number of aspects of supplying power during low power operation. First, the events analyzed in Chapter 15 of the FSAR can be evaluated with and without diesel generators. These evaluations demonstrate that the appropriate success criteria are met provided power is restored within certain time periods. Thus, the next step in the process is to compare the reliability of the power sources used to restore power and the ability to transmit that power to the appropriate equipment at Shoreham. Conclusions about the safety of LILCO's proposal can be made by considering the high reliability of LILCO's power sources and the steps taken by LILCO to ensure that at least one of those power sources can be connected to the necessary emergency loads at any time during low power testing. These factors are both addressed later.

Accident Consequences

As previously stated in LILCO's affidavits and testimony, the lack of diesels is only pertinent to four events analyzed in Chapter 15 of the SNPS FSAR. When operating the plant in Phase I (fuel load and precriticality testing) and Phase II (initial criticality), AC power is not needed to mitigate the consequences of those FSAR Chapter 15 events that could possibly occur. When operating the plant in Phase III (plant heat-up to 1% power) and Phase IV (operation up to 5% power), the most limiting event of the four events is the loss of coolant accident. We have demonstrated that for this event, operation of Shoreham during Phases III and IV results in acceptable consequences to the public as would the same event at a plant with qualified diesels.

To illustrate the analytical basis for our safety conclusion, we have prepared two curves (attachments 2 and 3) to this letter which plot the three 10 CFR 50.46 parameters (cladding temperature, local oxidation and core wide oxidation) as a function of time after a postulated loss of coolant accident at 5% thermal power. To compare the relative safety of SNPS without qualified diesels to a plant with diesels, the time when AC power is restored and available to operate mitigating equipment is a pertinent factor. Inspection of the attached curves shows the following:

TABLE 1: 10 CFR Part 50.46 Parameters

Time to Restoration of AC Power	Peak Clad Temp (PCT) (°F)	Local Oxidation (%)	Core Wide Oxidation (%)
With Qualified Diesels - Less than 1 Minute	550	0.033	0.033
With Onsite Temporary Diesels and Enhanced Offsite Power:			
-3 min (20MW GT)	558	0.033	0.033
-30 min (GM EMD)	1086	0.05	0.034

Inspection of these results shows that in both cases (i.e., with and without qualified diesels), the calculated values are below the regulatory limits specified in 10 CFR 50.46. Thus, in both cases the objective of not exceeding the limits of the regulation are met. Moreover, the protection of the public is further assured in both cases because:

(a) the calculated rod internal pressure is substantially less than that which would be required to cause perforation of the cladding and result in fission product release from the gap to the reactor coolant system, and

(b) even if the cladding failed, the fuel rod gap inventory of fission products, based upon operation of Shoreham at 5% power is an extremely small fraction of the rod inventory itself. See item 6 of the attachment to the NRC Staff Comments In Responses to the Commission's Order of April 30, 1984, dated May 4, 1984.

In addition to the LOCA, three other events might require onsite power for mitigation of their consequences. They are pipe break outside containment event, the feedwater line break event and the loss of offsite power event. By assuming no qualified onsite power sources, these accidents are essentially station blackout events. There are two critical plant parameters for a station blackout condition at SNPS; (a) the containment drywell atmospheric temperature and (b) the suppression pool temperature, both depending on the availability of HPCI and RCIC. Thus, a comparison of these parameters following these events at SNPS with and without diesels is the appropriate assessment.

LILCO letter, SNRC-1035, dated April 6, 1984 provides the results of calculations performed to determine the drywell bulk atmospheric heatup in response to this condition. Active containment cooling is not achieved until AC power is restored. Again the time required to restore AC power must be known. The following table shows the comparison called for in the Commission Order of May 16, 1984.

TABLE 2: Bulk Drywell Temperature

	Qualified Onsite Power	Onsite Temporary Diesels and Enhanced Offsite AC Power		
	1 Min.	3 Min. (20 MW GT)	14 Min. (Peak Temp)	30 Min. (GM EMD)
Drywell Temperature (°F)	145 (Approx.)	215	248	242

In each case the resultant bulk atmospheric drywell temperature is below the qualification temperature (over 300° F) for drywell equipment. Thus, it follows that an identical conclusion can be drawn for operation with or without qualified onsite diesels -- atmospheric drywell temperature poses no threat to the safety related equipment of the plant.

