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Document Control Branch (Document Control Desk)

SUBJECT: Forwards description of Design Change Request DCR 2172 - Phase II, "Analog-to-Digital Radiation Monitoring Instrumentation Replacement" to resolve unreviewed safety question.Approval of proposed digital sys requested.

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September 10, 1992

10 CFR 50.90

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

Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Unreviewed Safety Question - Analog to Digital
Radiation Monitoring Instrumentation Replacement

References:
1) Federal Register; Volume 57, No. 158; Friday, August 14, 1992; Notices; Page 36680

2) Letter from K. H. Evers (WPSC) to Document Control Desk (NRC) dated August 21, 1989 (LER 89-013)

3) Letter from K. H. Evers (WPSC) to Document Control Desk (NRC) dated August 23, 1989 (LER 89-014)

4) Letter from K. H. Evers (WPSC) to Document Control Desk (NRC) dated December 12, 1990 (LER 90-011)

5) Letter from K. H. Evers (WPSC) to Document Control Desk (NRC) dated January 4, 1991 (LER 90-013)

A001

In Reference 1, the Nuclear Regulatory Commission (NRC) staff stated that replacing safety-related analog equipment with digital instrumentation introduces new failure modes not previously evaluated and is therefore, an unreviewed safety question (USQ) and requires NRC approval prior to installation. Currently, Wisconsin Public Service Corporation (WPSC) plans to replace the Kewaunee Nuclear Power Plant (KNPP) analog process radiation monitors with a digital system supplied by Nuclear Research Corporation (NR). This replacement will be performed under design change request (DCR) 2172 and is scheduled for completion by the end of the 1993 refueling outage. Implementation of DCR 2172 will complete our corrective actions for radiation monitor replacement, which were developed in response to recent Licensee Event Reports at the KNPP related to the Radiation Monitoring System (references 2, 3, 4 and 5).

Phase I of DCR 2172 replaced the non safety-related area radiation monitoring channels which are used for indication only. The 10 CFR 50.59 Safety Evaluation for Phase I activities did not result in an unreviewed safety question.

Phase II of DCR 2172 involves, in part, the replacement of six (6) safety-related radiation monitoring channels which initiate automatic actuations upon a high radiation alarm. The 10 CFR 50.59 safety evaluation for Phase II activities resulted in an unreviewed safety question due to "the possibility of a malfunction of equipment important to safety of a different type than any previously evaluated in the Updated Safety Analysis Report (USAR). "

Accordingly, WPSC is seeking NRC approval of the proposed digital system prior to installation during the 1993 refueling outage. WPSC is confident that the digital instrumentation system supplied by NR is a more reliable system than the current Victoreen and Westinghouse instrumentation systems. Attachment 1 to this letter provides a description of the proposed change and documents and assesses the possible failure modes of the proposed digital system that have not been previously evaluated in the KNPP USAR. Attachment 1 also addresses concerns regarding software verification and validation as well as digital system sensitivity to plant environments such as electro-magnetic interference (EMI), temperature, power quality and grounding. Attachment 2 consists of the Safety Evaluation, Significant Hazards Determination, and Environmental Considerations for the proposed change. Attachment 3 is a simplified Radiation Monitoring Equipment Layout drawing for the new digital system which has been provided to aid in your review. Our conclusion is that this change will have no adverse impact on the health and safety of the public and will not reduce the margin of safety at the KNPP.

In accordance with the requirements of 10 CFR 50.30(b), this submittal has been signed and notarized. A complete copy of this submittal has been transmitted to the State of Wisconsin as required by 10 CFR 50.91(b)(1).

