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Detroit Edison
A DTE Energy Company

10CFR50.67

May 2, 2001
NRC-01-0036

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington D C 20555-0001

References: 1) Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

2) Detroit Edison Letter to NRC, "Proposed License Amendment for a Limited Scope Application of the Alternative Source Term Guidelines in NUREG-1465 Related to the Re-evaluation of the Fuel Handling Accident Dose Consequences," NRC-00-0073, dated December 29, 2000

Subject: Response to NRC Request for Additional Information Regarding the Application of the Alternative Source Term Guidelines to the Re-analysis of the Fuel Handling Accident Dose Consequences

In Reference 2, Detroit Edison requested NRC approval of a proposed license amendment to modify the Technical Specification requirements for handling irradiated fuel and performing Core Alterations. The NRC staff requested additional information to help complete their review of the proposed amendment. Several telephone conversations between Detroit Edison personnel and the NRC staff clarified the requested additional information and discussed Detroit Edison's planned response. As a result, Detroit Edison has revised the re-analysis of the Fuel Handling Accident to address the NRC request. Details of the re-analysis and summaries of the results are provided in the responses to NRC questions in Enclosure 1. The information in Enclosure 1 supersedes information provided in Reference 2.

Enclosure 2 provides a revised analysis, using the standards of 10 CFR 50.92, indicating that no significant hazards consideration is involved. Enclosure 3

With CD

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provides revised marked up pages of the existing Technical Specification (TS) Bases to show the proposed changes and a typed version of the affected TS Bases pages with the proposed changes incorporated. There are no changes to the marked up and retyped TS pages submitted in Reference 2. Enclosure 4 provides copies of the requested ARCON96 computer program output printouts and Enclosure 5 provides copies of plant drawings to help in the NRC review.

Should you have any questions or require additional information, please contact Mr. Norman K. Peterson of my staff at (734) 586-4258.

Sincerely,

William J. O'Connor Jr.

Enclosures

cc: M. A. Ring
M. A. Shuaibi
NRC Resident Office
Regional Administrator, Region III
Supervisor, Electric Operators,
Michigan Public Service Commission

I, William T. O'Connor, Jr., do hereby affirm that the foregoing statements are based on facts and circumstances which are true and accurate to the best of my knowledge and belief.

William T. O'Connor Jr.

William T. O'Connor, Jr.
Vice President, Nuclear Generation

On this 2nd day of May, 2001 before me personally appeared William T. O'Connor, Jr., being first duly sworn and says that he executed the foregoing as his free act and deed.

Karen M Reed

Notary Public

KAREN M. REED
Notary Public, Monroe County, MI
My Commission Expires 09/02/2005

ENCLOSURE 1 TO
NRC-01-0036

FERMI 2 NRC DOCKET NO. 50-341
OPERATING LISENCE NO. NPF-43

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING THE RE-ANALYSIS OF THE FUEL HANDLING ACCIDENT

Question 1; Quality of Meteorological Data:

Confirm that, overall, the meteorological data used in the assessment are of high quality and suitable for use in the assessment of atmospheric dispersion to which it was applied. During the period of data collection, was the tower base area on the natural surface (e.g., short natural vegetation) and tower free from obstructions (e.g., trees, structures) and micro-scale influences to ensure that the data were representative of the overall site area? Did the measurement program meet the guidelines of Regulatory Guide 1.23, "Onsite Meteorological Programs," including factors such as maintaining good siting, instruments within specifications, and adequate data recovery and quality assurance checks? If deviations occurred, describe such deviations from Regulatory Guide 1.23 guidance and why the data are still deemed to be adequate. What types of quality assurance checks were performed on the meteorological measurement systems prior to and during the periods of collection to assure that the data are of high quality? Were calibrations properly performed and systems found to be within guideline specifications for the use of the data? What additional checks and at what frequency were the checks performed on the data following collection and prior to input into the atmospheric dispersion calculations to assure identifying any problems in a timely manner and flagging data of questionable quality? Were the data compared with other site historical or regional data and, if so, what were the findings? The intent of these questions is to assess the overall quality of the meteorological data. A detailed response for each individual data point is not expected.

Response to Question 1:

The meteorological tower base area is located on a natural surface consisting of crushed rock and low vegetation. During the growing season from May through October, this vegetation is periodically trimmed. The tower area is free from obstructions except for a small 10-foot high enclosure that houses the tower electronics instrumentation near the base of the tower. This enclosure is located on the opposite side of the prevailing winds and has no effect on the meteorological measurements. The tower is free from micro-scale influences. A lake breeze study described in UFSAR Section 2.3.2.4.2 showed no adverse effects from Lake Erie on the meteorological data. The plant's natural draft cooling towers are located a significant distance from the meteorological tower. There is no substantial heat source in the general area of the tower. All instruments are provided with protection against freezing in cold weather. The above information, describing the appropriate siting of the tower, is discussed in UFSAR Section 2.3 "Meteorology."

The measurement program meets the guidelines of Regulatory Guide (RG) 1.23. In addition, NRC Inspection Report Number 50-341/01-04(DRS) issued on January 31, 2001, resulted in no observations or findings regarding the meteorological monitoring program. A February 2001 Fermi 2 internal audit based on ANSI/ANS standard 2.5-1984 also revealed no observations or findings on the program.

An internal concern regarding the accuracy of the meteorological data being provided to the Radiation Protection department has been recently addressed through the Fermi 2 corrective action program. This concern was based on potential non-compliance with RG 1.23 section C.6.b "Data Reduction and Compilation." Subsequent corrective actions have validated the data for the time period from 1993 through 2000. A 100% quality check was performed on the computer programs that translate the data from a binary to a usable ASCII format. All data from 1993 through 2000 was re-generated using the re-affirmed programs. Current χ/Q values have been compared with prior χ/Q results to verify consistency of the data from year to year – no anomalies have been noted. Data recovery was greater than 90% for all joint frequency distributions from 1993 through 2000.

Quality of the data is checked through a daily surveillance performed by a nuclear operator. The tower has a primary and a secondary set of instruments that are compared for data validation. Instruments that fail the check are force failed such that a "999" (bad flag) is archived for the failed instrument, and the reading is not used in calculations. Preventive Maintenance (PM) is performed every six months to satisfy calibration requirements. As part of each calibration PM, all instruments are replaced with newly refurbished instruments. No problems have been noted with the calibrations from 1993 through 2000 regarding joint frequency distribution instruments. The System Engineer also performs routine walkdowns to ensure system operability.

No comparison with independent regional weather data was performed; however, wind rose plots representing the new meteorological data from the 60-meter tower elevation (years 1995 to 1999) are consistent with the original wind rose data presented in UFSAR Figure 2.3-19.

<u>Question 2; Provide Meteorological Data:</u>

Provide an electronic copy of the meteorological data used to calculate the χ/Q values. Data should be provided either in the format specified in Appendix A to Section 2.7, "Meteorology and Air Quality," of draft NUREG-1555, "Environmental Standard Review Plan," or in the ARCON96 format described in NUREG/CR-6331, "Atmospheric Relative Concentrations in Building Wakes." Data may be provided in a compressed form, but a method to decompress the data should be provided. If the ARCON96 format is selected when providing data, the atmospheric stability categorization should be based on the delta-T methodology. Any missing data should be designated by completely filling the field for that parameter with 9's.

<u>Response to Question 2:</u>

An electronic copy of the meteorological data used to calculate the χ/Q values is enclosed on a Compact Disk (CD). The data is provided in the ARCON96 format as described in NUREG/CR-6331. The atmospheric stability categorization is based on the delta-T methodology, and missing data is designated with 9's. The data provided has not been compressed.

Question 3; Describe Inputs, Assumptions and Bases:

Describe the specific inputs, assumptions and bases used with the ARCON96 methodology so as to result in the limiting dose for each accident scenario. A copy of the ARCON96 printouts is acceptable to show inputs. Was the physical height of the vent or other release location assumed? Are distances the shortest distance from the postulated release location to the intake location? Are all directional inputs defined in terms of true north? References to figures showing structures, dimensions, and distances may also be helpful in describing the postulated transport of the effluent. If the figures are drawn to plant or magnetic north, what is the relationship to true north? If more than one release to the environment/transport scenario could occur (e.g., loss of offsite power and non-loss of site power, single failure), were comparative χ/Q calculations made to ensure consideration of the limiting dose?

Response to Question 3:

Copies of the ARCON96 computer output printouts are provided in Enclosure 4.

All χ/Q calculations considered the heights of the release point and the control room intake location. Calculations of the control room χ/Q for releases from the Reactor Building Heating, Ventilation and Air Conditioning (RBHVAC) and from the Standby Gas Treatment (SGT) stacks conservatively assumed zero-velocity vent releases. Accordingly, ARCON96 was provided with the vent and intake elevations and with the horizontal distances. Analyses to determine the control room χ/Q for releases from paths located at the site grade elevation (the railway doors or the outage building doors) were appropriately analyzed as ground releases. Ground releases were analyzed using the diagonal distance (horizontal and vertical) between the release point and the intake as opposed to just using the horizontal distance. Direct diagonals were calculated regardless of buildings and structures along the path.

All directional inputs are referenced to True North. Plant drawings are oriented to "plant north" which is approximately 19° NNE of the True North; thus, all directions from the release points to the intake were calculated by adding 19° to the directions obtained from the drawings (see UFSAR Figure Number 1.2-05; a copy is included in Enclosure 5).

To help describe the Fermi 2 site and the transport of the effluent from the potential release points to the control room intakes, the following drawings are also provided in Enclosure 5:

Drawing Number	Revision	Title
A-2068	E	Louver Air Intake Houses, Reactor Building
A-OB-2000	0	Outage Building Floor Plans
M-2257	H	Vent and Duct Layout, 5th Floor Reactor Building 684'-6"
M-4228-1	A	Isometric, Emergency Outside Air Intake to Makeup Filter

Additionally, UFSAR Figure Number 9.1-03 provides a drawing of the Reactor and Auxiliary Buildings roof plan (a copy is included in Enclosure 5).

Evaluations were performed to establish the most limiting χ/Q based on several credible release points. The normal release point via the RBHVAC stack would be available assuming offsite power was not lost. Although Spent Fuel Pool radiation monitors are designed to trip the RBHVAC system and start the SGT system upon detection of radiation in the area, no credit was given to the SGT system or to the Control Room Emergency Filtration (CREF) system. Additionally, potential Secondary Containment boundary release points (Railway Air Lock doors, Outage Building doors, etc.) were evaluated. The post-shutdown decay period defining non-recently irradiated fuel was determined based on the bounding χ/Q of all these paths (RBHVAC stack, SGT stack and other Secondary Containment release paths) without crediting Control Room and Secondary Containment integrity and filtration systems.

Question 4; Fuel Limitation:

You state that non-LOCA gap fractions given in RG 1.183 were not used for GE11 fuel because it is assumed to exceed the limitations imposed by the Footnote to Table 3 in RG 1.183. What is the assumed burnup for the GE11 fuel and how is it measured (i.e., peak pellet, average peak rod, average peak assembly, etc.)? What is the maximum linear heat generation rate? If the average peak rod burnup and maximum linear heat generation rate do not meet the footnote limitations, you should perform fission gas release calculations using NRC-approved methodologies to determine the non-LOCA gap fractions for use with the GE 11 fuel. Please submit these fission gas release calculations for NRC review, if they are found to be necessary.

Response to Question 4:

The assumed maximum burnup for the fuel is 60 GWD/MTU measured at the peak rod average power. This limit is consistent with the Fermi 2 approved power uprate limits in License Amendment Number 87. The maximum Linear Heat Generation Rate (LHGR) for the current eighth fuel cycle (all GE11 fuel) will not exceed the limits in Footnote 11 in Regulatory Guide 1.183 (6.3 kw/ft peak rod average power for burnup exceeding 54 GWD/MTU). However, in future cycles, GE11 LHGR may exceed the footnote limits in a limited number of fuel rods. The GE14 fuel, to be used in future cycles, is not expected to exceed the footnote limits.

Given the potential for the GE11 fuel to exceed the limits in Footnote 11 of RG 1.183 on peak rod average power LHGR in future fuel cycles, it is proposed that the required post-shutdown delay period used in the definition of the term "recently irradiated" be determined based on two separate analyses. Specifically, the definition of recently irradiated as applied in a fuel cycle, where all fuel is determined to meet the RG 1.183 limits, is to be based on the Alternative Source Term (AST) methodologies and acceptance criteria. On the other hand, if it is determined that any fuel rod in a given cycle does not meet the RG 1.183 limits; then, the duration of the required post-shutdown delay period defining the term "recently irradiated" is established using RG 1.25

and NUREG/CR-5009 methodologies and the acceptance criteria in 10 CFR Part 100 and Standard Review Plan (SRP), Section 15.7.4 (i.e., AST would not be applied). The proposed TS Bases changes in Enclosure 2 summarize these criteria.

