DONALD C. COOK NUCLEAR PLANT

ANNUAL OPERATING REPORT FOR 1978

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TABLE OF CONTENTS

INTRODUCTION

The D. C. Cook Nuclear Plant, owned by Indiana & Michigan Power Company and located five miles north of Bridgman, Michigan, consists of two 1100 MWe pressurized water reactors. The nuclear steam supply systems for both units are supplied by Westinghouse with a General Electric turbine-generator on Unit 1 and a Brown Boveri turbine-generator on Unit 2. The condenser cooling method is open cycle, using Lake Michigan water as the condenser cooling source. The D. C. Cook Nuclear Plant is the first nuclear facility to use the ice condenser reactor containment system, which utilizes a heat sink of borated ice in a cold storage compartment located inside the containment. The architect/engineer and constructor was the American Electric Power Service Corporation.

This report was compiled by Mr. R. D. Begor with the following individuals contributing information to this report:

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PERSONNEL EXPOSURE SUMMARY

The following table represents a tabulation on an annual basis of the number of plant, utility and other personnel receiving exposure greater than 100 mrem/year and their associated man-rem exposure according to work and job functions.

Assignment of personnel to various groupings is based on what type of work they are usually involved with. Specifically, assignments are made as follows:

Maintenance Personnel -- Includes non-exempt (non-supervisory) personnel from the Maintenance Department and from the Control and Instrument Section of the Technical Department.

Operating Personnel -- Includes non-exempt personnel from the Operations Department, from the Chemical Section of the Technical Department, from the Quality Assurance Department and Security Personnel.

Health Physics Personnel -- Includes non-exempt personnel from the Radiation Protection Section of the Technical Department.

Supervisory Personnel -- Includes exempt (supervisory) personnel from all departments who function primarily as supervisors of non-exempt personnel.

Engineering Personnel -- Includes personnel not primarily functioning as supervisors of non-exempt personnel. This includes such personnel as maintenance engineers, nuclear engineers, performance engineers and station management.

1978

WORK & JOB FUNCTION	NUMBER OF PERSONNEL (>100 mRem			TOTAL MAN-REM		
	STATION EMPLOYEES	UTILITY EMPLOYEES	CONTRACT WORKERS AND OTHERS	STATION EMPLOYEES	UTILITY EMPLOYEES	CONTRACT WORKERS & OTHERS
Reactor Operations & Surveillance						
Maintenance Personnel	33	0	6	2.545	0	0.412
Operations Personnel	67	0	0	30.752	0	0
Health Physics Personnel	14	0	4	9.931	0	0.411
Supervisory Personnel	12	0	2	2.326	0	0.208
Engineering Personnel	3	0	0	0.320	0	0
Routine Maintenance						
Maintenance Personnel	91	1	49	67.030	0.402	10.467
Operations Personnel	8	0	0	1.030	0	0
Health Physics Personnel	8	0	0	1.361	0	0
Supervisory Personnel	15	0	1	4.260	0	0.011
Engineering Personnel	3	0	0	0.437	0	0
Inservice Inspection						
Maintenance Personnel	38	1	50	10.564	0.127	27.628
Operations Personnel	1	0	1	0.157	0	0.014
Health Physics Personnel	2	0	1	0.144	0	0.375
Supervisory Personnel	3	0	2	0.728	0	0.457
Engineering Personnel	4	0	0	0.352	0	0
Special Maintenance						
Maintenance Personnel	63	4	144	20.586	0.483	38.563
Operations Personnel	1	0	6	0.026	0	0.616
Health Physics Personnel	4	0	0	0.480	0	0
Supervisory Personnel	8	0	6	2.085	0	1.414
Engineering Personnel	4	0	0	0.555	0	0
Waste Processing						
Maintenance Personnel	53	0	43	13.319	0	14.048
Operations Personnel	22	0	2	2.916	0	0.667
Health Physics Personnel	4	0	0	0.455	0	0
Supervisory Personnel	4	0	1	0.179	0	0.119
Engineering Personnel	2	0	0	1.223	0	0
Refueling						
Maintenance Personnel	34	1	57	10.262	0.017	21.392
Operations Personnel	0	0	2	0	0	0.159
Health Physics Personnel	1	0	19	0.077	0	11.526
Supervisory Personnel	8	0	3	2.432	0	3.152
Engineering Personnel	3	0	0	0.095	0	0
TOTAL						
Maintenance Personnel	111	5	231	124.306	1.029	112.510
Operations Personnel	68	0	9	34.881	0	1.456
Health Physics Personnel	14	0	19	12.448	0	12.312
Supervisory Personnel	23	0	9	12.010	0	5.361
Engineering Personnel	8	0	0	2.982	0	0
GRAND TOTAL	224					

INSERVICE INSPECTION

In May 1978 an inservice examination of tubing contained within the Unit No. 1 Steam Generators (#2 and #3) was conducted by Southwest Research Institute. This examination was performed to satisfy the surveillance requirements identified in Section 4.4.5 of the Donald C. Cook Nuclear Plant Technical Specifications. The results of this inspection revealed the following:

1) The number and extent of tubes inspected were as follows:

   408 tubes were examined through the "U" bend area of the Steam Generators.