Sincerely,

C. R. Steinhardt
Senior Vice President-Nuclear Power

PEM/jac

Attach.

cc - US NRC - Region III
Mr. Patrick Castleman, US NRC
Mr. R. S. Cullen, PSCW

Subscribed and Sworn to
Before Me This 10th Day
of September 1992

Notary Public, State of Wisconsin

My Commission Expires:

June 18, 1995

LIC\NRC\PA116.WP

ATTACHMENT 1

To

Letter from C. R. Steinhardt (WPSC) to Document Control Desk (NRC)

Dated

September 10, 1992

Description of Change

For

DCR 2172 - Phase II

"Analog to Digital Radiation Monitoring Instrumentation Replacement"

Table of Contents

I. Backgrouud

The Nuclear Regulatory Commission (NRC) staff has deterınined that, replacing safety-related analog equipment with digital instrumentation ıntroduces new failure ınodes not previously evaluated, and is therefore an unreviewed safety question (USQ) and requires NRC review and approval prior to installation. WPSC will be replacing analog radiation monitoring equipment with digital instrumentation during the 1993 KNPP refueling outage and is therefore submitting this change for prior NRC approval. The following describes the proposed change and addresses the possible new common mode failures not previously evaluated and demonstrates that the replaceıment of the analog radiation monitoring equipment with digital instrumentation will not decrease the margin of safety of the Kewaunee Nuclear Power Plant (KNPP).

Several test reports were submitted to Wisconsin Public Service Corporation (WPSC) by Nuclear Research Corporation (NR) which address the areas of concern. Given that the unreviewed safety question pertains to the replacement of analog equipment with digital, only the design of the ADM-600A and ADM-610A modules need be addressed. The radiation detectors and PA-300 amplifiers are analog components and do not introduce any new failure modes. Since the ADM-600A and ADM-610A digital ratemeters are comınon eleıments among the process radiation monitoring channels, testing of one piece of hardware is considered adequate to qualify their design.

II. Description of Change - Process Radiation Monitor Replacement

Design Change Request (DCR) 2172 will replace or remove existing Westinghouse and Victoreen Radiation Monitoring System (RMS) channels that were installed during original plant construction. A total of twenty-five RMS channels (Radiation Monitors R1 through R24 and Radiation Monitor 13A) will be replaced or deleted under Phase I and Phase II of DCR 2172. Phase I only affected area radiation monitors which were not safety-related and had no automatic actuation features. Phase II of DCR 2172 affects fifteen (15) Process Radiation Monitoring Channels, six (6) of which are safety-related, and those channels are the subject of this submittal. The affected RMS channels of Phase II are as follows (*designate safety-related channels):

Channel No.	Channel Name
R11*	Containment Vent Particulate Monitor
R12*	Containment Vent Gas Monitor
R13*	Aux Building Stack Monitor A
R13A*	Aux Building Vent Sample Collector
R14*	Aux Building Stack Monitor B
R15	Condenser Air Ejector Monitor
R16	Containment Fan Coil Water Monitor
R17	Component Cooling Water Monitor
R18	Liquid Radwaste Discharge Monitor
R19	SG 1A Blowdown Monitor
R20	Service Water Monitor

Channel No.	Channel Name
R21*	Containment Vent Stack Monitor
R22	RHR Pump Pit A & B Leakage Monitor
R23	Control Room Vent Monitor
R24	Condenser Cooling Water Discharge Monitor

Of the process RMS channels being upgraded by Phase II of DCR 2172, ten (10) RMS channels currently initiate automatic actuations as described below:

R11,R12 High radiation level initiates closure of Train "B" Containment Vent purge supply and exhaust duct valves.

R21 High radiation level initiates closure of Train "A" Containment Vent purge supply and exhaust duct valves.

R13,R14 High radiation activates the Auxiliary Building Special Ventilation System and isolates all ducting to the Auxiliary Building ventilation system with the exception of the special ventilation discharge and spent fuel exhaust fans discharge. These radiation monitors also initiate closure of the Waste Gas Decay Tank gas release valve, isolation of the two inch containment depressurization line, and redirection of the Spent Fuel Pool Ventilation System exhaust to its charcoal filter banks.