When GE11 and GE14 fuel types are evaluated using the same gap fractions (i.e. either RG 1.183 or RG 1.25 with NUREG/CR-5009), the Fuel Handling Accident (FHA) involving the GE14 fuel type is more limiting than one involving the GE11 fuel. This is based on the fraction of core power associated with the broken fuel rods for each fuel type. Therefore, the post shutdown period required for the fuel to be considered not "recently irradiated" under AST will be defined using GE14 fuel analysis and the AST methodologies and acceptance criteria. Since the GE14 fuel is expected to satisfy the limits in Footnote 11 of RG 1.183, the required delay associated with fuel determined not to meet the RG 1.183 requirements is evaluated using the GE11 fuel and the assumptions and methods of RG 1.25 and NUREG/CR-5009; and the acceptance criteria in SRP, Section 15.7.4. The second analysis using RG 1.25 methodology is a direct implementation of Technical Specification Task Force (TSTF)-51, Revision 2 without applying AST.

The radiological consequences acceptance criteria used with the AST analysis is the Total Effective Dose Equivalent (TEDE) criteria described in RG 1.183. Accident dose at the Exclusion Area Boundary (EAB) and the Low Population Zone (LPZ) is limited to 6.3 rem after 2 hours and the Control Room TEDE is limited to 5 rem for the duration of the accident per 10 CFR 50.67.

Radiological consequences acceptance criteria used with the RG 1.25 analysis is the one established in the Standard Review Plan. Per SRP 15.7.4, the dose at both the EAB and LPZ is limited to 6 rem for the whole body and 75 rem for the thyroid in the first two hours at the EAB and for the whole duration of the accident at the LPZ. The control room dose is limited to 5 rem for the whole body and 30 rem for the thyroid for the duration of the accident per SRP, Section 6.4.

The attached revision to the Technical Specification (TS) Bases identifies "recently irradiated fuel" as fuel that has occupied part of a critical reactor core within the previous four days, provided that the limits in Footnote 11 of RG 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is identified as fuel that has occupied part of a critical reactor core within the previous 34 days. The number of days in both cases is a result of the two analyses described above. The revised TS Bases also clarifies that handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

To determine the extent of compliance with Footnote 11 in RG 1.183 in future fuel cycles, the peak rod average power LHGR and burnup limits will be formally verified based on actual fuel burnup and power distribution data obtained from the plant's reactor core monitoring system. As indicated in the revision to the TS Bases, this verification will be required in order to identify whether any fuel will be considered not "recently irradiated" prior to any fuel movement. For outage planning purposes, it will be necessary to determine the potential for compliance with Footnote 11 of RG 1.183 several months before the start of a refueling outage. Calculations routinely performed during the reload core design will provide a projection of footnote compliance; however, compliance with the footnote will be verified prior to fuel handling using the AST results.

Question 5; Pool Decontamination Factor:

Guidance in Appendix B of RG 1.183 gives an overall effective decontamination factor (DF) of 200 as acceptable to staff. The value of 200 for the effective DF is meant to be conservative and is not directly derived from the DF specific to each chemical form of iodine. The elemental DF of 500 and the organic DF of 1 are used only to determine the ratio of the iodine chemical forms above the pool water (i.e., 57 percent elemental and 43 percent organic) and should not be used to calculate an effective DF.

Response to Question 5:

The AST analysis has been re-performed using a pool DF of 200. For the analysis using RG 1.25 methodologies and assumptions, a DF of 100 was used.

Question 6; Core Inventory:

You state that the core inventory used for the re-analysis is consistent with the original FHA analysis inventory. How is the Table 2 core inventory shown to be applicable to the current core thermal power, fuel enrichment and fuel burnup?

Response to Question 6:

The core inventory used in the analyses was calculated specifically for the Fermi 2 power uprate assuming approximately 30 GWD/MTU average bundle exposure. As discussed in UFSAR Section 15.7.4.5.4, the impact of extended burnup on the FHA was assessed as part of the Fermi 2 Power Uprate based on the conclusions in NUREG/CR-5009. The NUREG concludes that an increase in burnup level up to 60 GWD/MTU peak rod average burnup results in no change in the total core inventory of the radionuclides of interest for the FHA. The only effect identified as significant is a re-distribution of 20% of the I-131 iodine source term to the rod gap. Therefore, the original FHA total core inventory is also valid for the current re-analysis.

Question 7; Iodine Chemical Form:

You state that since the GE 11 fuel might exceed the conditions in the Footnote to Table 3 in RG 1.183, you used the iodine chemical form distribution from RG 1.25. The iodine chemical form distribution given in RG 1.183 for use with alternative source terms is not subject to the conditions of the footnote. The RG 1.183 iodine chemical form distribution should be used.

Response to Question 7:

The AST re-analysis is revised to use the RG 1.183 iodine chemical distribution. As discussed above in the response to Question 4, for the re-analysis based on RG 1.25, the iodine chemical form distribution follows RG 1.25 guidance.

Additional Information:

Tables 1, 2 and 3 submitted earlier in Reference 2 have been updated based on the FHA re-analysis described above. The following information describes changes in the Tables:

- The overall effective iodine contamination factors are now shown as 200 for the AST analysis, based on RG 1.183 and 100 for the analysis based on RG 1.25.
- The bounding Control Room χ/Q is shown as 4.25E-3 s/m^3 as a result of using the closest corner of the Control Room intake enclosure to calculate the minimum distance between the Outage Building doors and the intake.
- The units for the χ/Q values are correctly shown as seconds per cubic meter (s/m^3).
- The Control Room fresh air makeup rate is now shown as 4000 cfm. The 13,000 cfm shown in Reference 2 is overly conservative. The system operates with a normal makeup rate of approximately 2900 cfm. This value has been conservatively rounded up to 4000 cfm.
- There are no changes to Table 2 as presented in Reference 2.
- Table 3 is revised based on the results of the analyses described above.
- The new (non-irradiated) bundle drop analysis results have been deleted from Table 3 since handling of new bundles over the open reactor core or the spent fuel pool will be subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

Table 1
Key Inputs for the FHA Re-analysis

Description	Value		Notes
	RG 1.25	AST	
Radial Peaking Factor	1.5	1.7	
Fuel Rods Damaged	140	172	Irradiated fuel bundle dropped over RPV
Total Rods In Core	56,536	66,720	
Gap Fractions: • Iodine 131 • Other Halogens • Kr-85 • Noble Gases (excluding Kr-85)	 12% 10% 30% 10%	 8% 5% 10% 5%	For analysis based on RG 1.25 (GE11 fuel), 12% gap fraction is assigned to all the iodine source term and not just I-131.
Iodine Release Chemical Form • Elemental • Organic • Aerosol	 99.75% 0.25% 0.0%	 4.85% 0.15% 95%	In accordance with Regulatory Guide 1.183, the 95% aerosol component for the AST analysis (GE14 fuel) is assumed to be in the form of cesium iodine (CsI) which instantaneously dissociates in the water. The iodine is then assumed to instantaneously re-evolve in the elemental form.
Overall Effective Iodine Decontamination Factor	100	200	
Reactor Power Level	3499 MWt		Includes 2% uncertainty in accordance with RG 1.183
Core Radionuclide Inventory	See Table 2 below		Current Fermi 2 core inventory assumed for both AST and RG1.25 analyses. Also, decay and daughtering is credited.
χ/Q: Control Room EAB	 4.25E-3 s/m^3 1.23E-4 s/m^3		 Bounding χ/Q represents transport to the south Control Room air intake. Original UFSAR value
Control Room Volume	2.53E5 ft^3		Ventilated Volume
Control Room Fresh Air Makeup Rate	4,000 cfm		Maximum expected rate from normal (south) air intake.
Refuel Floor Volume	950,000 ft^3		5th Floor Reactor Building
Refuel Floor Ventilation Rate	95,000 cfm		95,000 cfm is conservatively assumed to ensure the source term is released within 2 hours. 33,000 cfm is the normal rate of ventilation supplied by RBHVAC. 95,000 cfm effectively releases the source term within one-hour.

Table 2
FHA Core Radionuclide Inventory

Nuclide	Shutdown Activity (Ci/MWt)	24 hour Activity (Ci/MWt)	7 days Activity (Ci/MWt)
Xe-131m	158	165	177
Xe-133	55280	53212	26678
Xe-133m	2305	1971	361
Xe-135	7149	12302	0
Xe-135m	10420	748	0
Kr-83m	3137	0	0
Kr-85	302	302	301
Kr-85m	6734	164	0
Kr-87	12920	0	0
Kr-88	18300	52	0
I-131	26310	24320	14671
I-132	38450	32040	8942
I-133	55020	24727	204
I-134	60560	0	0
I-135	51950	4194	0
Te-131m	3730	2142	77
Te-132	37900	30637	8551

Table 3
FHA Dose Consequences

Analysis	Time from Shutdown	EAB Dose (rem)			LPZ Dose (rem)			Control Room Dose (rem)		
		WB	TH	TEDE	WB	TH	TEDE	WB	TH	TEDE
AST (GE14)	4 days	N/A	N/A	0.193	N/A	N/A	0.022	N/A	N/A	4.695
RG 1.25 (GE11)	34 days	0.005	1.029	N/A	0.001	0.116	N/A	0.008	29.0	N/A

WB: Whole Body
TH: Thyroid
TEDE: Total Effective Dose Equivalent

ENCLOSURE 2 TO
NRC-01-0036

FERMI 2 NRC DOCKET NO. 50-341
OPERATING LISENCE NO. NPF-43

REVISED 10CFR50.92
SIGNIFICANT HAZARDS CONSIDERATION

10CFR50.92 SIGNIFICANT HAZARDS CONSIDERATION

In accordance with 10 CFR 50.92, Detroit Edison has made a determination that the proposed amendment involves no significant hazards consideration. The License Amendment described above does not involve a significant hazards consideration for the following reasons:

1. The change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

   The new "recently irradiated fuel" term to describe irradiated fuel assemblies is used to establish operational conditions where specific activities represent situations where significant radioactive releases can be postulated. These operational conditions are consistent with the design basis analysis. Because the equipment affected by the revised operational conditions is not an initiator to any previously analyzed accident, the proposed change cannot increase the probability of any previously evaluated accident.

   The re-analysis of the Fuel Handling Accident (FHA) concludes that radiological consequences are within the regulatory acceptance criteria. The results of the Core Alterations events other than the FHA remain unchanged from the original design basis, which showed that these events do not result in fuel cladding damage or radioactive release. The FHA re-analysis includes evaluations of the radiological consequences resulting from a drop of a fuel assembly, using the Alternative Source Term (AST) and the Regulatory Guide 1.25 methodologies, over the reactor core after a post shutdown decay period. The radiological consequences associated with this scenario, assuming no mitigation credit for Secondary Containment, Standby Gas Treatment (SGT) and Control Room Emergency Filtration (CREF) Systems, have been shown to satisfy the regulatory acceptance criteria. Therefore, the proposed change does not significantly increase the radiological consequences of any previously evaluated accident.

   Based on the above, the proposed change does not significantly increase the probability or consequences of any accident previously evaluated.

2. The change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

   The relaxed Technical Specifications (TS) requirements apply when specific activities represent situations where significant radioactive releases are not postulated. The proposed relaxed requirements are supported by the revised design basis FHA analysis. The proposed change does not introduce any new modes of plant operation and does not involve physical modifications to the plant. Therefore, the proposed change does not create the potential for a new or different kind of accident from any accident previously evaluated.

3. The change does not involve a significant reduction in the margin of safety.

   The proposed change will result in a revision to the Fermi 2 TS and TS Bases to establish operational conditions where specific activities represent situations during which significant radioactive releases can be postulated. The corresponding TS requirements are consistent with the design basis analysis and are established such that the radiological consequences are at or below the regulatory guidelines. Safety margins and analytical conservatisms are retained to ensure that the analysis adequately bounds all postulated event scenarios. The proposed TS Applicability statements continue to ensure that the radiological consequences at both the Control Room and the exclusion area and low population zone boundaries are below the corresponding regulatory guidelines; therefore, the proposed change will not result in a significant reduction in the margin of safety.