2) This examination revealed no tubing defects having a penetration greater than 20 percent of wall thickness.

3) There were no tubes plugged in any of the Steam Generators.

Evaluation of the inservice eddy current examination data was accomplished by a Zetec Inc. data interpreter certified to Level IIA using Zetec equipment calibrated in accordance with Zetec procedures.

CHANGES TO FACILITY

Brief descriptions and summary safety evaluations for changes made to the facility as described in the Donald C. Cook Nuclear Plant Final Safety Analysis Report (FSAR) are presented in this section. These changes were completed without prior Nuclear Regulatory Commission approval pursuant to the provisions of Title 10, Code of Federal Regulations subsection 50.59(a).

DC-12-1564

The setpoints of the Waste Gas Decay Tanks' pressure controllers were reduced from 110 PSIG to 100 PSIG to agree with manufacturers recommendations for the operation of the Waste Gas Compressors. Performance of the compressors deteriorates rapidly and excessive wear is caused when they operate against a pressure above 100 PSIG.

This change was considered safety related since the change involves the Waste Gas Decay Tank System which is a Class I system.

RFC DC-12-1564 does not constitute an unreviewed safety question as defined in 10CFR50.59. This RFC will, in fact, improve the performance of the Waste Gas Compressors.

DC-01-2048

All Unit No. 1 Ice Condenser Lower Inlet Door gasket seals were replaced with an improved design.

The purpose of the seals is to reduce leakage of the Ice Condenser. The new seal design is safety related in that it could result in accelerated ice loss should the seal fail to meet its intended design function, or it could possibly interfere with lower inlet door operation by freezing the seal to the door.

Examination of the new seal design has indicated that the seals are similar in design to the prototype single-lipped seals previously tested at the Plant. Also, preliminary evaluation of the new seals has indicated that they form a more effective barrier to air loss from the Ice Condenser than the current design and, therefore, they should enhance the ice retention capability of the Ice Condenser.

The installation of the new seals neither constitutes an unreviewed safety question (10CFR50.59) nor will such installation afford an undue risk to the health and safety of the public.

DC-12-2137

This RFC replaced the undervoltage relays (Type HFA-27X) with agastat time delay relays (Type HGA) on all Reactor Coolant Pump bus undervoltage reactor trips for normal and reserve power trains. This modification will prevent spurious reactor tripping due to undervoltage transients. The 0.5 second time delay has been tested and meets the required maximum positive tolerance 0.05 seconds.

Since the Reactor Coolant Pumps and their associated circuits are Seismic Class I, this RFC is considered safety related.

The agastats have been seismically qualified and are acceptable control devices on safety systems in accordance with DCC-EE-120-QCN. The agastats are located in the main Control Room, which is a Seismic Class I structure. However, while the Reactor Coolant Pumps and their control circuits are necessary for normal operation, they do not constitute essential auxiliaries as they are not connected to the emergency diesel generator power train, and their operation is not essential for a safe shutdown of the Plant. The RFC does not constitute an unreviewed safety question in accordance with 10CFR50.59, and shall not adversely affect the health and safety of the public.

DC-02-2187

The Unit No. 2 Diesel Generator Protective Trip circuitry was modified to prevent all Diesel Generator trips except generator differential and engine overspeed when the Diesel Generator is required for accident conditions.

While all trips are retained for testing purposes, this modification prevents all Diesel Generator trips except generator differential and engine overspeed in the event a Safety Injection Signal is received during Surveillance Testing.

These modifications were required to comply with the Unit No. 2 Technical Specifications, Sections 4.8.1.1.2.C.8.C and 4.8.1.1.2.C.12.

The changes incorporated by this RFC are safety related in that the Diesel Generators are Seismic Class I equipment and are served by Class IE cable. These changes do not represent an unreviewed safety question in accordance with 10CFR50.59a(2) and further, they represent an upgrade in safety in that additional protection is afforded by the enhancement of Diesel Generator availability during a Safety Injection Signal. Hence, these changes shall not affect the health and safety of the public.