R13 also automatically shifts the R11 and R12 sample discharge from the Auxiliary Ventilation System to Containment upon indication of high radiation.

R15,R19 High radiation level initiates automatic action which aligns the condenser air ejector discharge header with the Auxiliary Building Vent Stack, closes the steam generator blowdown sample isolation and isolation valves, and closes the humidification steam inlet to the warehouse annex.

R17 High radiation intiates automatic closure of the Component Cooling Water Surge Tank vent valve. The existing automatic actuation capability will be permanently removed and the associated vent path isolated. A permanent vent path to the Waste Holdup Tank is in place. The radiation monitor will be retained for indication of reactor coolant leakage into the Component Cooling Water system. Reference - Proposed TS Amendment 116

R18 High radiation initiates automatic closure of the Waste Disposal System discharge valve.

R23 High radiation initiates closure of Control Room fresh air dampers, opens postaccident recirculation dampers, and starts postaccident recirculation fans.

The proposed process RMS equipment will be supplied by Nuclear Research Corporation (NR). Each process monitor channel consists of the following equipment:

- A beta or a gamma scintillation radiation detector;
- A preamplifier (PA-300);
- A local (field) microprocessor based Digital Ratemeter (ADM-600A or ADM-610A) and;
- A remote (control room) microprocessor based Digital Ratemeter (ADM-600A).

In addition, operational verification will be provided by check sources associated with each detector. Check source verification can be initiated locally or from the control room and will provide upscale deflection of at least one decade above background. Furthermore, all process (liquid and gaseous) sampling assemblies will be provided with local grab sampling taps and isolation valves.

Each channel detector will be connected to a local (field) Digital Ratemeter (ADM-600A or ADM-610A) using a NR supplied cable. This cable provides power and control signals to the detector and a radiation level signal to the digital ratemeter. The digital

ratemeters will be mounted near the detector or on a local skid. The ADM-610As are housed in NEMA enclosures. All safety-related equipment will be seismically qualified and mounted. Power consisting of 120VAC will be supplied to each local ratemeter from a battery backed instrument bus.

Remote (Control Room) indication and control will be provided by means of an ADM-600A ratemeter for each RMS channel. These units will be installed in Mechanical Vertical Panel "C" of the Control Room. Control switches and indicating lights for the control of the sample pumps will also be installed in Mechanical Vertical Panel "C".

Power for the control room ADM-600A units will be supplied from two redundant NR supplied twenty-eight (28) volt power supplies for each train in Mechanical Vertical Panel "C". Power of 120VAC will be supplied to the NR power supplies from a battery-backed instrument bus. Power for the sampling pumps will be 480V and will be supplied from the same train as the channel it serves.

The remote (control room) ADM-600A units communicate with their corresponding local (field) ADM-600A or ADM-610A units via an RS-485 communication loop through a shielded twisted quad.

Both the Phase I area monitor channels and the Phase II process channels will be connected to a data acquisition system with one remote terminal located in the Radiological Analysis Facility. In addition, analog output signals will be sent from each radiation monitoring channel to the plant process computer (Honeywell) and the existing control room recorder.

The non safety-related RMS Data Acquisition System (DAC) uses a rack mounted industrial personal computer data concentrator. This data concentrator communicates with each RMS channel through the control room ADM-600A units. This computer, which will be mounted in the control room, is not used for normal plant operation. The major function of this unit is for data collection, communication with remote terminals and system troubleshooting.

All of the safety-related components, including the ADM-600As, ADM-610As, detectors, preamplifiers and cables for this design change will be procured to safety-related standards.

