UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

September 20, 2006

MEMORANDUM TO: Harry Freeman, Senior Allegations Coordinator
Jeffrey Clark, Chief, Engineering Branch 1 (EB1)

FROM: George Replogle, Senior Reactor Inspector, EB1
John Reynoso, Reactor Inspector, EB1

SUBJECT: Allegation 2006-A-0054

Engineering Branch 1 performed an inspection of the alleger's concerns during the component design basis inspection at the San Onofre Nuclear Generating Station, July 10 - 20, 2006. The inspectors met with the alleger twice during this inspection. The following information describes the inspector's findings:

Concern 1: Several safety-related breakers (480V load Centers B04 and B06, described in Calculation E4C-099) will not clear over load and/or abnormal conditions and may damage the cables. Overload conditions are not alarmed. Cable damage may go unnoticed and, as a result, the safety-related loads may not perform there function during an accident condition. The acceptance criteria, exceptions to the criteria, and analysis stated in the base calculation are ambiguous. The exception to the criteria for short-time pickup may trip a motor prematurely during starting.

NRC Evaluation: The inspectors substantiated this concern. The inspectors received clarification on this issue from the alleger. The alleger was primarily concerned that cables in 480Vac circuits could be overloaded, and damaged, because breaker trip settings were too high. The inspectors, therefore, focused on this sole aspect of this particular concern.

Summary: The inspectors found that the licensee did not have adequate over-current protection for cables and the licensee was not meeting Updated Final Safety Analysis Report (UFSAR) commitments. While the licensee had identified this concern several years ago, their corrective measures were not prompt. This issue was a minor violation of 10 CFR Part 50, Appendix B, Criterion XVI (Corrective Actions).

Details: The UFSAR states, in part:

> Codes and standards applicable to the onsite power system are listed in Appendix 3.2A. Generally, the system is designed in accordance with IEEE Standards 308-1974...

D/5

(Inspector Note: others standards were also listed in this UFSAR section but the inspectors determined that IEEE 308 was the appropriate standard for this application).

IEEE 308-1974 states, in part:

Protective devices: Protective devices shall be provided to limit the degradation of the Class 1E power systems.

That means, the licensee should have provided overload devices to protect cables, as well as other components, from overload currents that can cause damage. Typical overload protective devices include fuses, breakers and thermal overloads.

Contrary to the above, the licensee's overload protection was inadequate in some cases. While the licensee did provide circuit breakers as a form of overload protection, the breaker trip settings were set too high. It was possible for overload currents to exist, such that, the cables could be damaged but the breakers would not trip. Affected components included, but were not limited to, 480Vac cables to charging pumps and control room air conditioning equipment. It is important to note that many of the affected cables were to motor-operated valves. Since these components would only operate for very short-time periods during an accident, the cables would not heat up to temperatures that could cause damage. For this reason, cables for motor-operated valves did not constitute a safety concern.

When the plant was originally designed the overload protection was adequate. However, in response to NRC fire protection requirements, the licensee had installed fire retardant insulation on many of the 480Vac cables that are now in question. Although this modification enhanced the site's capability with respect to fire protection, the applicable industry codes required engineers to reduce the ampacity ratings of the affected cables. Essentially, that meant that the cables could be damaged at lower currents. The licensee documented this problem in Action Request 011001639, dated October 30, 2001. Causes for overload conditions include grounds, as well as overloaded motors (i.e., packing is too tight) and degraded motors. Since many of the licensee's systems are ungrounded, multiple grounds would be necessary before those cables could be realistically damaged because of grounds.

To ensure that the cables were not experiencing excessive running currents, the licensee monitored each affected 480Vac running current one time. The licensee then verified that the running currents were less than the ampacity ratings. The inspectors were concerned because this monitoring was insufficient to ensure that degradation did not occur over the life of the plant. While the inspectors noted that it was unlikely that currents could be high enough to damage cables but not trip the breakers, it was still possible.

In some cases, the 480Vac breakers either could not, or could not easily, be set to provide cable overload protection consistent with the new ampacity limits. For example, the licensee was concerned that the small amount of margin between a breaker's trip setting and the normal

running current could result in some breakers prematurely tripping and challenging the safety function. The licensee's priority was correct in these instances. Nonetheless, this condition left the licensee in a position where cables could be overloaded, and damaged, without being detected until the component/cable failed. This was not consistent with their commitment to IEEE-308.

