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 SORESEN, G. C. Washington Public Power Supply System  
 RECIP. NAME RECIPIENT AFFILIATION  
 Document Control Branch (Document Control Desk)

SUBJECT: Application for amend to License NPF-21 to implement  
 requirements of Rev 2 to Reg Guide 1.97 for flux monitoring  
 prior to startup following fourth refueling outage. Fee paid.

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## Washington Public Power Supply System

3000 George Washington Way P.O. Box 968 Richland, Washington 99352-0968 (509)372-5000

December 23, 1987

G02-87-293

Docket No. 50-397

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

Gentlemen:

Subject: NUCLEAR PLANT NO. 2  
OPERATING LICENSE NPF-21, REQUEST FOR  
AMENDMENT TO LICENSE CONDITION 2.C.(16),  
ATTACHMENT 2, ITEM 3(b)

Reference: Letter, G02-87-0107, GC Sorensen (SS) to  
NRC, same subject, dated March 31, 1987

The subject license condition, as amended (Amendment 46), requires the Supply System to implement the requirements of Reg. Guide 1.97, Rev. 2 for flux monitoring prior to startup following the third refueling outage. In accordance with the Code of Federal Regulations, Title 10, parts 50.90 and 2.101, the Supply System hereby requests that the license be amended as follows:

- (b) The Licensee shall implement (installation or upgrade) requirements of R.G. 1.97, Rev. 2 for flux monitoring prior to startup following the fourth refueling outage.

The Wide Range Neutron Monitor (WRNM) designed and fabricated by Gamma Metrics (G-M) was installed and tested during the last refueling outage. From a performance standpoint, the equipment is very satisfactory. The problem was and still is to demonstrate that the WRNM is environmentally qualified in accordance with Reg. Guide 1.97, Rev. 2.

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Page Two  
AMENDMENT TO LICENSE CONDITION 2.C (16),  
ATTACHMENT 2, ITEM 3(b)

The Supply System has diligently worked very closely with G-M in an effort to meet the Reg. Guide requirements (see attachment). To date we have been unsuccessful. The Supply System still believes that the design of the G-M product is the best one available for our particular circumstances. It is possible, however, that a slight design modification to the connections may be required to fully qualify this equipment. G-M is still analyzing this possibility.

These modifications and the subsequent testing make it highly improbable that the equipment will be qualified to Reg. Guide 1.97, Rev. 2 in sufficient time to meet the present license condition requirement of being completed prior to startup following the third refueling outage. For this reason we are requesting a deferral to the fourth refueling outage.

The Supply System has reviewed the requested amendment per 10CFR 50.59 and 50.92, and has determined that no unreviewed safety questions or significant hazards will result. Further, the proposed change will not:

- 1) Involve a significant increase in the probability or consequences of an accident previously evaluated because the existing instrumentation consists of four redundant safety-related channels. Additionally, there are unrelated systems in place to provide operators with sufficient data to assess reactor conditions (e.g., control rod position monitors, reactor vessel level and pressure monitors) in the unlikely event of an accident condition prior to replacement.
- 2) Create the possibility of a new or different kind of accident because no function of the flux monitor system is being changed; therefore, no new or different kind of accident is conceivable.
- 3) Involve a significant reduction in a safety margin as adequate instrumentation is provided to allow the operator to assess reactor conditions without this monitor in the unlikely event of an accident condition that could cause the monitor currently in place to fail prior to replacement.



Page Three

REQUEST FOR AMENDMENT TO LICENSE CONDITION 2.C.(16),  
ATTACHMENT 2, ITEM 3(b)

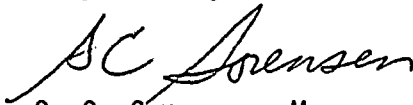
As discussed above, the Supply System considers that this change does not involve a significant hazards consideration, nor is there a potential for significant change in the types or significant increase in the amount of any effluents that may be released offsite, nor does it involve a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criteria for categorical exclusion set forth in 10CFR 51.22(c)(9) and therefore, per 10CFR 51.22(b), an environmental assessment of the change is not required.

This Technical Specification change has been reviewed and approved by the WNP-2 Plant Operations Committee (POC) and the Supply System Corporate Nuclear Safety Review Board (CNSRB).

In accordance with 10CFR170.21, an application fee of One hundred fifty dollars (\$150.00) accompanies this request. In accordance with 10CFR 50.91, the State of Washington has been provided a copy of this letter.

Should you have any questions, please contact Mr. P. L. Powell, Manager, WNP-2 Licensing.