The following changes to the facility were reported for Unit No. 1 during the 1975, 1976 and 1977 Annual Operating Reports. These changes were completed on Unit No. 2 and are being reported for Unit No. 2 in accordance with 10CFR50.59.

DC-12-259

Installation of additional radiation monitoring equipment on the unit vents (R-31 and R-32) to provide continuous monitoring for iodine and radiogases.

These monitoring systems are added to provide us with means to sample and analyze the gaseous and particulate effluents released to the environment. This change will not adversely affect the health and safety of the public, but will be used as an aid in reducing off site dose by early detection of an abnormal release.

DC-12-590

This design change provides the ability to sample the instrument room and upper and lower containment air without entering the containment prior to purging. Additionally, the change allows sampling the containment atmosphere prior to personnel entry.

Modification of the existing radiation monitoring systems to allow sampling of airborne activity including iodines and tritium in the containment upper volume, lower volume and instrument room was accomplished by installation of permanent access lines to these areas. These access lines, together with their associated Class A valves (FSAR Table 5.4-1) and radiation monitoring equipment, provides means for measurement of activity prior to entering into the above areas. This change will not affect the health and safety of the public, but will increase the safety of Plant personnel entering the containment upper volume, lower volume, and/or instrument room -- as good health physics practice dictates that no one enter an area where conditions are unknown.

DC-12-592

Modifications to containment air particulate detector bypass piping to upgrade it to Class "B" and installation of isolation valve test connection.

The modification of the air particulate detector bypass piping was required in order to maintain proper classification of containment isolation with respect to radiogas system. This change meets FSAR requirements that Class "B" piping be "connected to a closed system outside containment if it is open to the containment atmosphere." (FSAR Table 5.4-1) A safety review of the above modification indicates that in no way would this change jeopardize the health and safety of the public.

DC-12-651

Installation of a ½" sampling line and heat exchanger on Steam Generator blowdown piping to fulfill requirements of Appendix B Technical Specifications Table 2.4-1.

The Heat Exchanger was required for the safety of Plant personnel since the blowdown temperatures are near boiling at this point. The change does not constitute an unreviewed safety question, and in the event of accident, its failure would not affect the safe shutdown of the Plant or result in an uncontrolled release of radioactivity. Hence, the above changes would have no affects on the health and safety of the public.

DC-12-671

Installed additional containment isolation valves and leak testing valves in the Nonessential Service Water System (NSW). The installation upgraded isolation valves in the NSW System from Class C to Class A.

The redesign of the containment isolation arrangement for the NSW System (FSAR Figure 9.8-6 and Table 5.4-1, "Piping Penetrations") by addition of isolation valves to upcoming and outgoing lines upgrades the isolation of this system from Class C to Class A and this will in turn maintain the isolation function during a loss-of-coolant accident plus earthquake and a single active failure of a valve to close. In reviewing the above safety related change, it has been concluded that this change does not affect the health and safety of the public, but, in fact, is an improvement providing greater safety by meeting the FSAR requirement that "all isolation valves are designed to operate as Class I seismic equipment."

DC-12-738

Replaced the motor operators on valves IMO-315, IMO-316, IMO-325 and IMO-326 with motor operators qualified for service inside the containment after an accident. The valves are in the Residual Heat Removal System lines to the hot and cold legs of the Reactor Coolant System.

This change was made to environmentally qualify motor operators on valves inside the containment which must function 24 hours following a loss-of-coolant accident (LOCA). The four valves involved in the above change functioned to switch Emergency Core Cooling recirculation flow from the cold leg to the hot leg to prevent the possibility of boron precipitation in the reactor vessel following a LOCA. The requirements regarding prevention of excessive boron precipitation were met, because this change resulted in replacement of the existing valve motor operators with motor operators qualified for post-LOCA operation. The above change yields a safer condition and cannot have an adverse affect on the health and safety of the public.

DC-12-657

Changed the setpoints for the Volume Control Tank low level alarm, and the Control Room Boric Acid and Pressurizer Annunciator Panels to read "Vol. Cont. Tk. Level Low" at 5" height and "Vol. Cont. Tk. Level Lo-Lo/Re-Fuel Wtr. Seq." at 1" height, respectively.

This modification is safety related because the Volume Control Tank has an important function as a part of the Reactor Coolant System for both make-up and reactivity control. The change is not considered to be an unreviewed safety question as defined by 10CFR50.59, but rather is an improvement for safer operability in that the operator is given more indications of the system status. The modifications will not affect the health and safety of the public.