In addition to analyzing drywell temperature, LILCO has also determined that power to run pumps to provide suppression pool cooling would not be necessary for at least 30 days (assuming the availability of HPCI or RCIC). Active core cooling and inventory makeup in the station blackout event is initially provided by the steam driven HPCI and RCIC pumps. After several days, the reduced amount of decay heat in the core can be accommodated by the existing water inventory in the core.

Reliability of Power Sources

According to a study done for the NRC by Oak Ridge National Laboratory ("Reliability of Emergency AC Power Systems at Nuclear Power Plants," NUREG/CR-2989 (July 1983)), the reliability of onsite diesel generators at nuclear plants is in the range of 90% to 99.2% with an average reliability of 97.5%. The reliability of the four GM EMD diesel generators now installed at Shoreham is demonstrated by actual operating data gathered by New England Power during the years 1982 and 1983. During this period the machines were called upon to start 279 times and successfully started on each of these occasions. Thus, the starting reliability in actual operation in the most recent two year period was 100%. In one of these instances, a diesel tripped off after a successful start but restarted automatically. It is appropriate to include this as a successful start for the purposes of LILCO's low power license application because the machine would have been available to perform its intended function. Following three of the 279 start attempts, a diesel was manually shut down because of minor problems. In an emergency situation, the machines could have continued to run with these conditions. Consequently, for the purposes of LILCO's low power license application, these starts should also be considered successful. Even if the four attempts described above are not considered successful, the starting reliability is 98.6%. To augment our confidence in our GM EMDs, LILCO completed an analysis to demonstrate the seismic survivability of these diesels. This study was previously sent via LILCO letter SNRC-1057, dated June 15, 1984.

LILCO's other sources of offsite power are also very reliable and within the range of reliability for diesels at nuclear plants. The 20 MW gas turbine installed at the site has been fitted with a low pressure air start system and fuel control system which makes it virtually identical to the gas turbine at East Hampton. The East Hampton gas turbine has a starting reliability of 100% and operational availability of 97.9%. The five blackstart gas turbines at Holtsville have an average starting reliability of 93%, with a number of the units having 100% starting reliability. This reliability has been established in monthly tests conducted since August, 1982. Other gas turbines that could supply power to Shoreham are installed at Port Jefferson and Southhold. Both of these units have undergone tests which have been conducted almost monthly since September, 1982 to the present and both have shown 100% starting reliability during these tests.

Consequently, as the above data reflects, it is virtually certain that one or more of the enhanced offsite power sources for Shoreham would be available in an emergency. Indeed, given the excellent record of all of these machines, there is high assurance that a wide variety of sources could be called upon to supply power to Shoreham.

Assurance That Power From These Sources Can Be Supplied To SNPS

As discussed above, LILCO has demonstrated that the operation of Shoreham at 5% power without qualified diesels results in acceptable consequences to the public as would operation of a plant at 5% with qualified diesels, assuming power is restored within a certain period of time. LILCO has taken a number of steps to ensure that power can be restored to Shoreham quickly in the unlikely event it is lost during low power testing. These steps include procedures for training and a full-scale walkthrough of the restoration of power. A brief description of these steps follows:

1. Procedures

A number of procedures have been developed to install, test and use the supplemental power sources that are located on-site. These procedures will be used by plant operating personnel or Electric System Operation personnel to ensure that these power sources can supply power to the Shoreham plant in an emergency situation.

Our prior testimony describes the procedures for restoration of power from sources located both offsite and on-site. Here we provide more information on the procedures that are relevant to restoration of power from these supplemental sources located on-site:

A. TP 29.015.03 - Restoration of AC Power with Onsite Mobile Generators

This emergency procedure provides information and instruction for operator action in the event that all offsite power is lost, all TDI emergency diesels fail to start, the 20 MW Gas Turbine fails to start and the system operator indicates that offsite power restoration is not imminent. Using this procedure, station operating personnel will isolate normal and emergency loads, verify availability of GM EMD diesels, open the NSST disconnect switch if necessary, close the supply breaker to bus 11 and manually sequence on emergency core cooling system pumps in accordance with existing station procedures.

B. TP 24.307.04 - Bi-Weekly Test of GM Mobile Diesel Generators

This surveillance procedure demonstrates the capability of the GM EMD diesels to be manually started, operated at rated speed and synchronized on to the bus. The procedure documents the steps taken by the operator to manually place each unit in service in order to satisfy technical specification requirements.