Very truly yours,



G. C. Sorensen, Manager  
Regulatory Programs

PLP/bk  
Attachments

cc: C Eschels - EFSEC  
JB Martin - NRC RV  
NS Reynolds - BCP&R  
RB Samworth - NRC  
DL Williams - BPA/399  
NRC Site Inspector - 901A

STATE OF WASHINGTON )  
 )  
COUNTY OF BENTON )

Subject: License  
Amendment LC 2.C.(116)

I, G. C. SORENSEN, being dully sworn, subscribe to and say that I am the Manager, Regulatory Programs, for the WASHINGTON PUBLIC POWER SUPPLY SYSTEM, the applicant herein; that I have full authority to execute this oath; that I have reviewed the foregoing; and that to the best of my knowledge, information and belief the statements made in it are true.

DATE 23 DEC, 1987

G. C. Sorensen  
G. C. SORENSEN, Manager  
Regulatory Programs

On this day personally appeared before me G. C. SORENSEN to me known to be the individual who executed the foregoing instrument and acknowledged that he signed the same as his free act and deed for the uses and purposes herein mentioned.

GIVEN under my hand and seal this 23 day of Dec, 1987.

S. R. Mucha  
Notary Public in and for the  
State of Washington

Residing at Richland, WA.







## SUBJECT: CHRONOLOGY OF GAMMA-METRICS WRNMS TEST FAILURES

The basic design of the Gamma-Metrics Wide Range Neutron Monitoring System (WRNMS) in-containment is: a detector, interconnected by coaxial cabling to an amplifier outside containment. The cabling is housed in flexible metal tubing which is used to isolate the coaxial cables from any moisture. Electrical coaxial connectors (in-containment) are contained in the detector housing (6" stainless steel pipe), a stainless steel junction box, and Raychem heat shrink tubing at the containment electrical penetration connection.

### CHRONOLOGY:

#### Calendar Year 1986

Gamma-Metrics and General Electric proposals for supplying a Wide Range Neutron Monitoring System are reviewed by Supply System.

#### June 17, 1986

Gamma-Metrics is awarded the contract to provide a ex-core wide range neutron monitoring system.

#### Late September 86 through January 1987

Review of the Gamma-Metrics Test Plan and Procedure were ongoing. The manufacture of the test specimen was in progress. Manufacture was completed in mid January 1987. Radiation and thermal aging of non-metallic piece/parts was conducted. The test specimen was assembled and readied for LOCA testing.

#### Week of February 9, 1987

LOCA testing was conducted at WYLE Labs, Norco, CA. The LOCA testing was halted at about 7 minutes into testing when output was observed to be off scale. Investigative testing of the test specimen determined that two test equipment lead cables had shorted in the triaxial connector by which they were attached to the test specimen. It was determined that the stainless steel flexible tubing, which the test leads were routed in, leaked. This permitted the high temperature steam (340 F) to enter the backshell of the triaxial connector and create a current leakage path between the coaxial cable's inner conductor and outer shield. No failure of the test specimen was observed. The test leads and their stainless steel tubing were replaced and testing restarted.

#### Week of February 17, 1987

LOCA testing resulted in two failures. Investigation into the cause of the failures determined that the 3/8" stainless steel tubing (mfr: Service Air) was found to be defective. In fact, Service Air's 3/8" tubing was found to be manufactured in a faulty manner ie. the process and jig were faulty. Gamma-Metrics personnel have also determined that the 1/2" and 3/4" stainless steel tubing are acceptably manufactured by Service Air with different equipment. Only the two larger sizes were used in previous (@1982) LOCA testing by G-M, with success.

Week of March 4, 1987

A test specimen bench test failure resulted from a leaking silver metal O-ring. G-M decided to revert back to their previously successful design configuration (i.e., using silicone rubber O-rings). Thermal and radiation aging would have to be performed on the new O-rings prior to installation in the test specimen.

Week of March 11, 1987

LOCA testing was initiated on the same test specimen (now it included a silicon rubber O-ring as the junction box cover seal). The test specimen failed during the post-LOCA phase of the LOCA + Post-LOCA design basis accident. The unit had survived the double peak LOCA portion, and was operating in a 259 F environment. The failure mechanism was not readily apparent. G-M was proceeding to examine the test specimen with great caution and care. This was to try to prevent alteration of the failed condition to where failure mechanism and mode could not be determined.

Week of March 18, 1987

The LOCA testing was started again. It had been determined that test equipment lead wires failed during the LOCA testing. These wires were not considered part of the test specimen. Forty minutes of the LOCA peak temperature (340 F) was duplicated and then ramped down to (250 F). During the test failure investigation, the test specimen environment was maintained at (340 F), dry, for 14 hours up to resuming the LOCA testing with steam. This was due to miscommunication between the test lab technicians and G-M.