ENCLOSURE 3 TO
NRC-01-0036

FERMI 2 NRC DOCKET NO. 50-341
OPERATING LISENCE NO. NPF-43

TECHNICAL SPECIFICATION BASES PAGES

Attached are marked-up pages of the affected Technical Specifications (TS) Bases, indicating the proposed changes (Part 1), and a complete typed version of the affected TS Bases pages incorporating the proposed changes (Part 2).

ENCLOSURE 3 TO
NRC-01-0036
PART 1

A MARK-UP OF AFFECTED TS BASES
INDICATING PROPOSED CHANGES

Affected TS Bases Pages:

Inserts (pages 1 through 4)
B 3.3.6.2-6, B 3.3.6.2-7
B 3.3.7.1-5
B 3.6.4.1-1, B 3.6.4.1-2, B 3.6.4.1-4
B 3.6.4.2-1, B 3.6.4.2-2, B 3.6.4.2-5
B 3.6.4.3-2, B 3.6.4.3-3, B 3.6.4.3-4, B 3.6.4.3-5
B 3.7.3-2, B 3.7.3-3, B 3.7.3-4, B 3.7.3-5, B 3.7.3-6
B 3.7.4-3, B 3.7.4-4, B 3.7.4-5
B 3.8.2-1, B 3.8.2-3, B 3.8.2-4, B 3.8.2-5
B 3.8.5-1, B 3.8.5-2, B 3.8.5-3
B 3.8.8-1, B 3.8.8-2, B 3.8.8-3

Insert A (page B 3.3.6.2-6)

Due to radioactive decay, this Function is only required to isolate secondary containment during fuel handling accidents involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

Insert B (page B 3.3.7.1-5, two places)

Also due to radioactive decay, this Function is only required to initiate the CREF System during fuel handling accidents involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

Insert C1 (pages B 3.6.4.1-1, B 3.6.4.2-1, B 3.6.4.3-2 and B 3.7.3-2)

involving handling recently irradiated fuel

Insert C2 (pages B 3.6.4.1-1, B 3.6.4.2-1, B 3.6.4.3-2 and B 3.7.3-2)

"Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

Insert D (page B 3.6.4.1-2)

Due to radioactive decay, secondary containment is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

Insert E (page B 3.6.4.2-2)

Due to radioactive decay, SCIVs are only required to be OPERABLE during fuel handling involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

Insert F (page B 3.6.4.3-3)

Due to radioactive decay, the SGT System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

Insert G (page B 3.7.3-3)

Due to radioactive decay, the CREF System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

Insert H (page B 3.7.4-3)

Due to radioactive decay, the Control Room AC System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

Insert I (page B 3.8.2-1)

involving handling recently irradiated fuel. Due to radioactive decay, AC electrical power is only required to mitigate fuel handling accidents involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

Insert J (pages B 3.8.2-3, B 3.8.5-2 and B 3.8.8-2)

involving handling recently irradiated fuel

Insert K1 (pages B 3.8.2-4, B 3.8.5-2 and B 3.8.8-2)

involving handling recently irradiated fuel

Insert K2 (pages B 3.8.2-4, B 3.8.5-2 and B 3.8.8-2)

"Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated;

<u>Insert L</u> (page B 3.8.5-1)

involving handling recently irradiated fuel. Due to radioactive decay, DC electrical power is only required to mitigate fuel handling accidents involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

<u>Insert M</u> (page B 3.8.8-1)

involving handling recently irradiated fuel. Due to radioactive decay, AC and DC electrical power is only required to mitigate fuel handling accidents involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

individual monitor whose trip outputs are assigned to an isolation channel. Four channels of Fuel Pool Ventilation Exhaust Radiation—High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Values are chosen to promptly detect gross failure of the fuel cladding.

The Fuel Pool Ventilation Exhaust Radiation—High Function is required to be OPERABLE in MODES 1, 2, and 3 where considerable energy exists; thus, there is a probability of pipe breaks resulting in significant releases of radioactive steam and gas. In MODES 4 and 5, the probability and consequences of these events are low due to the RCS pressure and temperature limitations of these MODES; thus, this Function is not required. In addition, the Function is also required to be OPERABLE during ~~CORE ALTERATIONS,~~ OPDRVs, and movement of recently irradiated fuel assemblies in the secondary containment, because the capability of detecting radiation releases due to fuel failures (due to fuel uncovery or dropped fuel assemblies) must be provided to ensure that offsite dose limits are not exceeded. Insert A

4. Manual Initiation

The Manual Initiation push button channels introduce signals into the secondary containment isolation and SGTS initiation logic that are redundant to the automatic protective instrumentation channels and provide manual isolation capability. There is no specific UFSAR safety analysis that takes credit for this Function. It is retained for the overall redundancy and diversity of the secondary containment isolation instrumentation as required by the NRC approved licensing basis.

There are two push buttons for the logic, one manual initiation push button per trip system. There is no Allowable Value for this Function, since the channels are mechanically actuated based solely on the position of the push buttons.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Two channels of Manual Initiation Function are available and are required to be OPERABLE in MODES 1, 2, and 3, and during ~~CORE ALTERATIONS,~~ OPDRVs, and movement of recently irradiated fuel assemblies in the secondary containment. These are the MODES and other specified conditions in which the Secondary Containment Isolation automatic Functions are required to be OPERABLE.

ACTIONS

A Note has been provided to modify the ACTIONS related to secondary containment isolation instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable secondary containment isolation instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable secondary containment isolation instrumentation channel.

A.1

Because of the diversity of sensors available to provide isolation signals and the redundancy of the isolation design, an allowable out of service time of 12 hours for Function 2, and 24 hours for Functions other than Function 2, has been shown to be acceptable (Refs. 4 and 5) to permit restoration of any inoperable channel to OPERABLE status. This out of service time is only acceptable provided the associated Function is still maintaining isolation capability (refer to Required Action B.1 Bases). If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action A.1. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

ventilation exhaust). Four channels of Fuel Pool Ventilation Exhaust Radiation — High Function are available (two channels per trip system) and are required to be OPERABLE to ensure that no single instrument failure can preclude CREF System initiation. The Allowable Value was selected to ensure that the Function will promptly detect high activity that could threaten exposure to control room personnel.

The Fuel Pool Ventilation Exhaust Radiation — High Function is required to be OPERABLE in MODES 1, 2, and 3 and during movement of recently irradiated fuel assemblies in the secondary containment, ~~CORE ALTERATIONS,~~ and operations with a potential for draining the reactor vessel (OPDRVs), to ensure that control room personnel are protected during a LOCA, fuel handling event, or vessel draindown event. During MODES 4 and 5, when these specified conditions are not in progress (e.g., ~~CORE ALTERATIONS~~ OPDRVs), the probability of a LOCA ~~or fuel damage~~ is low; thus, the Function is not required. Insert B

4. Control Center Normal Makeup Air Radiation — High

The control center normal makeup air radiation monitors measure radiation levels before filtration in the inlet ducting of the MCR. A high radiation level may pose a threat to MCR personnel; thus, automatically initiating the CREF System.

The Control Center Normal Makeup Air Radiation — High Function consists of two independent monitors. Two channels of Control Center Normal Makeup Air Radiation — High are available and are required to be OPERABLE to ensure that no single instrument failure can preclude CREF System initiation. The Allowable Value was selected to ensure protection of the control room personnel.

The Control Center Normal Makeup Air Radiation — High Function is required to be OPERABLE in MODES 1, 2, and 3 and during ~~CORE ALTERATIONS,~~ OPDRVs, and movement of recently irradiated fuel assemblies in the secondary containment, to ensure that control room personnel are protected during a LOCA, fuel handling event, or vessel draindown event. During MODES 4 and 5, when these specified conditions are not in progress (e.g., ~~CORE ALTERATIONS~~ OPDRVs), the probability of a LOCA ~~or fuel damage~~ is low; thus, the Function is not required. Insert B

B 3.6 CONTAINMENT SYSTEMS

B 3.6.4.1 Secondary Containment

BASES

BACKGROUND

The function of the secondary containment is to contain, dilute, and hold up fission products that may leak from primary containment following a Design Basis Accident (DBA). In conjunction with operation of the Standby Gas Treatment (SGT) System and closure of certain valves whose lines penetrate the secondary containment, the secondary containment is designed to reduce the activity level of the fission products prior to release to the environment and to isolate and contain fission products that are released during certain operations that take place inside primary containment, when primary containment is not required to be OPERABLE, or that take place outside primary containment.

The secondary containment is a structure that completely encloses the primary containment and those components that may be postulated to contain primary system fluid. This structure forms a control volume that serves to hold up and dilute the fission products. It is possible for the pressure in the control volume to rise relative to the environmental pressure (e.g., due to pump and motor heat load additions). To prevent ground level exfiltration while allowing the secondary containment to be designed as a conventional structure, the secondary containment requires support systems to maintain the control volume pressure at less than the external pressure. Requirements for these systems are specified separately in LCO 3.6.4.2, "Secondary Containment Isolation Valves (SCIVs)," and LCO 3.6.4.3, "Standby Gas Treatment (SGT) System."

APPLICABLE SAFETY ANALYSES

There are two principal accidents for which credit is taken for secondary containment OPERABILITY. These are a loss of coolant accident (LOCA) (Ref. 1) and a fuel handling accident INSERT C1 inside secondary containment (Ref. 2). INSERT C2 The secondary containment performs no active function in response to each of these limiting events; however, its leak tightness is required to ensure that the release of radioactive materials from the primary containment is

BASES

APPLICABLE SAFETY ANALYSES (continued)

restricted to those leakage paths and associated leakage rates assumed in the accident analysis and that fission products entrapped within the secondary containment structure will be treated by the SGT System prior to discharge to the environment.

Secondary containment satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

An OPERABLE secondary containment provides a control volume into which fission products that bypass or leak from primary containment, or are released from the reactor coolant pressure boundary components located in secondary containment, can be diluted and processed prior to release to the environment. For the secondary containment to be considered OPERABLE, it must have adequate leak tightness to ensure that the required vacuum can be established and maintained.

APPLICABILITY

In MODES 1, 2, and 3, a LOCA could lead to a fission product release to primary containment that leaks to secondary containment. Therefore, secondary containment OPERABILITY is required during the same operating conditions that require primary containment OPERABILITY.

In MODES 4 and 5, the probability and consequences of the LOCA are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining secondary containment OPERABLE is not required in MODE 4 or 5 to ensure a control volume, except for other situations for which significant releases of radioactive material can be postulated, such as during operations with a potential for draining the reactor vessel (OPDRVs)~~, during CORE ALTERATIONS,~~ or during movement of recently irradiated fuel assemblies in the secondary containment.

Insert D

BASES

ACTIONS (continued)

D.1, D.2, and ~~D.3~~

Movement of recently irradiated fuel assemblies in the secondary containment, ~~CORE ALTERATIONS,~~ and OPDRVs can be postulated to cause significant fission product release to the secondary containment. In such cases, the secondary containment is the only barrier to release of fission products to the environment. ~~CORE ALTERATIONS and~~ movement of recently irradiated fuel assemblies must be immediately suspended if the secondary containment is inoperable. Therefore,

Suspension of these activities shall not preclude completing an action that involves moving a component to a safe position. Also, action must be immediately initiated to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.

The Required Actions have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving recently irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving recently irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of recently irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.6.4.1.1

This SR ensures that the secondary containment boundary is sufficiently leak tight to preclude exfiltration under expected wind conditions. The 24 hour Frequency of this SR was developed based on operating experience related to secondary containment vacuum variations during the applicable MODES and the low probability of a DBA occurring between surveillances.

Furthermore, the 24 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal secondary containment vacuum condition.

B 3.6 CONTAINMENT SYSTEMS

B 3.6.4.2 Secondary Containment Isolation Valves (SCIVs)

BASES

BACKGROUND

The function of the SCIVs, in combination with other accident mitigation systems, is to limit fission product release during and following postulated Design Basis Accidents (DBAs). Secondary containment isolation within the time limits specified for those isolation valves designed to close automatically ensures that fission products that leak from primary containment following a DBA, or that are released during certain operations when primary containment is not required to be OPERABLE or take place outside primary containment, are maintained within the secondary containment boundary.

The OPERABILITY requirements for SCIVs help ensure that an adequate secondary containment boundary is maintained during and after an accident by minimizing potential paths to the environment. These isolation devices consist of either passive devices or active (automatic) devices. Manual valves, de-activated automatic valves secured in their closed position (including check valves with flow through the valve secured), and blind flanges are considered passive devices.