C. TP 85.84042.3 - Supplemental Diesel Generators -- EMD (GM) Electrical Functional Test Procedure

This procedure provides instructions for functionally testing the ability of the supplemental GM Diesel generators to restore AC power to emergency systems with a total loss of offsite power coincident with a failure to TDI diesels to start.This test procedure also demonstrates the ability of the GM-EMD diesels to automatically start upon a loss of voltage signal and synchronize themselves so that the operator can energize the station buses. This procedure will be utilized to demonstrate the ability of operators to restore power to an emergency bus within 30 minutes.

D. TP 85.42042.1 - Supplemental Diesel Generators - EMD (GM) Mechanical Pre-Qualification and Performance Test Procedure

This procedure provides instructions to demonstrate that the EMD diesels can perform the following:

a) operate individually at various levels

b) operate individually at rated full load with acceptable frequency and voltage characteristics for one hour

c) operate in parallel with each other

d) can be manually synchronized onto an energized bus

e) automatically start on a dead bus signal

Other procedures are in the final approval and signature cycle and include SP 24.307.07 20 MW Gas Turbine Monthly Surveillance Test, SP 24.307.08 20 MW Gas Turbine Semi-annual Surveillance Test, and TP 84.84042.4 Battery Capacity Tests for GM EMD Diesels.

2. Training

A detailed lesson plan has been developed by the Training section (see attached) and has been presented to all six operating crews. All on shift operating personnel have received this training. Upon completion of the installation testing of the GM EMD diesels, drills will be conducted so that each crew will have hands-on experience in energizing the emergency buses from these units.

3. Full Scale Walkthrough

As part of the acceptance testing associated with the installation of the supplemental diesel generators, an integrated functional test will be performed on July 2, 1984 to demonstrate that the GM EMD diesels are capable of supplying power to the Emergency Core Cooling System equipment within 30 minutes of a simulated loss of offsite power event. Coordination among control room operators, field operators and LILCO System Operators will be demonstrated during this test. Additionally, restoration of AC power utilizing the 20 MW gas turbine will be demonstrated at this time.

CONCLUSION

LILCO has applied for an exemption from "that portion of General Design Criterion 17, and from other applicable regulations, if any, requiring that the TDI diesel generators be fully adjudicated prior to conducting the low power testing described in LILCO's March 20 motion . . . ." (Application for Exemption, dated May 22, 1984, at 4.) In other words, since the ASLB has decided not to give LILCO any credit for the TDI diesels as an onsite power source until litigation is complete, LILCO has requested permission to perform low power testing without such a qualified power source even though two of the three TDI diesels have successfully completed their qualification testing and will be enhanced further by implementation of the Owners' Group recommendations. The basic requirement for an onsite power source is found in GDC 17. Other NRC regulations specify applicable requirements for this power source. Thus, for example, GDC 1 and Appendix B contain the quality assurance requirements placed on onsite power sources and GDC 2 specifies seismic qualification requirements for them. In LILCO's view, exemptions from each of the requirements applicable to a GDC 17 onsite power source is not necessary. If no GDC 17 onsite power source exists, then there is nothing upon which to impose these other requirements. Inherent in LILCO's request for an exemption from GDC 17 is the understanding that this power source would have been subjected to all of the Commissions applicable requirements. It follows that analysis of the safety of the plant which assumes no qualified onsite power source, necessarily includes within it the impact of not having a power source which meets all of the associated regulatory requirements.

This letter summarizes how LILCO meets the standard set out in the Commissioner's May 16 Order. LILCO's prior testimony, submittals and affidavits include other information which supports the conclusion that Shoreham can be operated at 5% power with protection to the public commensurate with a plant with qualified diesels. For example, LILCO's commitments to shut down the plant when certain natural phenomena (e.g. storms, tornadoes, earthquakes) might occur, reduces the likelihood that power would be lost to Shoreham while the reactor is critical. LILCO's testimony also demonstrates that its normal offsite power supply to Shoreham exceeds regulatory requirements. Specifically, Shoreham has seven offsite power circuits coming to the SNPS area with two onsite circuits feeding the normal station service transformer and the reserve station service transformer; regulations only require two circuits. Shoreham uses multiple rights-of-way for these circuits whereas the regulations permit a single right-of-way. Shoreham has two separate switchyards plus a bypass of one of the switchyards, while the regulations only require a single switchyard. Finally, in addition to the 20 MW gas turbine and the four EMD diesels, the LILCO grid has multiple blackstart gas turbines specifically dedicated to restoring power to Shoreham rapidly.