III. Software

A. Vendor Software Design Verification and Validation (V&V)

The following is a summary of the non-proprietary information provided to WPSC by Nuclear Research Corporation regarding software verification and validation. The software verification program used by Nuclear Research is twofold. First, all Electrically Erasable Programmable Read Only Memory (EEPROM) chips are assigned a checksum number which designates the software vintage. Any changes to the software would be tracked and a new checksum would subsequently be assigned. Secondly, the software is validated by functional test procedures developed in conjunction with the customer. These procedures verify that all components of the software are consistent in operation for different pieces of hardware. In addition, temperature and seismic testing with these same procedures validates the operation of the equipment under adverse conditions. This is discussed further in Part V.

If WPSC would develop a need to change the functionality of the digital equipment supplied by NR, the EEPROMs would be returned to the vendor for reprogramming and retesting. A new checksum number would be assigned to indicate the proper software vintage. This ensures that software changes would

be reviewed and approved in accordance with an appropriate Quality Assurance program.

B. System Failure Firmware Checking

The ADM-600A and ADM-610A read only memory (ROM) and random access memory (RAM) have a software error checking feature which detects operational status. A checksum verifies the ROM and RAM software upon power-up and periodically during operation. As outlined in section C, the amber fail light and error message will activate if a problem is detected. The ADM-600A error message "ROM/RAM Failure" and the ADM-610A error message "DET: Memory Fail" indicate that the EEPROM or CPU circuit card assembly would need to be replaced.

C. System Failure Modes

The ADM-600A will give the control room operator indication of a failure by means of status lights for a high or alert alarm condition, failure messages, and annunciators in the control room. The following messages will appear at the ADM-600A for the stated reason:

Lights	Message	Reason
Green	Det: Keylock	ADM-610A Key is in the KEYPAD position.
Green and Fail Amber	Det: AC Pow_Fail	ADM-610A loses AC power and relies on battery. Radiation level still is correct.
Green	Det: Calibrate	ADM-610A is in calibrate mode. Normal detector information unavailable at ADM-600A.
Green	Check Source Active	Unit has entered check source mode.
Fail Amber	No Detector Link	Probe is not attached to ADM-610A.
Fail Amber	No Detector Link	Cable from ADM-600A to ADM-610A disconnected.
Fail Amber	RAM/ROM Memory	Check sum error has occurred in ADM-600A.
Fail Amber	Det: Memory Fail	Check sum error has occurred in ADM-610A.

Fail Amber Det: Gamma Fail ADM-610A has not received gamma count from detector for 5 minutes.

The conditions stated above will reset themselves to normal if the condition clears. The exceptions are the check sum errors in the ADM-600A and ADM-610A units. These failures require repowering the unit to begin self-diagnostic checking. In addition, the last failure mode listed above requires power to the unit to be cycled before the lamp can be cleared.

In conclusion, should a failure occur in either the ADM-600A or ADM-610A units, the control room operators will be alerted. Any failures would require minimal time to identify and correct.

IV. Testing

All ADM-600A and ADM-610A units have a functional acceptance test prior to shipment. Test reports are submitted with equipment when shipped. WPSC will perform additional testing after each channel is installed to verify operability. All safety-related channels will have Plant Operations Review Committee (PORC) approved installation and pre-operational test procedures. All surveillance procedures for safety-related channels

will be revised and PORC approved, as necessary. All non safety-related channels will have similar installation and test procedures.

V. Equipment Qualification

The KNPP Environmental Qualification (EQ) Plan identifies the equipment that is required post-accident. The radiation monitoring channels that will be replaced under DCR 2172 are not included within that scope. Additionally, it should be noted that the affected radiation monitors are not within the scope of Regulatory Guide 1.97. Although environmental qualification was not required, the vendor has successfully performed extensive environmental testing at conditions which bound the KNPP parameters. This has provided added assurance of the reliability and performance capability of the digital equipment to be installed. Details of the vendor testing follow.