Automatic SCIVs close on a secondary containment isolation signal to establish a boundary for untreated radioactive material within secondary containment following a DBA or other accidents.

Other penetrations are isolated by the use of valves in the closed position or blind flanges.

APPLICABLE SAFETY ANALYSES

The SCIVs must be OPERABLE to ensure the secondary containment barrier to fission product releases is established. The principal accidents for which the secondary containment boundary is required are a loss of coolant accident (Ref. 1) and a fuel handling accident INSERT C1 inside secondary containment (Ref. 2). INSERT C2 The secondary containment performs no active function in response to either of these limiting events, but the boundary established by SCIVs is required to ensure that leakage from the primary containment is processed by the Standby Gas

BASES

APPLICABLE SAFETY ANALYSES (continued)

Treatment (SGT) System before being released to the environment.

Maintaining SCIVs OPERABLE with isolation times within limits ensures that fission products will remain trapped inside secondary containment so that they can be treated by the SGT System prior to discharge to the environment.

SCIVs satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

SCIVs form a part of the secondary containment boundary. The SCIV safety function is related to control of offsite radiation releases resulting from DBAs.

The power operated automatic isolation valves are considered OPERABLE when their isolation times are within limits and the valves actuate on an automatic isolation signal. The valves covered by this LCO, along with their associated stroke times, are listed in Reference 3.

The normally closed isolation valves or blind flanges are considered OPERABLE when manual valves and blind flanges are closed, or open in accordance with appropriate administrative controls. These passive isolation valves or devices are listed in plant procedures.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could lead to a fission product release to the primary containment that leaks to the secondary containment. Therefore, the OPERABILITY of SCIVs is required.

In MODES 4 and 5, the probability and consequences of these events are reduced due to pressure and temperature limitations in these MODES. Therefore, maintaining SCIVs OPERABLE is not required in MODE 4 or 5, except for other situations under which significant radioactive releases can be postulated, such as during operations with a potential for draining the reactor vessel (OPDRVs)~~, during CORE ALTERATIONS,~~ or during movement of irradiated fuel recently assemblies in the secondary containment. Moving irradiated fuel assemblies in the secondary containment may also occur in MODES 1, 2, and 3. Insert E

BASES

ACTIONS (continued)

C.1 and C.2

If any Required Action and associated Completion Time cannot be met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

D.1, D.2, and ~~D.3~~

If any Required Action and associated Completion Time are not met, the plant must be placed in a condition in which the LCO does not apply. If applicable, ~~CORE ALTERATIONS and~~ the movement of irradiated fuel assemblies in the secondary containment must be immediately suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, actions must be immediately initiated to suspend OPDRVs in order to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.

recently

The Required Actions have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving fuel while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

BASES

BACKGROUND (continued)

The moisture separator is provided to remove entrained water in the air, while the electric heater reduces the relative humidity of the airstream to less than 70% (Ref. 2). The prefilter removes large particulate matter, while the HEPA filter removes fine particulate matter and protects the charcoal from fouling. The charcoal adsorber removes gaseous elemental iodine and organic iodides, and the final HEPA filter collects any carbon fines exhausted from the charcoal adsorber.

The SGT System automatically starts and operates in response to actuation signals indicative of conditions or an accident that could require operation of the system. Following initiation, both charcoal filter train fans start. Upon verification that both subsystems are operating, the redundant subsystem is normally shut down.

APPLICABLE SAFETY ANALYSES

The design basis for the SGT System is to mitigate the consequences of a loss of coolant accident and fuel handling accidents INSERT C1 (Ref. 2). For all events analyzed, the SGT System is shown to be automatically initiated to reduce, via filtration and adsorption, the radioactive material released to the environment. INSERT C2

The SGT System satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Following a DBA, a minimum of one SGT subsystem is required to maintain the secondary containment at a negative pressure with respect to the environment and to process gaseous releases. Meeting the LCO requirements for two OPERABLE subsystems ensures operation of at least one SGT subsystem in the event of a single active failure.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could lead to a fission product release to primary containment that leaks to secondary containment. Therefore, SGT System OPERABILITY is required during these MODES.

BASES

APPLICABILITY (continued)

In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining the SGT System in OPERABLE status is not required in MODE 4 or 5, except for other situations under which significant releases of radioactive material can be postulated, such as during operations with a potential for draining the reactor vessel (OPDRVs)~~, during CORE ALTERATIONS,~~ or during movement of recently irradiated fuel assemblies in the secondary containment. Insert F

ACTIONS

A.1

With one SGT subsystem inoperable, the inoperable subsystem must be restored to OPERABLE status in 7 days. In this Condition, the remaining OPERABLE SGT subsystem is adequate to perform the required radioactivity release control function. However, the overall system reliability is reduced because a single failure in the OPERABLE subsystem could result in the radioactivity release control function not being adequately performed. The 7 day Completion Time is based on consideration of such factors as the availability of the OPERABLE redundant SGT System and the low probability of a DBA occurring during this period.

B.1 and B.2

If the SGT subsystem cannot be restored to OPERABLE status within the required Completion Time in MODE 1, 2, or 3, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

BASES

ACTIONS (continued)

C.1, C.2.1, C.2.2, and ~~C.2.3~~

During movement of irradiated fuel assemblies, in the secondary containment, ~~during CORE ALTERATIONS,~~ or during OPDRVs, when Required Action A.1 cannot be completed within the required Completion Time, the OPERABLE SGT subsystem should immediately be placed in operation. This action ensures that the remaining subsystem is OPERABLE, that no failures that could prevent automatic actuation have occurred, and that any other failure would be readily detected.

a significant amount of

An alternative to Required Action C.1 is to immediately suspend activities that represent a potential for releasing radioactive material to the secondary containment, thus placing the plant in a condition that minimizes risk. If applicable, ~~CORE ALTERATIONS and~~ movement of irradiated fuel assemblies must immediately be suspended. Suspension of these activities must not preclude completion of movement of a component to a safe position. Also, if applicable, actions must immediately be initiated to suspend OPDRVs in order to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.

recently

The Required Actions of Condition C have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

D.1

If both SGT subsystems are inoperable in MODE 1, 2, or 3, the SGT System may not be capable of supporting the required radioactivity release control function. Therefore, actions are required to enter LCO 3.0.3 immediately.

BASES

ACTIONS (continued)

E.1, E.2, and E.3

When two SGT subsystems are inoperable, if applicable, ~~CORE ALTERATIONS and~~ movement of irradiated fuel assemblies in secondary containment must immediately be suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, actions must immediately be initiated to suspend OPDRVs in order to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.

The Required Actions have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

recently

SURVEILLANCE REQUIREMENTS

SR 3.6.4.3.1

Operating each SGT subsystem from the control room with flow through the HEPA filters and charcoal adsorbers for ≥ 10 continuous hours ensures that both subsystems are OPERABLE and that all associated controls are functioning properly. It also ensures that blockage, fan or motor failure, or excessive vibration can be detected for corrective action. Operation with the heaters on (automatic heater cycling to maintain temperature) for ≥ 10 continuous hours every 31 days eliminates moisture on the adsorbers and HEPA filters. The 31 day Frequency was developed in consideration of the known reliability of fan motors and controls and the redundancy available in the system.

SR 3.6.4.3.2

This SR verifies that the required SGT filter testing is performed in accordance with the Ventilation Filter Testing Program (VFTP). The SGT System filter tests are in accordance with Regulatory Guide 1.52 (Ref. 3). The VFTP includes testing HEPA filter performance, charcoal adsorber efficiency, minimum system flow rate, and the physical

BASES

BACKGROUND (continued)

automatically switches to the recirculation mode of operation to prevent infiltration of contaminated air into the control room. A part of the recirculated air is routed through the emergency recirculation filter train. Outside air is taken in at one of two emergency outside air ventilation intakes and is passed through the emergency makeup filter train before being mixed with recirculated air. The air mixture is then returned to the control room.

The CREF System is designed to maintain the control room environment for a 30 day continuous occupancy after a DBA without exceeding 5 rem whole body dose or its equivalent to any part of the body. The recirculation mode will pressurize the control room to about 0.250 ± 0.125 inches water gauge to prevent infiltration of air from surrounding buildings. CREF System operation in maintaining control room habitability is discussed in the UFSAR, Chapters 6 and 9 (Refs. 1 and 2, respectively).

APPLICABLE SAFETY ANALYSES

The ability of the CREF System to maintain the habitability of the control room is an explicit assumption for the safety analyses presented in the UFSAR, Chapters 6 and 15 (Refs. 1 and 3, respectively). The recirculation mode of the CREF System is assumed to operate following a ~~loss of coolant accident, fuel handling accident~~, main steam ~~line break, and control rod drop accident, as discussed in the UFSAR (Ref. 3).~~ INSERT C1 The radiological doses to control room ~~personnel as a result of the various DBAs are also summarized in Reference 3.~~ INSERT C2 No single active failure will cause the loss of outside or recirculated air from the control room.

The CREF System satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The non-redundant passive components and both divisions of the redundant active components of the CREF System must be OPERABLE to ensure that the system safety function can be performed assuming any active single failure. Total system failure could result in exceeding a dose of 5 rem whole-body (or its equivalent to any part of the body) to the control room operators in the event of a DBA.

BASES

LCO (continued)

Redundant components, of which both divisions must be OPERABLE, include:

a. Emergency inlet air heater;
b. Emergency recirculation fans;
c. Return fans;
d. Supply fans;
e. Emergency air intakes; and
f. Air handling dampers needed to support the system operation.

Non-redundant components required to be OPERABLE include:

a. Emergency recirculation air filter train;
b. Emergency makeup air filter train; and
c. Ductwork and other system structures needed to form the necessary air flow paths.

In addition, the control room boundary must be maintained, including the integrity of the walls, floors, ceilings, ductwork, and access doors.

APPLICABILITY

In MODES 1, 2, and 3, the CREF System must be OPERABLE to control operator exposure during and following a DBA, since the DBA could lead to a fission product release.

In MODES 4 and 5, the probability and consequences of a DBA are reduced because of the pressure and temperature limitations in these MODES. Therefore, maintaining the CREF System OPERABLE is not required in MODE 4 or 5, except for the following situations under which significant radioactive releases can be postulated:

a. During operations with potential for draining the reactor vessel (OPDRVs); and

~~b. During CORE ALTERATIONS;~~ and

b ~~c~~. During movement of recently irradiated fuel assemblies in the secondary containment. Insert G

BASES

ACTIONS

A.1

With one CREF subsystem inoperable, the inoperable CREF subsystem must be restored to OPERABLE status within 7 days. With the unit in this condition, the remaining OPERABLE CREF subsystem is adequate to perform control room radiation protection. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in reduced CREF System capability. The 7 day Completion Time is based on the low probability of a DBA occurring during this time period, and that the remaining subsystem can provide the required capabilities.

B.1 and B.2

In MODE 1, 2, or 3, if the inoperable CREF subsystem cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE that minimizes risk. To achieve this status, the unit must be placed in at least MODE 3 within 12 hours and in MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

C.1, C.2.1, C.2.2, and ~~C.2.3~~

The Required Actions of Condition C are modified by a Note indicating that LCO 3.0.3 does not apply. If moving recently irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

During movement of irradiated fuel assemblies in the secondary containment, ~~during CORE ALTERATIONS,~~ or during OPDRVs, if the inoperable CREF subsystem cannot be restored to OPERABLE status within the required Completion Time, the OPERABLE CREF subsystem may be placed in the recirculation mode. This action ensures that this remaining subsystem is OPERABLE, that no failures that would prevent automatic actuation will occur, and that any active failure will be readily detected.

BASES

ACTIONS (continued)

An alternative to Required Action C.1 is to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk.

If applicable, ~~CORE ALTERATIONS and~~ movement of recently irradiated fuel assemblies in the secondary containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.

A Note is applied to Required Action~~s~~ C.2.2 ~~and C.2.3~~. This Note allows these Required Actions to not be required when the inoperability is due to CREF system duct work testing required by SR 3.7.3.6 or when the system charcoal filter train filter media cannot provide the required efficiency or is being replaced. Dose calculations have shown that the CREF system is not needed during the activities that would otherwise be suspended by these Required Actions.

D.1

If both CREF subsystems or a non-redundant component or portion of the CREF System are inoperable in MODE 1, 2, or 3, the CREF System may not be capable of performing the intended function and the unit is in a condition outside the accident analyses. Therefore, LCO 3.0.3 must be entered immediately.