DC-12-837

This design revision provided for the addition of an alarm relay to monitor AC power to the Safeguards Auxiliary Output relays to annunciate in the Control Room.

The above change permits voltage monitoring of the Safeguards Auxiliary Output relays and alerts the operator immediately of a blown fuse in the Reactor Protection System electrical cabinet and the loss of one safeguards actuation train. This change will not affect the health and safety of the public, nor the functioning of any safety system. It does, however, provide for improved operator monitoring of the electrical operability of Safeguards Systems.

DC-12-847

The setpoints for the Refueling Water Storage Tank (RWST) minimum level alarm (ILA-950) and the high level alarm (ILA-951) were raised from 637'0" to 638'11" and from 639'0" to 640'0" respectively.

The setpoints on the RWST minimum level alarm and high level alarm were changed to provide a minimum of 350,000 gallons of useable volume in the RWST as differentiated from 350,000 gallons of contained volume as currently specified by the Donald C. Cook Plant Technical Specifications. The change itself is not safety related, only in that the change supplies more water than is required to meet the needs of the analysis for LOCA considerations. This change will not affect the health and safety of the public.

DC-12-860

The setpoint of the Refueling Water Storage Tank (RWST) low level alarm (ILA-951) was raised from 614'0" to 620'0".

The setpoint of the low level alarm on the RWST was changed to allow the operator sufficient time to switch from injection to recirculation following a

LOCA. The current setpoint (614') allows about one minute to switch over a complete train of pumps, a time which was judged to be inadequate. The new setpoint will allow the operator approximately ten (10) minutes to switch over, a time which was judged to be more than adequate. This change is in a direction that will allow the operator more time to make the transition from injection to recirculation and as such will not adversely affect the health and safety of the public.

DC-12-886

Modification of the defrost control circuitry on the Ice Condenser Air Handling Units (AHU) and provision for blocked open dampers.

These changes are not considered to be safety related, although they involve hardware changes to Seismic Class II equipment. These modifications were made to enhance the operation of this equipment and to eliminate a potential cuase of failure during the Units' defrost cycle. The changes made require an amendment be made to the description of the AHU operation as presently stated in the FSAR, but will not affect the health and safety of the public.

DC-12-908

The range of the Unit Vent Hi-Level Radiogas Monitor (R-31) was changed from 10^{-4} - 10^{-1} µCi/cc to 10^{-2} to 10^{+4} µCi/cc by replacing a detector crystal and check source. This will provide the Vent Radiogas Monitor with an adequate range to remain on scale following major accidents including a fuel handling accident.

This change was considered safety related because the Radiation Monitoring System, though not Seismic Class I, is very important to the operation of the Plant during other than accident conditions for such purposes as protection of Plant personnel and monitoring releases to the environment. This change does not constitute an unreviewed safety question since it cannot jeopardize the safety functioning of any part of any safety system.

DC-12-1248

Modification of the Diesel Generator annunciator circuits and Control Room panel to give indication of a blown fuse and loss of AC power to AB and CD Diesel Generator governor inverters.

The installation of Seismic Class I relays on the DC input fuses and AC output busses provide for an alarm to annunciate in the Control Room should a loss to the governor inverters and subsequent loss of Diesel Generator operation occur. This change will not adversely affect the health and safety of the public. It provides an improvement in the operator's awareness of an inoperable system.

DC-12-1291

Changes made to the bistable setpoints for pressurizer level to allow for instrument drift.

The setpoints are being changed in a conservative direction, that is, the reactor trip or safety injection actuation would occur earlier in the course of a transient or accident than it would if the setpoints were not changed. This change does not involve an unreviewed safety question.

DC-12-1340

Installation of 10 turn potentiometers on the radiation monitoring system for containment area monitor (R-2), containment air particulate monitor (R-11) and containment radiogas monitor (R-12).

This change authorizes the addition of panel mounted potentiometers to allow the operators to be able to adjust the setpoint on radiation monitors R-2, R-11 and R-12 to Technical Specifications specified two times background level. This change is safety related in that the setpoints are part of the system used to isolate the containment upon radiation levels which exceed two times background radiation level. This change does not constitute an unreviewed safety question nor does it require a change to the Technical Specifications. In fact, it is actually required to facilitate compliance with the Technical Specifications.

DC-12-1358

Changes made to the bistable setpoints for pressurizer pressure and steam generator water level to allow for instrument drift.