In response to the continued concerns, the licensee initiated actions to periodically monitor the running currents of certain affected loads to ensure that over-load conditions did not develop (see attached actions). In the case of the charging pumps, the licensee proposed no additional monitoring because: 1) multiple grounds would be required (for a high impedance grounding scenario); 2) the licensee no longer credits the pumps for mitigation of small break loss of coolant accidents; and 3) three pumps are available for primary system makeup.

Since corrective measures were not prompt, the inspectors considered the issue to be a violation of 10 CFR Part 50, Appendix B, Criterion XVI (Corrective Actions). This regulation requires the licensee to take prompt corrective measures to address conditions adverse to quality. The failure to meet a UFSAR commitment is considered a condition adverse to quality if safety-related equipment is affected. Since the inspectors had no indication that cables had actually been damaged, or that damage was likely to occur, the inspectors considered the issue's significance minor.

It is important to note that NRC regulations permit the licensee to change the commitment to IEEE-308, provided the conditions outlined in 10 CFR 50.59, "Changes, Tests, and Experiments," are met. The periodic monitoring of cable currents in lieu of overload protection, in this set of circumstances, is an acceptable alternative.

Concern 2: The derated ampacity of some of the 480Vac cables, listed in Calculations E4C-065 and E4C-120, is less than the continuous load current. The main drawbacks of these calculations are false assumptions and the methodology. The number of outstanding changes is in the hundreds. This is an error-likely situation and, as a result, some of the Class 1E devices may not perform the intended safety functions.

The inspectors divided this concern into three sub-concerns.

2A: The derated ampacity of some of the 480Vac cables, listed in Calculations E4C-065 and E4C-120, is less than the continuous load current.

NRC Evaluation: The inspectors did not substantiate this concern. The inspectors reviewed an extensive list of components and did not identify any where the actual continuous load currents exceeded the ampacity limits. The rated continuous load currents in some instances did exceed the ampacity limits of the cables. However, the licensee had measured the actual running currents to verify that the ampacity limits were not exceeded. The rated running current is not always an accurate predictor of actual running current. In many cases, manufacturers over estimate this current-to-bound service conditions.

The use of actual running currents was acceptable provided that the licensee periodically measure the running loads to ensure that running currents did not exceed ampacity limits. This issue was discussed further in Concern 1.

2B: The main drawbacks of these calculations are false assumptions and the methodology.

NRC Evaluation: This concern was not substantiated. The inspection team included an electrical contractor who reviewed the subject calculations. In addition, one NRC team member reviewed the subject calculations independently. As noted in Concern 1, the licensee was not meeting a UFSAR commitment with respect to circuit overload protection.

2C: The number of outstanding changes is in the hundreds. This is a worst error likely situation and as a result some of the class 1E devices may not perform the intended safety functions.

NRC Evaluation: The inspectors substantiated this concern but no violation of NRC requirements occurred. The licensee routinely modifies calculations through the "change notice" process but does not periodically consolidate the changes into the main body of the calculations (through what is normally called "revisions"). The licensee's approach made calculation usage very cumbersome, as engineers must review the main calculation and all of the accumulated changes notices in order to perform technical work. This makes technical errors more likely. However, the NRC does not require the licensee to perform periodic calculation revisions to incorporate the numerous change notices. In addition, the inspectors did not identify technical errors that were caused by the licensee's process.

Concern 3: The first line supervisors are rubber stamping the electrical calculations. As a result, there is lack of uniformity and consistency in electrical calculations.

NRC Evaluation: This concern was not substantiated. The inspectors interpreted this concern as: the supervisors were performing inadequate calculation reviews. To substantiate this concern the inspectors would need to have identified several calculation errors that supervisors should had identified previously. The inspectors identified only one error. The inspection team included an electrical contractor who reviewed numerous electrical calculations. In addition, several members of the team had electrical backgrounds and had also reviewed electrical calculations. While the team did identify one violation associated with battery calculations, this alone was not sufficient to show that supervisors, in general, performed inadequate reviews. With respect to calculation uniformity and consistency, NRC requirements only demand technical adequacy. Uniformity and consistency, while preferred, is not specifically required.