BASES

ACTIONS (continued)

E.1, E.2, and ~~E.3~~

The Required Actions of Condition E are modified by a Note indicating that LCO 3.0.3 does not apply. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of recently irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

During movement of recently irradiated fuel assemblies in the secondary containment, ~~during CORE ALTERATIONS,~~ or during OPDRVs, with two CREF subsystems or a non-redundant component or portion of the CREF System inoperable, action must be taken immediately to suspend activities that present a potential for releasing radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk.

If applicable, ~~CORE ALTERATIONS and~~ movement of recently irradiated fuel assemblies in the secondary containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. If applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.

A Note is applied to Required Actions E.2 ~~and E.3~~. This Note allows these Required Actions to not be required when the inoperability is due to CREF system duct work testing required by SR 3.7.3.6 or when the system charcoal filter train filter media cannot provide the required efficiency or is being replaced. Dose calculations have shown that the CREF system is not needed during the activities that would otherwise be suspended by these Required Actions.

BASES

APPLICABILITY (continued)

a. During operations with a potential for draining the reactor vessel (OPDRVs); and

~~b. During CORE ALTERATIONS;~~ and

b c. During movement of recently irradiated fuel assemblies in the secondary containment.

Insert H

ACTIONS

A.1

With one control center AC subsystem inoperable, the inoperable control center AC subsystem must be restored to OPERABLE status within 30 days. With the unit in this condition, the remaining OPERABLE control center AC subsystem is adequate to perform the control center air conditioning function. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in loss of the control center air conditioning function. The 30 day Completion Time is based on the low probability of an event occurring requiring control room isolation, the consideration that the remaining subsystem can provide the required protection, and the availability of alternate safety and nonsafety cooling methods.

B.1 and B.2

In MODE 1, 2, or 3, if the inoperable control center AC subsystem cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE that minimizes risk. To achieve this status, the unit must be placed in at least MODE 3 within 12 hours and in MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

BASES

ACTIONS (continued)

C.1, C.2.1, C.2.2, and ~~C.2.3~~

The Required Actions of Condition C are modified by a Note indicating that LCO 3.0.3 does not apply. If moving

recently

irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

During movement of irradiated fuel assemblies in the secondary containment, ~~during CORE ALTERATIONS,~~ or during OPDRVs, if Required Action A.1 cannot be completed within the required Completion Time, the OPERABLE control center AC subsystem may be placed immediately in operation. This action ensures that the remaining subsystem is OPERABLE, that no failures that would prevent actuation will occur, and that any active failure will be readily detected.

An alternative to Required Action C.1 is to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk.

If applicable, ~~CORE ALTERATIONS and~~ movement of irradiated fuel assemblies in the secondary containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.

D.1

If both control center AC subsystems are inoperable in MODE 1, 2, or 3, the Control Center AC System may not be capable of performing the intended function. Therefore, LCO 3.0.3 must be entered immediately.

BASES

ACTIONS (continued)

E.1, E.2, and E.3

recently

The Required Actions of Condition E are modified by a Note indicating that LCO 3.0.3 does not apply. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of irradiated fuel assemblies is not a sufficient reason to require a reactor shutdown.

During movement of irradiated fuel assemblies in the secondary containment, ~~during CORE ALTERATIONS,~~ or during OPDRVs, with two control center AC subsystems inoperable, action must be taken immediately to suspend activities that present a potential for releasing radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk.

If applicable, ~~CORE ALTERATIONS and~~ handling of irradiated fuel in the secondary containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.

SURVEILLANCE REQUIREMENTS

SR 3.7.4.1

This SR verifies that the heat removal capability of the system is sufficient to remove the control room heat load. The SR consists of a verification of the control room temperature. The 12 hour Frequency is appropriate since significant degradation of the Control Center AC System is not expected over this time period.

REFERENCES

1. UFSAR, Section 6.4.

2. UFSAR, Section 9.4.1.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.2 AC Sources — Shutdown

BASES

BACKGROUND

A description of the AC sources is provided in the Bases for LCO 3.8.1, "AC Sources — Operating."

APPLICABLE SAFETY ANALYSES

The OPERABILITY of the minimum AC sources during MODES 4 and 5 and during movement of recently irradiated fuel assemblies ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate AC electrical power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident. Insert I

In general, when the unit is shut down the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or loss of all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, and 3 have no specific analyses in MODES 4 and 5. Worst case bounding events are deemed not credible in MODES 4 and 5 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and corresponding stresses result in the probabilities of occurrences significantly reduced or eliminated, and minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

BASES

LCO (continued)

buses required OPERABLE by LCO 3.8.8, ensures that a diverse power source is available for providing electrical power support assuming a loss of the offsite circuit. Together, OPERABILITY of the required offsite circuit and EDGs ensures the availability of sufficient AC sources to operate the plant in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents, and reactor vessel draindown).

Insert J

The qualified offsite circuit(s) must be capable of maintaining rated frequency and voltage while connected to their respective ESF bus(es), and of accepting required loads during an accident. Qualified offsite circuits are those that are described in the UFSAR and are part of the licensing basis for the unit. The offsite circuit consists of incoming breakers and disconnect to the station service 64 or 65 transformer, and the respective circuit path including feeder breakers to all 4.16 kV ESF buses required by LCO 3.8.8.

The required EDGs must be capable of starting, accelerating to rated speed and voltage, connecting to their respective ESF buses on detection of bus undervoltage, and accepting required loads. This sequence must be accomplished within 10 seconds. Each EDG must also be capable of accepting required loads within the assumed loading sequence intervals, and must continue to operate until offsite power can be restored to the ESF buses. These capabilities are required to be met from a variety of initial conditions such as EDG in standby with engine hot and EDG in standby with engine at ambient conditions.

Proper sequencing of loads, including tripping of nonessential loads, is a required function for EDG OPERABILITY.

It is acceptable for divisions to be cross tied during shutdown conditions, permitting a single offsite power circuit to supply all required divisions.

BASES

APPLICABILITY

The AC sources are required to be OPERABLE in MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment to provide assurance that:

recently

a. Systems providing adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core in case of an inadvertent draindown of the reactor vessel;

INSERT K1

b. Systems needed to mitigate a fuel handling accident are available;

INSERT K2

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

AC power requirements for MODES 1, 2, and 3 are covered in LCO 3.8.1.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of irradiated fuel assemblies would not be sufficient reason to require a reactor shutdown.

A.1

An offsite circuit is considered inoperable if it is not available to one required ESF division. If two or more ESF 4.16 kV buses are required per LCO 3.8.8, one division with offsite power available may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, fuel movement, and operations with a potential for draining the reactor vessel. By the allowance of the option to declare required features inoperable with no offsite power available, appropriate restrictions can be

recently irradiated

BASES

ACTIONS (continued)

implemented in accordance with the affected required feature(s) LCOs' ACTIONS.

A.2.1, A.2.2, A.2.3, A.2.4, B.1, B.2, B.3, and B.4

With the offsite circuit not available to all required divisions, the option still exists to declare all required features inoperable. Since this option may involve undesired administrative efforts, the allowance for sufficiently conservative actions is made. With one or both required EDGs inoperable, the minimum required diversity of AC power sources is not available. It is, therefore, required to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies in the secondary containment, and activities that could result in inadvertent draining of the reactor vessel.

recently

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required AC sources and to continue this action until restoration is accomplished in order to provide the necessary AC power to the plant safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required AC electrical power sources should be completed as quickly as possible in order to minimize the time during which the plant safety systems may be without sufficient power.

Pursuant to LCO 3.0.6, the Distribution System ACTIONS would not be entered even if all AC sources to it are inoperable, resulting in de-energization. Therefore, the Required Actions of Condition A have been modified by a Note to indicate that when Condition A is entered with no AC power to any required ESF bus, ACTIONS for LCO 3.8.8 must be immediately entered. This Note allows Condition A to provide requirements for the loss of the offsite circuit whether or not a division is de-energized. LCO 3.8.8 provides the appropriate restrictions for the situation involving a de-energized division.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.5 DC Sources — Shutdown

BASES

BACKGROUND

A description of the DC sources is provided in the Bases for LCO 3.8.4, "DC Sources — Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume that Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the emergency diesel generators (EDGs), emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum DC electrical power sources during MODES 4 and 5 and during movement of recently irradiated fuel assemblies ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status: and

c. Adequate DC electrical power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident. or Insert L

The DC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

At least one DC electrical power subsystem consisting of two 130 VDC batteries in series, two battery chargers, and the corresponding control equipment and interconnecting cabling is required to be OPERABLE to support required DC distribution subsystems required OPERABLE by LCO 3.8.8, "Distribution Systems – Shutdown." In addition, when the redundant division of the Class 1E DC electrical power subsystem is required by LCO 3.8.8, the other DC source subsystem, consisting of either a battery or a battery charger, the corresponding control equipment and interconnecting cabling, is required to be OPERABLE. This ensures the availability of sufficient DC electrical power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents and inadvertent reactor vessel draindown).

INSERT J

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment provide assurance that:

recently

a. Required features to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core in case of an inadvertent draindown of the reactor vessel;

b. Required features needed to mitigate a fuel handling accident are available;

INSERT K1   .   INSERT K2

c. Required features necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The DC electrical power requirements for MODES 1, 2, and 3 are covered in LCO 3.8.4.

BASES

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of irradiated fuel assemblies would not be sufficient reason to require a reactor shutdown.

A.1, A.2.1, A.2.2, A.2.3, and A.2.4

recently irradiated

If more than one DC distribution subsystem is required according to LCO 3.8.8, the DC subsystems remaining OPERABLE with one or more DC power sources inoperable may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, fuel movement, and operations with a potential for draining the reactor vessel. By allowance of the option to declare required features inoperable with associated DC power sources inoperable, appropriate restrictions are implemented in accordance with the affected system LCOs' ACTIONS. In many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies, and any activities that could result in inadvertent draining of the reactor vessel).

recently

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required DC electrical power subsystems and to continue this action until restoration is accomplished in order to provide the necessary DC electrical power to the plant safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required DC electrical power subsystems should be completed as quickly as possible in order to minimize the time during which the plant safety systems may be without sufficient power.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.8 Distribution Systems — Shutdown

BASES

BACKGROUND

A description of the AC and DC electrical power distribution system is provided in the Bases for LCO 3.8.7, "Distribution Systems — Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume Engineered Safety Feature (ESF) systems are OPERABLE. The AC and DC electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded.

The OPERABILITY of the AC and DC electrical power distribution system is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum AC and DC electrical power sources and associated power distribution subsystems during MODES 4 and 5, and during movement of recently irradiated fuel assemblies in the secondary containment ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident.

Insert M

The AC and DC electrical power distribution systems satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

Various combinations of subsystems, equipment, and components are required OPERABLE by other LCOs, depending on the specific plant condition. Implicit in those requirements is the required OPERABILITY of necessary support required features. This LCO explicitly requires energization of the portions of the electrical distribution system necessary to support OPERABILITY of Technical Specifications required systems, equipment, and components – both specifically addressed by their own LCO, and implicitly required by the definition of OPERABILITY.

In addition, during the shutdown conditions applicable to this LCO, cross-tie breakers between redundant safety related power distribution systems may be closed.

Maintaining these portions of the distribution system energized ensures the availability of sufficient power to operate the plant in a safe manner to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents and inadvertent reactor vessel draindown). INSERT J

APPLICABILITY

The AC and DC electrical power distribution subsystems required to be OPERABLE in MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment provide assurance that:

a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel in the core in case of an inadvertent draindown of the reactor vessel;

b. Systems needed to mitigate a fuel handling accident are available; . INSERT K2 INSERT K1

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The AC and DC electrical power distribution subsystem requirements for MODES 1, 2, and 3 are covered in LCO 3.8.7.

BASES

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of irradiated fuel assemblies would not be sufficient reason to require a reactor shutdown.

A.1, A.2.1, A.2.2, A.2.3, A.2.4, and A.2.5

Although redundant required features may require redundant divisions of electrical power distribution subsystems to be OPERABLE, one OPERABLE distribution subsystem division may be capable of supporting sufficient required features to allow continuation of ~~CORE ALTERATIONS,~~ recently irradiated fuel movement, and operations with a potential for draining the reactor vessel. By allowing the option to declare required features associated with an inoperable distribution subsystem inoperable, appropriate restrictions are implemented in accordance with the affected distribution subsystem LCO's Required Actions. In many instances this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made, (i.e., to suspend CORE ALTERATIONS, movement of recently irradiated fuel assemblies in the secondary containment, and any activities that could result in inadvertent draining of the reactor vessel).