The purpose of this modification in trip setpoints was to provide values which would allow for instrumentation drift but remain within the specified values as stated in the Technical Specifications. The change does not constitute an unreviewed safety question as defined by 10 CFR 50.59, but rather provides more conservative setpoints for the reactor protection system. Hence, this change will not adversely affect the health and safety of the public.

DC-12-1344

Changes made to the bistable setpoints for comparing feedwater flow to steam flow to provide a wider span and to prevent Technical Specification violations due to instrument drift.

This change is safety related in that it involves a change to instrumentation included in the reactor trip system instrumentation. This change is within limits specified in the Technical Specifications and is to prevent Technical Specification violations due to instrument drift. This change does not constitute an unreviewed safety question, nor will it adversely affect the health and safety of the public.

DC-01-799

The cage assemblies of all Westinghouse supplied AMF Cuno nuclear system filters were changed to utilize pleated paper cartridges rather than nylon wound filter cartridges.

This revision arose out of difficulty experienced in maintenance of the nylon filters and increasing radiation exposure of personnel due to the lengthier than expected time required for change out of such filters. This modification does not represent an unreviewed safety question and in fact is an improvement in safety for plant personnel by the reduction in time required to change out and maintain the proper filters. The change does not adversely affect the health and safety of the public.

DC-12-995

Additional bolting was added to the fixed feet of the Component Cooling Water (CCW) heat exchangers to provide additional strength in the event of a seismic disturbance. Detailed seismic analysis performed in house indicated that this change was necessary.

This RFC was considered safety related since the involved equipment is Seismic Class 1. This change does not constitute an unreviewed safety question since it cannot adversely affect the safety function of any safety system, in fact, it assures that the CCW heat exchangers are capable of withstanding a design basis earthquake.

DC-12-1253

The radiation detectors R-20 and R-28 in the Essential Service Water (ESW) piping to the containment spray heat exchangers were relocated out of the heat exchanger rooms to eliminate interference to the monitor readings because of background radiation. New instrument cables were pulled to the monitors at their new locations.

The detectors are intended to detect leakage from the Containment Spray Heat Exchangers to the ESW System. However, the monitors were located so close to the heat exchangers tnat in an event of a high alarm it would not be obvious if the alarm was due to a leakage of the contaminated spray water into the ESW System or the presence of isotopes in the spray water itself. Moving of the monitors away from the heat exchanger to where they would not be affected by the activity in the spray water will eliminate such false alarms. This change will enhance the safe operation of the plant and does not constitute an unreviewed safety question (10CFR50.59).

DC-12-1489

A 1½" check valve has been added in the demineralized makeup water fill line to the Unit 1 Component Cooling Water (CCW) surge tank.

This check valve was needed to prevent Component Cooling Water (CCW), treated with sodium nitrate, from siphoning back into the header conveying high purity demineralized water (DW) throughout the Auxiliary Building. The affected piping is Seismic Class III. This change will not adversely affect the health and safety of the public.

DC-12-2022

Horizontal supports were added to the top of the Containment Spray Heat Exchangers to reduce projected stress levels in the feet bolts in the event of a seismic occurrence. Detailed seismic analysis performed in house indicated that this change was necessary.

This RFC was considered safety related since the Containment Spray System is Seismic Class 1. The addition of the supports does not constitute an unreviewed safety question since it does not create the possibility of a previously unanalyzed accident nor increase the probability or consequences of one already considered in the safety analysis. It assures that the containment spray heat exchangers are capable of withstanding a seismic event.

DC-12-2164

Cannon type electrical connector assemblies used in the containment were replaced with butt splices on certain safety related instrumentation cable penetration feedthroughs.

Each butt splice was subjected to a test program to qualify the connection in post-accident environment. Following the replacement each instrument loop was tested and a calibration check was made. The design revision is not considered to be an unreviewed safety question in accordance with 10CFR50.59 and shall not adversely affect the health and safety of the public.

DC-12-982

The setpoints for the accumulator high and low level alarms were changed to accomoda a Technical Specification revision. The minimum volume of water in the accumulators was increased from 850ft^3 to 929ft^3 and the maximum volume of water in the accumulators was raised from 934ft^3 to 971ft^3.

This change is safety related in that the volume of water in the accumulators is used directly in the ECCS analysis and deviations of this volume below the minimum required level will result directly in decreasing the core peaking factor at which the limit on peak cladding temperature will be reached. On this basis, the change is required to meet the Technical Specification requirements. The implementation of this change neither constitutes an unreviewed safety question nor does it adversely affect the health and safety of the public.