Based upon (a) the results of our analyses for Shoreham which demonstrate that all the transient and accident success criteria are satisfied with and without qualified onsite power sources, (b) the enhancements made to our offsite power system, (c) our demonstrable restoration of AC power utilizing any of our many sources, and (d) our commitment to place the plant in cold shutdown for certain natural phenomena, we conclude that during operation up to and including 5% power LILCO has provided an acceptable degree of public protection.

Very truly yours,

John D. Leonard
Vice President -
Nuclear Operations

MJG:ck

Attachments

cc: P. Eselgroth, Sr. Resident Inspector w/attachments
C. Petrone, Resident Inspector "
All Parties Listed in Attachment I

ATTACHMENT I

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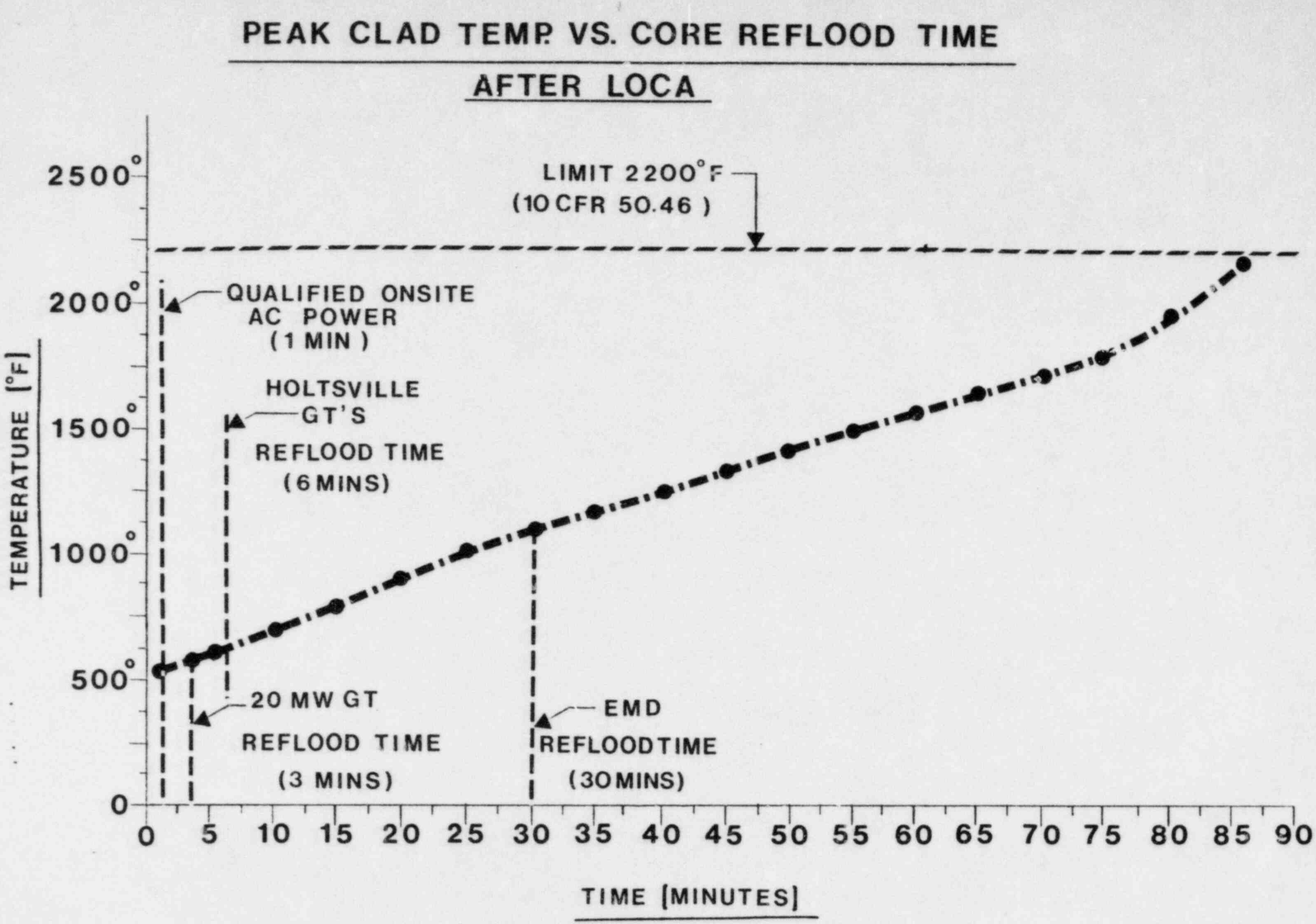
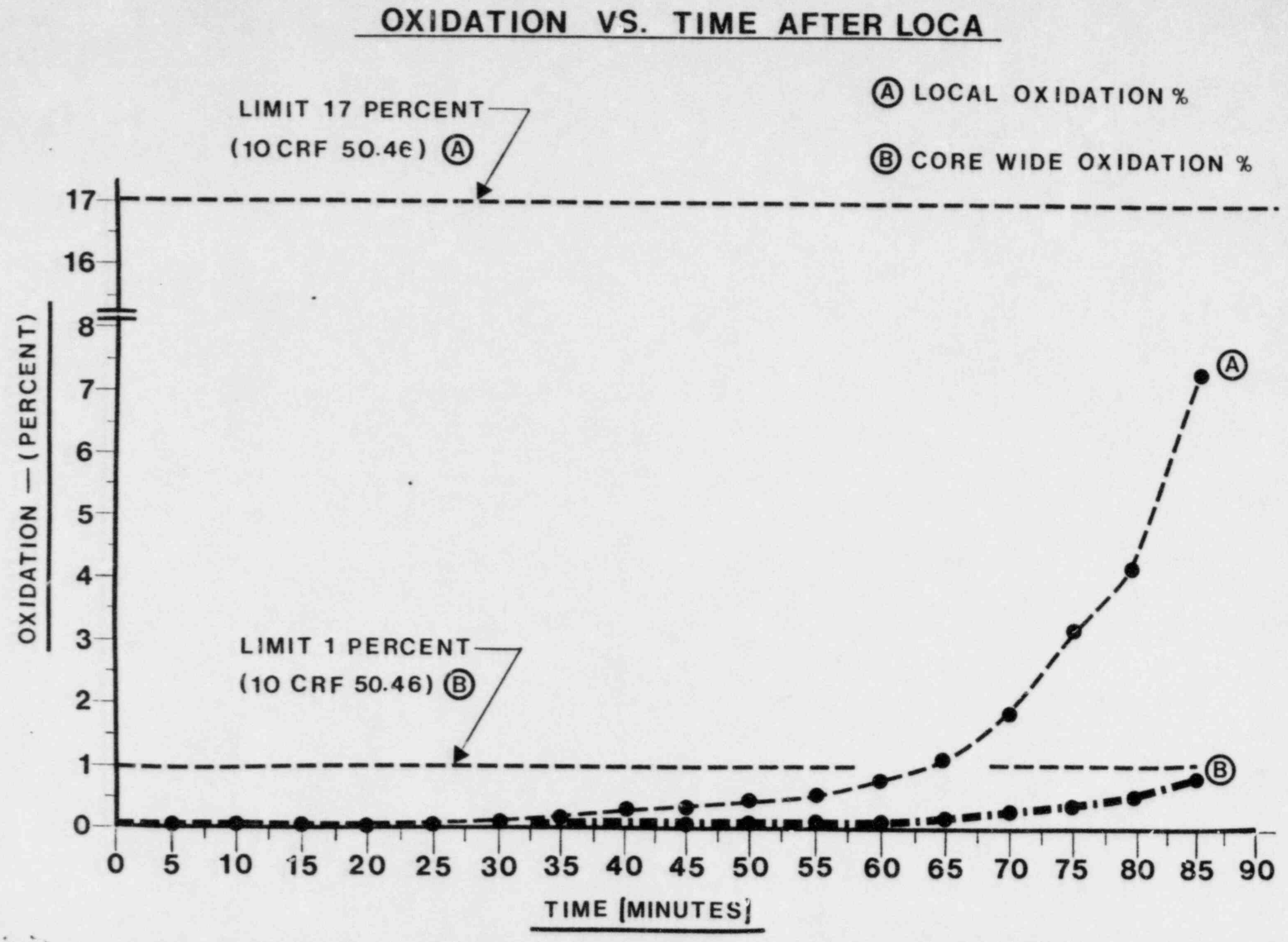


ATTACHMENT 2
SNRC-1060



ATTACHMENT 3 SNRC-1060