UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of	)	
	)	
DUKE POWER COMPANY, et al.	)	Docket Nos. 50-414
	)	50-415
(Catawba Nuclear Station, Units 1 and 2)	)	

AFFIDAVIT OF STEVEN ERIC FERDON

My name is Steven Eric Ferdon. I have been employed by Duke Power Company in the Materials Engineering Group of Design Engineering for two and one-half years. My current job classification is Engineer Associate.

I have a BS in Metallurgical Engineering from Purdue University, awarded in 1982. I am a member of the American Society of Metals and the Metallurgical Society of AIME. My Technical Division activity in ASM includes Materials Testing and Quality Control, Joining and Energy. I am also a member of the National Association of Corrosion Engineers, where I am active in the Nuclear Energy Systems technical division.

At Duke Power, my responsibilities over the last two and one-half years have included studying and researching inter-granular stress corrosion (IGSCC) cracking in nuclear systems. I have been involved in developing procedures and specifications to prevent stress corrosion (IGSCC) cracking at Catawba and other Duke Power units. My activities have included all aspects of IGSCC including its cause, prevention, and implications.

Corrosion, including IGSCC, was a significant part of my curriculum at Purdue University. Areas of study included chemistry, fracture mechanics, metallurgical properties of corrosion resistance and stress corrosion

cracking ir general. Since graduation, I have continued study in the areas related to stress corrosion cracking through continuing education courses sponsored by the American Society for Metals and M.I.T.

While I was a student at Purdue University, during the summer I was employed as an Engineering student Intern at Rea Magnet Wire Company and at Slayter Stainless Steel Company. While at Rea Wire, I participated in research involving corrosion testing and chemistry related to corrosion. At Slayter Steel, my activities and responsibilities included the control of metallurgical properties in stainless steel which make it corrosion resistant.

The purpose of this affidavit is to respond to the assertions made in the affidavits of Dr. Kaku and Mr. Schlissel filed by Palmetto Alliance and CESG in support of their Motion for Stay.

Taken together, the affidavits take the position that some "critical" stainless steel welds at Catawba exhibit sensitization; that under certain circumstances sensitization can lead to IGSCC; that such welds result in "weakened components" subject to sudden rupture; that even though the ASLB found (because of the chemical composition of the reactor coolant) that IGSCC is not expected to occur in Catawba's "primary loop", and the affidavits acknowledge explicitly that "it is true IGSCC has been less of a problem for [PWRs] than for [BWRs]" IGSCC might occur in "previously unanticipated" locations; that potential contaminants might "concentrate" in areas that the ASLB "believes unlikely"; and that there are areas other than the primary loop where one might look for IGSCC.

The affidavits fail to reflect either the state of the record or the known facts regarding sensitization of stainless steel welds and IGSCC.

The welds of concern in this proceeding are 2-inch stainless steel (Type 304 and 316) heavy-wall socket welds. The assertion is that foreman override resulted in violation of interpass temperatures; violation of interpass temperatures led to sensitization; and sensitization will lead to IGSCC.

At the outset it should be made clear that there is no evidence in the record demonstrating that violation of interpass temperatures on the subject welds results in sensitization of those welds. To the contrary, Duke fabricated welds under strictly controlled interpass temperature conditions, and conducted tests on those welds to determine the degree of sensitization, if any, in an attempt to relate the degree of sensitization of a stainless steel weld to interpass temperatures. Duke also tested actual welds (2-inch and smaller heavy wall stainless steel socket welds) in the field in an attempt to arrive at a field test for determining whether interpass temperatures had been violated on a particular weld. Two conclusions emerged from those tests. First, sensitization did not appear to be related to control (or lack thereof) of interpass temperatures; second, there was no field test that could be devised to show whether or not interpass temperatures had been violated on a particular weld. In short, Duke's tests showed that there was no evidence to suggest interpass temperatures had been violated; even if such had occurred, the degree of sensitization exhibited by such welds is indistinguishable from welds performed in accordance with

interpass temperature requirements. In light of that, it is reasonable to conclude there are some sensitized stainless welds at Catawba. It is also reasonable to conclude there are some sensitized stainless steel welds at every other PWR either under construction or operating.

However, the record reflects that the welds are suitable for performing their intended function. The degree of sensitization is not severe enough to cause IGSCC. The record further reflects that for IGSCC to occur, three factors - sensitization, tensile stress, and a corrosive environment - must be present. Sensitization has been discussed above. With respect to tensile stress, it is assumed that the welding process introduces stress into the metal. Mr. Schlissel makes the point that tensile stresses may be present "because the piping was not heat treated subsequent to the completion of the welding operations". Though it is true that some piping can be heat treated under certain conditions subsequent to welding to relieve tensile stresses, such is not the industry practice. Operating experience with with PWRs has proven that heat treatment to relieve tensile stress on stainless steel welds is not necessary for them to perform satisfactorily in service.

The third factor - corrosive environment - will not exist at the Catawba facility. The chemical composition of the reactor coolant and other fluids in the piping systems at Catawba will be carefully controlled through Technical Specifications and operating procedures, to assure that the allowable limits of potential corrodents are well below the levels at which IGSCC occurs. The operating procedures and the chemistry controls for the process fluids were set to prevent IGSCC from occurring. They are based on

knowledge learned to date about IGSCC, including that which has been learned from the few isolated cases of IGSCC in PWR's. These controls are very stringent for all nuclear systems and have been demonstrated to be effective in preventing IGSCC at other Duke Power Company plants and throughout the industry.

Stress corrosion cracking in PWRs has been limited to only a few cases, and none of these involved piping within the reactor coolant pressure boundary. The limited number of cases of IGSCC in PWRs have occurred in support and safety systems where the leaks have not resulted in an unisolatable reactor coolant leak. Each case involved an aggressive environment created by a corrodent which is either not present or strictly controlled and maintained below problem levels in these systems at Catawba.

Contrary to the assertion of Mr. Schlissel, there will be no "concentration" of these levels of corrodents in liquids in Catawba's piping systems. There will be no boiling of fluids in the stainless steel piping, and therefore there will be no mechanism for potential corrodents to concentrate in the piping systems. Thus the concentration of potential contaminants will not change from that originally put in a system. Chemicals to be used in the systems will be inspected on receipt to assure compliance with specifications. Inadvertent or undetected contaminant intrusion will be precluded by monitoring of fluid chemistry, in accordance with plant Technical Specifications and operating procedures. Therefore, because potential corrodents will not concentrate, and the systems will be monitored for contaminant intrusion, a corrosive environment will not exist

at Catawba, and there is no reason to suspect that IGSCC will occur at Catawba.

In any event, IGSCC is not a safety problem. It is a maintenance and efficiency problem. Experience with IGSCC in stainless steel piping in all industries has shown it manifests itself by leakage over a period of time rather than through a sudden pipe break. With the low number of incidents of IGSCC reported in PWRs over hundreds of reactor years of operation, the number of leaks, if any, that might occur would be extremely limited.

In summary, the potential for IGSCC at Catawba is minimal. Catawba has been designed, constructed, and will be maintained in a manner to prevent stress corrosion cracking from occurring. The process fluid specifications are intended to preclude IGSCC and are based on parameters that current knowledge indicates are necessary to initiate IGSCC. Furthermore, even if IGSCC were to occur, the implications of such are of a maintenance nature rather than a potential hazard to health and safety.

Steven Eric Ferdon

Subscribed and sworn to before me
this 19 day of December 1984.

JoAnn D. Bowman
Notary Public

My Commission Expires 7-12-88