A. Temperature, Humidity, & Radiation

Nuclear Research Corporation has qualified the ADM-600A and ADM-610A for a temperature environment from 32 to 120°F (Reference A). This design parameter envelops the temperatures established by the KNPP EQ Plan for the containment building, auxiliary building, turbine building and control room under normal operating conditions at the locations where the equipment is to be

installed. Reference B is the environmental test report for the ADM-610A. The ADM-600A was qualified on the basis of similarity to the ADM-610A. The ADM-600A contains the same electronics but is in a mesh-type enclosure which allows for better heat dissipation. Therefore, temperature qualification of the ADM-600A is bounded by the environmental test report for the ADM-610A.

Reference A (p. 13) states an operating and storage relative humidity level of 10 to 95 % which meets all normal operating environments at the KNPP (containment building, auxiliary building, turbine building and control room). The reference 2 test report documents the testing of the ADM-610A in an environment from 40% to 95%. The humidity level from 10-40% was not tested since a lower humidity level was bounded by the higher humidity testing and would introduce fewer adverse effects.

Functional testing of the ADM-600A was not performed under a high humidity environment. The ADM-600A components will reside in the control room and auxiliary building. The control room has a 10-40% humidity environmental parameter which would not affect the continued operation of the ADM-600A. In addition, the equipment is mounted in mechanical vertical panel C which will protect the equipment from the environment. The auxiliary building has a relative

humidity level of 10-95% and the ADM-600A components will be housed in an enclosure which will protect the unit from exposure to high humidity levels.

As shown in the Equipment Qualification report provided by Nuclear Research, the equipment was fully functional before and after temperature and humidity testing with no adverse effects.

In reference A (p. 14), Nuclear Research states that the allowable radiation exposure for the ADM-600 and ADM-610 is 1.5×10^3 Rads total dose. The maximum background level during normal plant operation for any channel at the KNPP is 5 mR/hr which is the radiation monitor in the vicinity of the Incore Instrument Seal Table Area (R-7). Using this information, it can be shown that the equipment qualification is satisfactory until the end of plant life by calculating the total expected radiation exposure over the remaining life of the plant and comparing this value with the equipment limit for allowable radiation exposure. Assuming all equipment will experience a maximum normal background radiation level equivalent to that received by R-7 over a remaining plant life of 22 years, the estimated total dose that each piece of equipment will experience is approximately 960 rads. Given that 960 rads is significantly less than the allowable 1500 rads, the equipment is qualified for the remaining life of the KNPP. Furthermore, since normal background radiation in the vicinity of most

channels is less than 2 mR/hr, the projected monitor exposure is conservatively high.

B. Electro-Magnetic Interference (EMI)/Radiofrequency (RF) Interference

The following tests were performed by Radiation Sciences Inc. for NR:

Conducted EMI Transient Susceptibility

Conducted RF EMI Susceptibility

Radiated RF EMI Field Susceptibility

Hand Held Radio RF EMI Susceptibility

As documented in Table 4.1 of reference A, no problems occurred with the ADM-600A or ADM-610A when the stated condition was present.

C. Seismic

The ADM-600A and ADM-610A were tested for the required response spectra listed in Appendix A of reference C. The g-forces the equipment experienced during testing were much higher than those required by the KNPP Engineering Specification (ES)-12004, which delineates the acceptance criteria for seismically

qualified components at the KNPP. The equipment was tested before and after seismic testing and was found to be fully functional with no adverse effects.

VI. Separation and Isolation

Cables will be routed in accordance with the KNPP standard design criteria and will meet all applicable separation and isolation requirements.

The ADM-600A and ADM-610A communication link is optically isolated such that a failure in one piece of equipment will not adversely affect operation of the other equipment. The ADM-600A outputs to the data acquisition system, plant process computer, and recorder are also optically isolated to prevent failure in any of these systems from adversely affecting the ADM-600A.

Therefore, the separation convention and optical isolation provide assurance that any failure in one piece of radiation monitoring equipment or interfacing plant equipment will not propagate and result in a common mode failure to all radiation monitoring channels.