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required AC and DC electrical power distribution subsystems and to continue this action until restoration is accomplished in order to provide the necessary power to the plant safety systems.

Notwithstanding performance of the above conservative Required Actions, a required residual heat removal-shutdown cooling (RHR-SDC) subsystem may be inoperable. In this case, Required Actions A.2.1 through A.2.4 do not adequately address the concerns relating to coolant circulation and heat removal. Pursuant to LCO 3.0.6, the RHR-SDC ACTIONS would not be entered. Therefore, Required Action A.2.5 is

ENCLOSURE 3 TO
NRC-01-0036
PART 2

AFFECTED TS BASES
INCORPORATING PROPOSED CHANGES

Affected TS Bases Pages:
B 3.3.6.2-6, B 3.3.6.2-7, B 3.3.6.2-8
B 3.3.7.1-5, B 3.3.7.1-5a
B 3.6.4.1-1, B 3.6.4.1-2, B 3.6.4.1-3, B 3.6.4.1-4, B 3.6.4.1-5
B 3.6.4.2-1, B 3.6.4.2-2, B 3.6.4.2-3, B 3.6.4.2-4, B 3.6.4.2-5, B 3.6.4.2-6, B 3.6.4.2-7
B 3.6.4.3-2, B 3.6.4.3-3, B 3.6.4.3-4, B 3.6.4.3-5, B 3.6.4.3-6, B 3.6.4.3-7
B 3.7.3-2, B 3.7.3-3, B 3.7.3-4, B 3.7.3-5, B 3.7.3-6
B 3.7.4-3, B 3.7.4-4, B 3.7.4-5
B 3.8.2-1, B 3.8.2-2, B 3.8.2-3, B 3.8.2-4, B 3.8.2-5, B 3.8.2-6
B 3.8.5-1, B 3.8.5-2, B 3.8.5-3, B 3.8.5-4
B 3.8.8-1, B 3.8.8-2, B 3.8.8-3, B 3.8.8-4, B 3.8.8-5

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

individual monitor whose trip outputs are assigned to an isolation channel. Four channels of Fuel Pool Ventilation Exhaust Radiation—High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Values are chosen to promptly detect gross failure of the fuel cladding.

The Fuel Pool Ventilation Exhaust Radiation—High Function is required to be OPERABLE in MODES 1, 2, and 3 where considerable energy exists; thus, there is a probability of pipe breaks resulting in significant releases of radioactive steam and gas. In MODES 4 and 5, the probability and consequences of these events are low due to the RCS pressure and temperature limitations of these MODES; thus, this Function is not required. In addition, the Function is also required to be OPERABLE during OPDRVs and movement of recently irradiated fuel assemblies in the secondary containment, because the capability of detecting radiation releases due to fuel failures (due to fuel uncovery or dropped fuel assemblies) must be provided to ensure that offsite dose limits are not exceeded. Due to radioactive decay, this Function is only required to isolate secondary containment during fuel handling accidents involving handling recently irradiated fuel. “Recently irradiated fuel” is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, “recently irradiated fuel” is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

4. Manual Initiation

The Manual Initiation push button channels introduce signals into the secondary containment isolation and SGTS initiation logic that are redundant to the automatic protective instrumentation channels and provide manual isolation capability. There is no specific UFSAR safety analysis that takes credit for this Function. It is retained for the overall redundancy and diversity of the secondary

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

containment isolation instrumentation as required by the NRC approved licensing basis.

There are two push buttons for the logic, one manual initiation push button per trip system. There is no Allowable Value for this Function, since the channels are mechanically actuated based solely on the position of the push buttons.

Two channels of Manual Initiation Function are available and are required to be OPERABLE in MODES 1, 2, and 3, and during OPDRVs and movement of recently irradiated fuel assemblies in the secondary containment. These are the MODES and other specified conditions in which the Secondary Containment Isolation automatic Functions are required to be OPERABLE.

ACTIONS

A Note has been provided to modify the ACTIONS related to secondary containment isolation instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable secondary containment isolation instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable secondary containment isolation instrumentation channel.

A.1

Because of the diversity of sensors available to provide isolation signals and the redundancy of the isolation design, an allowable out of service time of 12 hours for Function 2, and 24 hours for Functions other than Function 2, has been shown to be acceptable (Refs. 4 and 5) to permit restoration of any inoperable channel to OPERABLE status. This out of service time is only acceptable provided the associated Function is still maintaining isolation capability (refer to Required Action B.1 Bases).

BASES

ACTIONS (continued)

If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action A.1. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an isolation), Condition C must be entered and its Required Actions taken.

B.1

Required Action B.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in a complete loss of automatic isolation capability for the associated penetration flow path(s) or a complete loss of automatic initiation capability for the SGT System. A Function is considered to be maintaining secondary containment isolation capability when sufficient channels are OPERABLE or in trip, such that one trip system will generate a trip signal from the given Function on a valid signal. This ensures that one of the two SCIVs in the associated penetration flow path and one SGT subsystem can be initiated on an isolation signal from the given Function. For Functions 1 and 2, with two two-out-of-two logic trip systems, this would require one trip system to have two channels, each OPERABLE or in trip. For Function 3 with two one-out-of-two logic trip systems, this would require one trip system to have one channel OPERABLE or in trip. The Condition does not include the Manual Initiation Function (Function 4), since it is not assumed in any accident or transient analysis. Thus, a total loss of manual initiation capability for 24 hours (as allowed by Required Action A.1) is allowed.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. The 1 hour Completion Time is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

ventilation exhaust). Four channels of Fuel Pool Ventilation Exhaust Radiation–High Function are available (two channels per trip system) and are required to be OPERABLE to ensure that no single instrument failure can preclude CREF System initiation. The Allowable Value was selected to ensure that the Function will promptly detect high activity that could threaten exposure to control room personnel.

The Fuel Pool Ventilation Exhaust Radiation–High Function is required to be OPERABLE in MODES 1, 2, and 3 and during movement of recently irradiated fuel assemblies in the secondary containment and operations with a potential for draining the reactor vessel (OPDRVs), to ensure that control room personnel are protected during a LOCA, fuel handling event, or vessel draindown event. During MODES 4 and 5, when these specified conditions are not in progress (e.g., OPDRVs, the probability of a LOCA is low; thus, the Function is not required. Also due to radioactive decay, this Function is only required to initiate the CREF system during fuel handling accidents involving handling recently irradiated fuel. “Recently irradiated fuel” is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, “recently irradiated fuel” is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

4. <u>Control Center Normal Makeup Air Radiation–High</u>

The control center normal makeup air radiation monitors measure radiation levels before filtration in the inlet ducting of the MCR. A high radiation level may pose a threat to MCR personnel; thus, automatically initiating the CREF System.

The Control Center Normal Makeup Air Radiation–High Function consists of two independent monitors. Two channels of Control Center Normal Makeup Air Radiation–High are available and are required to be OPERABLE to ensure that no single instrument failure can preclude CREF System

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

initiation. The Allowable Value was selected to ensure protection of the control room personnel.

The Control Center Normal Makeup Air Radiation–High Function is required to be OPERABLE in MODES 1, 2, and 3 and during OPDRVs and movement of recently irradiated fuel assemblies in the secondary containment, to ensure that control room personnel are protected during a LOCA, fuel handling event, or vessel draindown event. During MODES 4 and 5, when these specified conditions are not in progress (e.g., OPDRVs), the probability of a LOCA is low; thus, the Function is not required. Also due to radioactive decay, this Function is only required to initiate the CREF system during fuel handling accidents involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

B 3.6 CONTAINMENT SYSTEMS

B 3.6.4.1 Secondary Containment

BASES

BACKGROUND

The function of the secondary containment is to contain, dilute, and hold up fission products that may leak from primary containment following a Design Basis Accident (DBA). In conjunction with operation of the Standby Gas Treatment (SGT) System and closure of certain valves whose lines penetrate the secondary containment, the secondary containment is designed to reduce the activity level of the fission products prior to release to the environment and to isolate and contain fission products that are released during certain operations that take place inside primary containment, when primary containment is not required to be OPERABLE, or that take place outside primary containment.

The secondary containment is a structure that completely encloses the primary containment and those components that may be postulated to contain primary system fluid. This structure forms a control volume that serves to hold up and dilute the fission products. It is possible for the pressure in the control volume to rise relative to the environmental pressure (e.g., due to pump and motor heat load additions). To prevent ground level exfiltration while allowing the secondary containment to be designed as a conventional structure, the secondary containment requires support systems to maintain the control volume pressure at less than the external pressure. Requirements for these systems are specified separately in LCO 3.6.4.2, "Secondary Containment Isolation Valves (SCIVs)," and LCO 3.6.4.3, "Standby Gas Treatment (SGT) System."

APPLICABLE SAFETY ANALYSES

There are two principal accidents for which credit is taken for secondary containment OPERABILITY. These are a loss of coolant accident (LOCA) (Ref. 1) and a fuel handling accident involving handling recently irradiated fuel inside secondary containment (Ref. 2). “Recently irradiated fuel” is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, “recently irradiated fuel” is fuel that has occupied part of a critical reactor core within the

BASES

APPLICABLE SAFETY ANALYSES (continued)

previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated. The secondary containment performs no active function in response to each of these limiting events;
however, its leak tightness is required to ensure that the release of radioactive materials from the primary containment is restricted to those leakage paths and associated leakage rates assumed in the accident analysis and that fission products entrapped within the secondary containment structure will be treated by the SGT System prior to discharge to the environment.

Secondary containment satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

An OPERABLE secondary containment provides a control volume into which fission products that bypass or leak from primary containment, or are released from the reactor coolant pressure boundary components located in secondary containment, can be diluted and processed prior to release to the environment. For the secondary containment to be considered OPERABLE, it must have adequate leak tightness to ensure that the required vacuum can be established and maintained.

APPLICABILITY

In MODES 1, 2, and 3, a LOCA could lead to a fission product release to primary containment that leaks to secondary containment. Therefore, secondary containment OPERABILITY is required during the same operating conditions that require primary containment OPERABILITY.

In MODES 4 and 5, the probability and consequences of the LOCA are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining secondary containment OPERABLE is not required in MODE 4 or 5 to ensure a control volume, except for other situations for which significant releases of radioactive material can be postulated, such as during operations with a potential for draining the reactor vessel (OPDRVs) or during movement

BASES

APPLICABILITY (continued)

of recently irradiated fuel assemblies in the secondary containment. Due to radioactive decay, secondary containment is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

ACTIONS

A.1

With a Secondary Containment railroad bay access door inoperable there remains a redundant access door in an OPERABLE status. This door is capable of maintaining the Secondary Containment function. Therefore, the 7 day Completion Time gives a reasonable period of time to correct the problem given the availability of the other access door and the low probability of an event occurring that will challenge the Secondary Containment during this time period.

B.1

If secondary containment is inoperable for reasons other than Condition A, it must be restored to OPERABLE status within 4 hours. The 4 hour Completion Time provides a period of time to correct the problem that is commensurate with the importance of maintaining secondary containment during MODES 1, 2, and 3. This time period also ensures that the probability of an accident (requiring secondary containment OPERABILITY) occurring during periods where secondary containment is inoperable is minimal.

C.1 and C.2

If secondary containment cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To

BASES

ACTIONS (continued)

achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

D.1 and D.2

Movement of recently irradiated fuel assemblies in the secondary containment and OPDRVs can be postulated to cause significant fission product release to the secondary containment. In such cases, the secondary containment is the only barrier to release of fission products to the environment. Therefore, movement of recently irradiated fuel assemblies must be immediately suspended if the secondary containment is inoperable.

Suspension of these activities shall not preclude completing an action that involves moving a component to a safe position. Also, action must be immediately initiated to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.

The Required Actions have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving recently irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving recently irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of recently irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.6.4.1.1

This SR ensures that the secondary containment boundary is sufficiently leak tight to preclude exfiltration under expected wind conditions. The 24 hour Frequency of this SR was developed based on operating experience related to secondary containment vacuum variations during the applicable MODES and the low probability of a DBA occurring between surveillances.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Furthermore, the 24 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal secondary containment vacuum condition.