Week of March 25, 1987

When the LOCA testing had been underway for three days, fluctuations in output signal were observed. Troubleshooting suggested that cable shield annealing in handling the connector caused signal fluctuation by a reduction in insulation resistance. After examination, the test specimen was reassembled, run through another short high temperature spike, and the post-LOCA 30-day soak restarted.

Week of April 1, 1987

It was determined that a preamplifier in the amplifier (used as test equipment) was causing spike counts to be seen when the ambient temperature rose. The preamplifier was following the Wyle Labs open building air temperature in showing spurious increases in recorded counts per second. G-M was considering going through another LOCA peak at the end of the Post-LOCA (30 days) test to determine if the preamp was the cause of the higher noise readings during the LOCA peak.

Week of April 8, 1987

There seemed to be a failure of the test specimen; spurious signal spikes were being seen intermittently. G-M determined that the testing equipment was malfunctioning and replaced the amplifier. The new amplifier/recorder did record 0.5 counts per second, and maintained that level without any spurious rises. The testing was judged acceptable, and testing was continued. Later the same week the spurious problem returned. G-M was to travel to Wyle labs to investigate.

Week of April 15, 1987

The LOCA test specimen was judged to have failed. G-M decided to continue the LOCA testing on the chance that the testing equipment again might be at fault.

June - August 1987

Due to the many LOCA test failures, the Supply System requested G-M to modify their Test Plan and Test Procedure. There were problems encountered, however, after more than a month of rewriting, the test plan and procedure were approved. Subsequently, G-M started manufacturing the new test specimen. Thermal and radiation aging followed manufacture of the test specimen.

September 1, 1987

The in-containment test specimen was transported to (Radiation Sterilizers) for irradiation.

September 14, 1987

The in-containment test specimen irradiation (at Radiation Sterilizers) was completed.

September 22-24, 1987

The test specimen was checked for electrical continuity by G-M on the 22nd. No continuity was found through the triaxial connector. Further investigation revealed that the center conductor pin did not protrude far enough, out of the plug, to make contact with the center conductor receptacle in the jack. The technician, who had performed the work, was asked to examine the connector. He remarked that it was manufactured correctly. The responsible engineer responded that the design drawing dimensions were correct, but the technician's work was not within the tolerances of the drawing. The connector was reworked and the subsequent continuity check readings were found to be acceptable.

September 28, 1987

The LOCA chamber was closed, and the LOCA initiated. Within ten minutes of the start of the LOCA, the stripchart recording showed offscale spikes. The test was halted 30 minutes from the start. The LOCA chamber head was removed and a 15 psi pressure leak test was performed on the test specimen. Two conduit (flexible metal tubing) leaks were found (one on the test lead side, and one on the test specimen at the splitter solder joint).

October 9, 1987

G-M was working with Decisive Testing in San Diego to determine the root cause of one of the Test Specimen failures during the recent LOCA test. Review of the x-rays of the connectors on the transition piece from the test specimen to the LOCA chamber flange was inconclusive. One postulated cause of failure was that the connector and flexible tubing with metal mesh were not completely bonded. The leak appeared to be between the tubing and the metal mesh.

October 30, 1987

In preparation for LOCA testing, the test specimen was assembled and 60 psi nitrogen was applied to the sealed conduit (metal flexible hose) system. Normally, per procedure, only 15 psi nitrogen is applied, however, it was thought that applying 60 psi would show that the test specimen would be more likely to survive the LOCA chamber pressure of 53 psi. There were no problems; the preliminary pressure test was conducted with no failures or apparent leaks.

November 2, 1987

The test specimen was meggered after being assembled for LOCA testing. A Gamma-Metrics computer program determined from the megger values that moisture was present at one of the coaxial connector locations. To rectify the moisture problem without disassembling the test specimen, G-M applied a vacuum, followed by 15 psi nitrogen. This process was repeated several times. Subsequently, the totally sealed conduit system was found to be leaking nitrogen during a 15 psi pressurization. The leak was located at the stainless steel splitter on the (bigger) 3/4" metal hose side. G-M identified this leak as identical to the leak that occurred in the September 18, 1987 test failure.

November 5, 1987

Mr. Orville Jones (Supply System - Material Engineering) flew to Gamma-Metrics to consult with G-M personnel. This was an attempt by Supply System to assist G-M in determining the failure mechanisms and modes, and in developing a fix.



November 19, 1987

Gamma-Metrics is presently attempting to create a second test specimen, separate from the prototype test specimen for WPPSS. This second test unit will contain fixes to defective solder joints on stainless steel flexible metal tubing, and will be LOCA tested to prove repaired solder joints can be relied upon to survive a LOCA without failure. They are attempting to develop a fix which can be implemented to repair the WNP-2 units to a qualified condition.