VII. Grounding

The instruments are grounded in accordance with the manufacturer's recommendations and standard plant practices. The communication cables between the ADM-600A control room units and the ADM-610A units in the field are grounded only at the ADM-610A end to prevent ground loops. The control room instrumentation is grounded on the instrument bus, thus preventing ground loops.

When performing maintenance, ground straps and static mats will be used where necessary when handling circuit card assemblies. Therefore, damage to the circuit cards should not be incurred due to electrostatic discharge.

VIII. Power

The ADM-600A process units in the control room are powered from two sets of independent, redundant PS-100 power supplies in the vertical panels. One set is for the A-train process channels and the other is for the B-train process channels. The PS-100 power supplies are then powered from safeguards inverters and backed by station batteries. To eliminate the necessity of providing two power sources to the vertical panels in the Control Room, (i.e., a safeguards power source for safety-related channels and a normal power source for non safety-related channels) all process ADM-600s in the

control room will be powered from a safeguards power source. A power failure in a non safety-related channel will not effect a safety related channel. Isolation is provided by individual fuses in each ADM-600A.

The field instrumentation is supplied by either safety-related power or by normal power depending on whether the channel is safety-related or non safety-related.

If power is interrupted to the PS-100 units, a "Power Supply Failure" annunciator will actuate in the control room. If power is interrupted to the field ADM-600A or ADM-610A units, the Control Room ADM-600A "Fail" alarm light, "AC Pow_Fail" message, and "Failure" annunciator will actuate in the control room. In the event of an interruption in power to a field unit, the field ADM units will have a battery backup that maintains operation of the detector so that the control room will still have accurate radiation level readings. The vendor has recommended a 2 year replacement cycle for these batteries.

IX. Response Time and Setpoints

DCR 2172 has not adversely affected the response time of the radiation monitoring channels. All channels are configured the same as the existing system equipment with the exception of the auxiliary building vent radiation monitors R13 and R14. These

channels have been changed from an in-line gaseous array to an off-line skid sampler. This change will result in a maximum time delay of 9 to 10 seconds. The original Victoreen equipment specification TS-426 states a response time of not greater than 5 seconds.

The new radiation monitoring ADM-600A has a display update time of 2 seconds and a 0.5 to 1 second alarm actuation time. The alarm actuation is performed in parallel to the display update. The delay time of the ADM-600A will not adversely effect alarms or automatic actuations.

The delay for the R13 and R14 process sample piping and the delay introduced by the ADM-600A will not adversely effect the alarm or automatic actuations. The effect on offsite dose is nonconsequential.

Setpoints will be determined in accordance with the Offsite Dose Calculation Manual and the Radiological Effluent Technical Specifications.

X. Product History

Nuclear Research Corporation has extensive experience in the field of radiation monitoring. Many Department of Energy (DOE) installations and commercial nuclear

power plants have had NR equipment in operation for a number of years. DOE facilities which have received NR instrumentation products include; Argonne, Brookhaven, Los Alamos, and Sandia National Laboratories. In addition, the Waste Isolation Pilot Plant Site in Carlsbad, New Mexico, has continuous air monitors and air sampling stations, which were also supplied by NR.

Commercial plants which have installed NR digital radiation monitoring systems include; Arkansas Power & Light/ANO1, Carolina Power & Light/H.B. Robinson, Florida Power & Light/Turkey Point, and Philadelphia Electric/Peach Bottom.

Contacts are available upon request at all of these locations to verify the operation of the NR system. WPSC personnel visited several plant locations and were satisfied with the performance record of the NR equipment.

XI. Training

Training plans will be developed by WPSC and will be reviewed by Nuclear Research Corporation for technical completeness. Training will be held on-site for Instrument and Control (I&C), Operations, and Health Physics personnel who will be required to maintain and operate the equipment. This training will be held in January or February of 1993 prior to system installation.