SR 3.6.4.1.2 and SR 3.6.4.1.3

Verifying that secondary containment equipment hatches, pressure relief doors, railroad bay access doors, and one access door in each access opening are closed ensures that the infiltration of outside air of such a magnitude as to prevent maintaining the desired negative pressure does not occur. Verifying that all such openings are closed provides adequate assurance that exfiltration from the secondary containment will not occur. In this application, the term "sealed" has no connotation of leak tightness. Maintaining secondary containment OPERABILITY requires verifying one door in each access opening is closed. An access opening contains one inner and one outer door. In some cases, secondary containment access openings are shared such that a secondary containment barrier may have multiple inner or multiple outer doors. The intent is not to breach the secondary containment at any time when secondary containment is required. This is achieved by maintaining the inner or outer portion of the barrier closed at all times. However, all secondary containment access doors are normally kept closed, except when the access opening is being used for entry and exit or when maintenance is being performed on an access opening. The 31 day Frequency for these SRs has been shown to be adequate, based on operating experience, and is considered adequate in view of the other indications of door and hatch status that are available to the operator.

A Note is added to SR 3.6.4.1.2 to allow a secondary containment railroad bay access door to be open for up to 4 hours for entry, exit or testing, and up to 12 hours for new fuel receipt activities. These activities do not indicate a problem with a railroad bay access door and the door should not be considered inoperable. Also, with one railroad bay door remaining closed, secondary containment OPERABILITY is maintained. The times allowed are reasonable for the activities being performed considering the availability of the redundant door.

B 3.6 CONTAINMENT SYSTEMS

B 3.6.4.2 Secondary Containment Isolation Valves (SCIVs)

BASES

BACKGROUND

The function of the SCIVs, in combination with other accident mitigation systems, is to limit fission product release during and following postulated Design Basis Accidents (DBAs). Secondary containment isolation within the time limits specified for those isolation valves designed to close automatically ensures that fission products that leak from primary containment following a DBA, or that are released during certain operations when primary containment is not required to be OPERABLE or take place outside primary containment, are maintained within the secondary containment boundary.

The OPERABILITY requirements for SCIVs help ensure that an adequate secondary containment boundary is maintained during and after an accident by minimizing potential paths to the environment. These isolation devices consist of either passive devices or active (automatic) devices. Manual valves, de-activated automatic valves secured in their closed position (including check valves with flow through the valve secured), and blind flanges are considered passive devices.

Automatic SCIVs close on a secondary containment isolation signal to establish a boundary for untreated radioactive material within secondary containment following a DBA or other accidents.

Other penetrations are isolated by the use of valves in the closed position or blind flanges.

APPLICABLE SAFETY ANALYSES

The SCIVs must be OPERABLE to ensure the secondary containment barrier to fission product releases is established. The principal accidents for which the secondary containment boundary is required are a loss of coolant accident (Ref. 1) and a fuel handling accident involving handling recently irradiated fuel inside secondary containment (Ref. 2). "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the

BASES

APPLICABLE SAFETY ANALYSES (continued)

previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated. The secondary containment performs no active function in response to either of these limiting events, but the boundary established by SCIVs is required to ensure that leakage from the primary containment is processed by the Standby Gas Treatment (SGT) System before being released to the environment.

Maintaining SCIVs OPERABLE with isolation times within limits ensures that fission products will remain trapped inside secondary containment so that they can be treated by the SGT System prior to discharge to the environment.

SCIVs satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

SCIVs form a part of the secondary containment boundary. The SCIV safety function is related to control of offsite radiation releases resulting from DBAs.

The power operated automatic isolation valves are considered OPERABLE when their isolation times are within limits and the valves actuate on an automatic isolation signal. The valves covered by this LCO, along with their associated stroke times, are listed in Reference 3.

The normally closed isolation valves or blind flanges are considered OPERABLE when manual valves and blind flanges are closed, or open in accordance with appropriate administrative controls. These passive isolation valves or devices are listed in plant procedures.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could lead to a fission product release to the primary containment that leaks to the

BASES

APPLICABILITY (continued)

secondary containment. Therefore, the OPERABILITY of SCIVs is required.

In MODES 4 and 5, the probability and consequences of these events are reduced due to pressure and temperature limitations in these MODES. Therefore, maintaining SCIVs OPERABLE is not required in MODE 4 or 5, except for other situations under which significant radioactive releases can be postulated, such as during operations with a potential for draining the reactor vessel (OPDRVs) or during movement of recently irradiated fuel assemblies in the secondary containment. Moving recently irradiated fuel assemblies in the secondary containment may also occur in MODES 1, 2, and 3. Due to radioactive decay, SCIVs are only required to be OPERABLE during fuel handling involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

ACTIONS

The ACTIONS are modified by three Notes. The first Note allows penetration flow paths to be unisolated intermittently under administrative controls. These controls consist of stationing a dedicated operator, who is in continuous communication with the control room, at the controls of the isolation device. In this way, the penetration can be rapidly isolated when a need for secondary containment isolation is indicated.

The second Note provides clarification that for the purpose of this LCO separate Condition entry is allowed for each penetration flow path. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable SCIV. Complying with the Required Actions may allow for continued operation, and subsequent inoperable SCIVs are governed by subsequent Condition entry and application of associated Required Actions.

BASES

ACTIONS (continued)

The third Note ensures appropriate remedial actions are taken, if necessary, if the affected system(s) are rendered inoperable by an inoperable SCIV.

A.1 and A.2

In the event that there are one or more penetration flow paths with one SCIV inoperable, the affected penetration flow path(s) must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic SCIV, a closed manual valve, and a blind flange. For penetrations isolated in accordance with Required Action A.1, the device used to isolate the penetration should be the closest available device to secondary containment. The Required Action must be completed within the 8 hour Completion Time. The specified time period is reasonable considering the time required to isolate the penetration, and the probability of a DBA, which requires the SCIVs to close, occurring during this short time is very low.

For affected penetrations that have been isolated in accordance with Required Action A.1, the affected penetration must be verified to be isolated on a periodic basis. This is necessary to ensure that secondary containment penetrations required to be isolated following an accident, but no longer capable of being automatically isolated, will be in the isolation position should an event occur. The Completion Time of once per 31 days is appropriate because the valves are operated under administrative controls and the probability of their misalignment is low. This Required Action does not require any testing or device manipulation. Rather, it involves verification that the affected penetration remains isolated.

Required Action A.2 is modified by two Notes. Note 1 applies to devices located in high radiation areas and allows them to be verified closed by use of administrative controls. Allowing verification by administrative controls is considered acceptable, since access to these areas is typically restricted. Therefore, the probability of misalignment, once they have been verified to be in the proper position, is low. Note 2 applies to isolation

BASES

ACTIONS (continued)

devices that are locked, sealed, or otherwise secured in position and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since the function of locking, sealing, or securing components is to ensure that these devices are not inadvertently repositioned.

B.1

With two SCIVs in one or more penetration flow paths inoperable, the affected penetration flow path must be isolated within 4 hours. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve, and a blind flange. The 4 hour Completion Time is reasonable considering the time required to isolate the penetration and the probability of a DBA, which requires the SCIVs to close, occurring during this short time, is very low.

The Condition has been modified by a Note stating that Condition B is only applicable to penetration flow paths with two isolation valves. This clarifies that only Condition A is entered if one SCIV is inoperable in each of two penetrations.

C.1 and C.2

If any Required Action and associated Completion Time cannot be met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

D.1 and D.2

If any Required Action and associated Completion Time are not met, the plant must be placed in a condition in which the LCO does not apply. If applicable, the movement of recently irradiated fuel assemblies in the secondary

BASES

ACTIONS (continued)

containment must be immediately suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, actions must be immediately initiated to suspend OPDRVs in order to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.

The Required Actions have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving recently irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving fuel while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of recently irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.6.4.2.1

This SR verifies that each secondary containment manual isolation valve and blind flange that is not locked, sealed, or otherwise secured and is required to be closed during accident conditions is closed. The SR helps to ensure that post accident leakage of radioactive fluids or gases outside of the secondary containment boundary is within design limits. This SR does not require any testing or valve manipulation. Rather, it involves verification that those SCIVs in secondary containment that are capable of being mispositioned are in the correct position.

Since these SCIVs are readily accessible to personnel during normal operation and verification of their position is relatively easy, the 31 day Frequency was chosen to provide added assurance that the SCIVs are in the correct positions. This SR does not apply to valves that are locked, sealed, or otherwise secured in the closed position since these were verified to be in the correct position upon locking, sealing, or securing.

Two Notes have been added to this SR. The first Note applies to valves and blind flanges located in high radiation areas and allows them to be verified by use of administrative controls. Allowing verification by administrative controls is considered acceptable, since access to these areas is typically restricted during

BASES

SURVEILLANCE REQUIREMENTS (continued)

MODES 1, 2, and 3 for ALARA reasons. Therefore, the probability of misalignment of these SCIVs, once they have been verified to be in the proper position, is low.

A second Note has been included to clarify that SCIVs that are open under administrative controls are not required to meet the SR during the time the SCIVs are open.

SR 3.6.4.2.2

Verifying that the isolation time of each power operated automatic SCIV is within limits is required to demonstrate OPERABILITY. The isolation time test ensures that the SCIV will isolate in a time period less than or equal to that assumed in the safety analyses. The isolation time and Frequency of this SR are in accordance with the Inservice Testing Program.

SR 3.6.4.2.3

Verifying that each automatic SCIV closes on a secondary containment isolation signal is required to prevent leakage of radioactive material from secondary containment following a DBA or other accidents. This SR ensures that each automatic SCIV will actuate to the isolation position on a secondary containment isolation signal. The LOGIC SYSTEM FUNCTIONAL TEST in SR 3.3.6.2.5 overlaps this SR to provide complete testing of the safety function. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the 18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

REFERENCES

1. UFSAR, Section 15.6.5.
2. UFSAR, Section 15.7.4.
3. Technical Requirements Manual.

BASES

BACKGROUND (continued)

The moisture separator is provided to remove entrained water in the air, while the electric heater reduces the relative humidity of the airstream to less than 70% (Ref. 2). The prefilter removes large particulate matter, while the HEPA filter removes fine particulate matter and protects the charcoal from fouling. The charcoal adsorber removes gaseous elemental iodine and organic iodides, and the final HEPA filter collects any carbon fines exhausted from the charcoal adsorber.

The SGT System automatically starts and operates in response to actuation signals indicative of conditions or an accident that could require operation of the system. Following initiation, both charcoal filter train fans start. Upon verification that both subsystems are operating, the redundant subsystem is normally shut down.

APPLICABLE SAFETY ANALYSES

The design basis for the SGT System is to mitigate the consequences of a loss of coolant accident and fuel handling accidents involving handling recently irradiated fuel (Ref. 2). "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated. For all events analyzed, the SGT System is shown to be automatically initiated to reduce, via filtration and adsorption, the radioactive material released to the environment.

The SGT System satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Following a DBA, a minimum of one SGT subsystem is required to maintain the secondary containment at a negative pressure with respect to the environment and to process gaseous releases. Meeting the LCO requirements for two OPERABLE

BASES

LCO (continued)

subsystems ensures operation of at least one SGT subsystem in the event of a single active failure.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could lead to a fission product release to primary containment that leaks to secondary containment. Therefore, SGT System OPERABILITY is required during these MODES.

In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining the SGT System in OPERABLE status is not required in MODE 4 or 5, except for other situations under which significant releases of radioactive material can be postulated, such as during operations with a potential for draining the reactor vessel (OPDRVs) or during movement of recently irradiated fuel assemblies in the secondary containment. Due to radioactive decay, the SGT System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

ACTIONS

A.1

With one SGT subsystem inoperable, the inoperable subsystem must be restored to OPERABLE status in 7 days. In this Condition, the remaining OPERABLE SGT subsystem is adequate to perform the required radioactivity release control function. However, the overall system reliability is reduced because a single failure in the OPERABLE subsystem could result in the radioactivity release control function not being adequately performed. The 7 day Completion Time is based on consideration of such factors as the

BASES

ACTIONS (continued)

availability of the OPERABLE redundant SGT System and the low probability of a DBA occurring during this period.

B.1 and B.2

If the SGT subsystem cannot be restored to OPERABLE status within the required Completion Time in MODE 1, 2, or 3, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

C.1, C.2.1 and C.2.2

During movement of recently irradiated fuel assemblies, in the secondary containment, or during OPDRVs, when Required Action A.1 cannot be completed within the required Completion Time, the OPERABLE SGT subsystem should immediately be placed in operation. This action ensures that the remaining subsystem is OPERABLE, that no failures that could prevent automatic actuation have occurred, and that any other failure would be readily detected.