WPSC will develop and implement a training plan for the new radiation monitoring system under the auspices of the INPO accredited training programs of the KNPP. Technical personnel required to maintain operation of the radiation monitoring equipment will be properly trained. The KNPP Simulator will also be modified with radiation monitoring equipment which mimics the equipment installed in the plant.

XII. Conclusion

New failure modes which may be introduced by the digital equipment supplied by Nuclear Research have been identified and addressed. This report documents that these failure modes would not adversely affect the continued operation of the radiation monitoring equipment and would not reduce the reliability of the equipment or the safety margin of the radiation monitoring system. The equipment has been tested under adverse conditions and has proven to maintain full functionality. In addition, the equipment supplied by Nuclear Research has proven itself at other government and commercial nuclear facilities. Based on this report, Design Change Request 2172 does not reduce the margin of safety of the Kewaunee Nuclear Power Plant.

XIII. References for Attachment 1

A. NRCI - TP: 200902 - Qualification Test Report - Environmental and Seismic Testing ADM-600 and ADM-610 Multifunction Digital Ratemeters

B. NRCI - TP: 200872 - Environmental Characteristics of ADM-610

C. National Technical Systems - TR. 60024-93N-1 - Seismic Test Report for the Qualification of the ADM-600 and ADM-610 Multi-function Display and Control Units

ATTACHMENT 2

To

Letter from C. R. Steinhardt (WPSC) to Document Control Desk (NRC)

Dated

September 10, 1992

Safety Evaluation, Significant Hazards
Determination, Environmental Considerations

Safety Evaluation

This proposed change to the Kewaunee Nuclear Power Plant (KNPP) will result in the replacement of several analog process radiation monitors with digital equipment. The purpose of the analog to digital change is to improve the reliability of the radiation monitoring system. The change was initiated due to obsolescence of the existing system along with the associated increased difficulty in obtaining spare parts.

Considerations in our evaluation of the acceptability of this change included:

- new failure modes not considered during plant design
- effect of electromagnetic interference
- equipment configuration
- detection of and response to software failures

Each of these considerations was addressed in more detail in Attachment 1. However, the following is a summary of each.

Although a digital radiation monitoring system does introduce new failure modes not considered during plant design, these failure modes would have no impact on the ability to safely shutdown the plant or mitigate the consequences of an accident. This is due to the fact that radiation

monitoring is not part of the Reactor Protection System and actions automatically initiated by a radiation monitor could also be accomplished through manual operator action in response to diverse indication. The new failure modes of primary concern include common mode software failures, the effect of electromagnetic interference on digital equipment, and failures specific to digital equipment. The testing performed by the manufacturer, the built-in failure detection system, and the demonstrated reliability of the selected manufacturer's equipment at other installations have provided a high level of assurance that probability of failure is low and should one occur the operators would be promptly alerted.

Converting radiation monitoring from an analog to digital system at the KNPP is a definite reliability improvement. Although this change would create the possibility of new digital failure modes the malfunctions associated with an analog system would be eliminated. The probability of digital malfunctions have demonstrated to be acceptably low and should one occur operators can take appropriate compensatory measures. Given the age degradation of the Radiation Monitoring System at the KNPP and the unavailability of spare parts, the analog to digital change is a system improvement which will not adversely affect the current safety margin.

Significant Hazards Determination

This proposed change was reviewed in accordance with the provisions of 10 CFR 50.92 to show no significant hazards exist. The proposed change will not:

1) involve a significant increase in the probability or consequences of an accident previously evaluated.

The proposed digital radiation monitoring equipment will provide functional capabilities equal to that provided by the analog equipment that is being replaced. It should be noted that radiation monitoring equipment at the Kewaunee Nuclear Power Plant (KNPP) is not an initiator of accidents analyzed in the Updated Safety Analysis Report (USAR), but does aid in mitigating the effects of some of those accidents. This is accomplished by monitoring radiation levels in plant process streams, alarming on high radiation, and in some instances initiating automatic actuations of safety-related equipment (e.g. valve closure, re-alignment of ventilation, etc.). The alarm and automatic actuation capability of the digital system will be comparable to the existing analog system for all channels that are being replaced, except for R-17 whose automatic actuation capability is being deleted. Because radiation monitors are not accident initiators and the new system has demonstrated reliability at other facilities and through successful manufacturer performance testing, this modification does not involve a significant increase in the probability of an accident previously evaluated.

During installation of the digital equipment operability requirements of applicable Technical Specifications will be demonstrated. This will ensure continued compliance with the functional requirements of the Radiation Monitoring System, and therefore this

modification will have no impact on the consequences of an accident previously evaluated.

2) create the possibility of a new or different type of accident from an accident previously evaluated.

The proposed change involves the replacement of analog radiation monitoring equipment with a more reliable digital system. The radiation monitoring system is not an accident initiator and only serves to aid in accident mitigation. The change from analog to digital equipment does not alter the mitigation function and consequently no new or different type of accident will be introduced by this change.

3) involve a significant reduction in the margin of safety.

The functions of the Radiation Monitoring System, to detect radiation leakage and aid in accident mitigation, are not altered by the analog to digital change. The reliability of this system will be enhanced through improved reliability and maintainability. Therefore, this change will not reduce the margin of safety.

Environmental Considerations

This proposed change involves the replacement of components located within the restricted areas, as defined in 10 CFR part 20. WPSC has determined that the proposed change involves no significant hazards considerations and no significant change in the types of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. Accordingly, this proposed change meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with this proposed amendment.

References for Attachment 2

1. USAR Section 6.3.2; Containment Air Cooling System - Design Basis.
2. USAR Section 6.5.1, 6.5.2; Leakage Detection and Provisions for the Primary and Auxiliary Coolant Loops.
3. USAR Table 7.2-1; List of Reactor Trips and Causes of Actuation of ESF.
4. USAR Section 9.6.4; Control Room Air Conditioning System.
5. USAR Section 9.6.5; Auxiliary Building Special Ventilation System.
6. USAR Section 11.1.2; Waste Disposal System-Steam Generator Blowdown.
7. USAR Section 11.2.3; Radiation Monitoring System.
8. USAR Section 14.2.1; Fuel Handling Accidents.
9. USAR Section 14.2.4; Steam Generator Tube Rupture.
10. USAR Section 14.3.7; Effects of Leakage from Residual Heat Removal System.
11. Technical Specification Section 3.5; Instrumentation System.
12. Technical Specification Table TS 3.5-1(8); Engineered Safety Features Initiation Instrument Setting Limits.
13. Technical Specification Table TS 3.5-2; Instrument Operation Conditions for Reactor Trip.
14. Technical Specification Table TS 3.5-4(3); Instrument Operating Conditions for Isolation Functions.
15. Technical Specification Section 3.12; Control Room Post Accident Recirculation System.
16. Technical Specification Table TS 4.1-1; Minimum Frequencies for Checks, Calibration and Test of Instrument.

17. Technical Specification Sections 7.1 & 8.1; Radiological Liquid Effluent Monitoring Instrumentation.

18. Technical Specification Tables TS 7.1 & 8.1; Radioactive Liquid Effluent Monitoring Instrumentation and Surveillance Requirements.

19. Technical Specification Sections 7.2 & 8.2; Radiological Gaseous Effluent Monitoring Instrumentation.

20. Technical Specification Tables TS 7.2 & 8.2; Radioactive Gaseous Effluent Monitoring.

21. System Description - Number 45; Radiation Monitoring (RM).

ATTACHMENT 3

To

Letter from C. R. Steinhardt (WPSC) to Document Control Desk (NRC)

Dated

September 10, 1992

Radiation Monitoring
Equipment Layout

DCR 2172

RADIATION MONITORING EQUIPMENT LAYOUT