An alternative to Required Action C.1 is to immediately suspend activities that represent a potential for releasing a significant amount of radioactive material to the secondary containment, thus placing the plant in a condition that minimizes risk. If applicable, movement of recently irradiated fuel assemblies must immediately be suspended. Suspension of these activities must not preclude completion of movement of a component to a safe position. Also, if applicable, actions must immediately be initiated to suspend OPDRVs in order to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.

The Required Actions of Condition C have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving recently irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations.

BASES

ACTIONS (continued)

Therefore, in either case, inability to suspend movement of recently irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

D.1

If both SGT subsystems are inoperable in MODE 1, 2, or 3, the SGT System may not be capable of supporting the required radioactivity release control function. Therefore, actions are required to enter LCO 3.0.3 immediately.

E.1 and E.2

When two SGT subsystems are inoperable, if applicable, movement of recently irradiated fuel assemblies in secondary containment must immediately be suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, actions must immediately be initiated to suspend OPDRVs in order to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.

The Required Actions have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving recently irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of recently irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.6.4.3.1

Operating each SGT subsystem from the control room with flow through the HEPA filters and charcoal adsorbers for ≥ 10 continuous hours ensures that both subsystems are OPERABLE and that all associated controls are functioning properly. It also ensures that blockage, fan or motor failure, or excessive vibration can be detected for corrective action. Operation with the heaters on (automatic heater cycling to maintain temperature) for ≥ 10 continuous hours every 31 days eliminates moisture on the adsorbers and HEPA

BASES

SURVEILLANCE REQUIREMENTS (continued)

filters. The 31 day Frequency was developed in consideration of the known reliability of fan motors and controls and the redundancy available in the system.

SR 3.6.4.3.2

This SR verifies that the required SGT filter testing is performed in accordance with the Ventilation Filter Testing Program (VFTP). The SGT System filter tests are in accordance with Regulatory Guide 1.52 (Ref. 3). The VFTP includes testing HEPA filter performance, charcoal adsorber efficiency, minimum system flow rate, and the physical properties of the activated charcoal (general use and following specific operations). Specific test frequencies and additional information are discussed in detail in the VFTP.

SR 3.6.4.3.3

This SR verifies that each SGT subsystem starts and associated dampers open on receipt of an actual or simulated initiation signal. While this Surveillance can be performed with the reactor at power, operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency. The LOGIC SYSTEM FUNCTIONAL TEST in SR 3.3.6.2.5 overlaps this SR to provide complete testing of the safety function. Therefore, the Frequency was found to be acceptable from a reliability standpoint.

SR 3.6.4.3.4

This SR verifies that the filter cooler bypass damper can be remote manually opened and the fan remote manually started. This ensures that the ventilation mode of SGT System operation is available. While this Surveillance can be performed with the reactor at power, operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency, which is based on the refueling cycle. Therefore, the Frequency was found to be acceptable from a reliability standpoint.

BASES

REFERENCES

1. 10 CFR 50, Appendix A, GDC 41.
2. UFSAR, Section 6.2.3.
3. Regulatory Guide 1.52, Rev. 2.

BASES

BACKGROUND (continued)

automatically switches to the recirculation mode of operation to prevent infiltration of contaminated air into the control room. A part of the recirculated air is routed through the emergency recirculation filter train. Outside air is taken in at one of two emergency outside air ventilation intakes and is passed through the emergency makeup filter train before being mixed with recirculated air. The air mixture is then returned to the control room.

The CREF System is designed to maintain the control room environment for a 30 day continuous occupancy after a DBA without exceeding 5 rem whole body dose or its equivalent to any part of the body. The recirculation mode will pressurize the control room to about 0.250 ± 0.125 inches water gauge to prevent infiltration of air from surrounding buildings. CREF System operation in maintaining control room habitability is discussed in the UFSAR, Chapters 6 and 9 (Refs. 1 and 2, respectively).

APPLICABLE SAFETY ANALYSES

The ability of the CREF System to maintain the habitability of the control room is an explicit assumption for the safety analyses presented in the UFSAR, Chapters 6 and 15 (Refs. 1 and 3, respectively). The recirculation mode of the CREF System is assumed to operate following a loss of coolant accident, fuel handling accident involving handling recently irradiated fuel, main steam line break, and control rod drop accident, as discussed in the UFSAR (Ref. 3). "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject of the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated. The radiological doses to control room personnel as a result of the various DBAs are also summarized in Reference 3. No single active failure will cause the loss of outside or recirculated air from the control room.

The CREF System satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

The non-redundant passive components and both divisions of the redundant active components of the CREF System must be OPERABLE to ensure that the system safety function can be performed assuming any active single failure. Total system failure could result in exceeding a dose of 5 rem whole-body (or its equivalent to any part of the body) to the control room operators in the event of a DBA.

Redundant components, of which both divisions must be OPERABLE, include:

a. Emergency inlet air heater;
b. Emergency recirculation fans;
c. Return fans;
d. Supply fans;
e. Emergency air intakes; and
f. Air handling dampers needed to support the system operation.

Non-redundant components required to be OPERABLE include:

a. Emergency recirculation air filter train;
b. Emergency makeup air filter train; and
c. Ductwork and other system structures needed to form the necessary air flow paths.

In addition, the control room boundary must be maintained, including the integrity of the walls, floors, ceilings, ductwork, and access doors.

APPLICABILITY

In MODES 1, 2, and 3, the CREF System must be OPERABLE to control operator exposure during and following a DBA, since the DBA could lead to a fission product release.

In MODES 4 and 5, the probability and consequences of a DBA are reduced because of the pressure and temperature limitations in these MODES. Therefore, maintaining the CREF System OPERABLE is not required in MODE 4 or 5, except for the following situations under which significant radioactive releases can be postulated:

a. During operations with potential for draining the reactor vessel (OPDRVs); and

BASES

APPLICABILITY (Continued)

b. During movement of recently irradiated fuel assemblies in the secondary containment. Due to radioactive decay, the CREF System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

ACTIONS

A.1

With one CREF subsystem inoperable, the inoperable CREF subsystem must be restored to OPERABLE status within 7 days. With the unit in this condition, the remaining OPERABLE CREF subsystem is adequate to perform control room radiation protection. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in reduced CREF System capability. The 7 day Completion Time is based on the low probability of a DBA occurring during this time period, and that the remaining subsystem can provide the required capabilities.

B.1 and B.2

In MODE 1, 2, or 3, if the inoperable CREF subsystem cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE that minimizes risk. To achieve this status, the unit must be placed in at least MODE 3 within 12 hours and in MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

BASES

ACTIONS (continued)

C.1, C.2.1 and C.2.2

The Required Actions of Condition C are modified by a Note indicating that LCO 3.0.3 does not apply. If moving recently irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of recently irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

During movement of recently irradiated fuel assemblies in the secondary containment or during OPDRVs, if the inoperable CREF subsystem cannot be restored to OPERABLE status within the required Completion Time, the OPERABLE CREF subsystem may be placed in the recirculation mode. This action ensures that this remaining subsystem is OPERABLE, that no failures that would prevent automatic actuation will occur, and that any active failure will be readily detected.

An alternative to Required Action C.1 is to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk.

If applicable, movement of recently irradiated fuel assemblies in the secondary containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.

A Note is applied to Required Action C.2.2. This Note allows these Required Actions to not be required when the inoperability is due to CREF system duct work testing required by SR 3.7.3.6 or when the system charcoal filter train filter media cannot provide the required efficiency or is being replaced. Dose calculations have shown that the CREF system is not needed during the activities that would otherwise be suspended by these Required Actions.

BASES

ACTIONS (continued)

D.1

If both CREF subsystems or a non-redundant component or portion of the CREF System are inoperable in MODE 1, 2, or 3, the CREF System may not be capable of performing the intended function and the unit is in a condition outside the accident analyses. Therefore, LCO 3.0.3 must be entered immediately.

E.1 and E.2

The Required Actions of Condition E are modified by a Note indicating that LCO 3.0.3 does not apply. If moving recently irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of recently irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

During movement of recently irradiated fuel assemblies in the secondary containment or during OPDRVs, with two CREF subsystems or a non-redundant component or portion of the CREF System inoperable, action must be taken immediately to suspend activities that present a potential for releasing radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk.

If applicable, movement of recently irradiated fuel assemblies in the secondary containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. If applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.

A Note is applied to Required Action E.2. This Note allows these Required Actions to not be required when the inoperability is due to CREF system duct work testing required by SR 3.7.3.6 or when the system charcoal filter train filter media cannot provide the required efficiency or is being replaced. Dose calculations have shown that the CREF system is not needed during the activities that would otherwise be suspended by these Required Actions.

BASES

APPLICABILITY (continued)

a. During operations with a potential for draining the reactor vessel (OPDRVs); and

b. During movement of recently irradiated fuel assemblies in the secondary containment. Due to radioactive decay, the Control Room AC System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

ACTIONS

A.1

With one control center AC subsystem inoperable, the inoperable control center AC subsystem must be restored to OPERABLE status within 30 days. With the unit in this condition, the remaining OPERABLE control center AC subsystem is adequate to perform the control center air conditioning function. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in loss of the control center air conditioning function. The 30 day Completion Time is based on the low probability of an event occurring requiring control room isolation, the consideration that the remaining subsystem can provide the required protection, and the availability of alternate safety and nonsafety cooling methods.

B.1 and B.2

In MODE 1, 2, or 3, if the inoperable control center AC subsystem cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE that minimizes risk. To achieve this status, the unit must be placed in at least MODE 3 within 12 hours and in MODE 4 within 36 hours. The allowed Completion Times are

BASES

ACTIONS (continued)

reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

C.1, C.2.1 and C.2.2

The Required Actions of Condition C are modified by a Note indicating that LCO 3.0.3 does not apply. If moving recently irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of recently irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

During movement of recently irradiated fuel assemblies in the secondary containment or during OPDRVs, if Required Action A.1 cannot be completed within the required Completion Time, the OPERABLE control center AC subsystem may be placed immediately in operation. This action ensures that the remaining subsystem is OPERABLE, that no failures that would prevent actuation will occur, and that any active failure will be readily detected.

An alternative to Required Action C.1 is to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk.

If applicable, movement of recently irradiated fuel assemblies in the secondary containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.

D.1

If both control center AC subsystems are inoperable in MODE 1, 2, or 3, the Control Center AC System may not be capable of performing the intended function. Therefore, LCO 3.0.3 must be entered immediately.

BASES

ACTIONS (continued)

E.1 and E.2

The Required Actions of Condition E are modified by a Note indicating that LCO 3.0.3 does not apply. If moving recently irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of recently irradiated fuel assemblies is not a sufficient reason to require a reactor shutdown.

During movement of recently irradiated fuel assemblies in the secondary containment or during OPDRVs, with two control center AC subsystems inoperable, action must be taken immediately to suspend activities that present a potential for releasing radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk.

If applicable, handling of recently irradiated fuel in the secondary containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.

SURVEILLANCE REQUIREMENTS

SR 3.7.4.1

This SR verifies that the heat removal capability of the system is sufficient to remove the control room heat load. The SR consists of a verification of the control room temperature. The 12 hour Frequency is appropriate since significant degradation of the Control Center AC System is not expected over this time period.

REFERENCES

1. UFSAR, Section 6.4.
2. UFSAR, Section 9.4.1.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.2 AC Sources—Shutdown

BASES

BACKGROUND

A description of the AC sources is provided in the Bases for LCO 3.8.1, "AC Sources—Operating."

APPLICABLE SAFETY ANALYSES

The OPERABILITY of the minimum AC sources during MODES 4 and 5 and during movement of recently irradiated fuel assemblies ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate AC electrical power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident involving handling recently irradiated fuel. Due to radioactive decay, AC electrical power is only required to mitigate fuel handling accidents involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

In general, when the unit is shut down the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or loss of all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, and 3 have no specific analyses in MODES 4 and 5. Worst case bounding events are deemed not

BASES

APPLICABLE SAFETY ANAYSES (continued)

credible in MODES 4 and 5 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and corresponding stresses result in the probabilities of occurrences significantly reduced or eliminated, and minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

During MODES 1, 2, and 3, various deviations from the analysis assumptions and design requirements are allowed within the ACTIONS. This allowance is in recognition that certain testing and maintenance activities must be conducted, provided an acceptable level of risk is not exceeded. During MODES 4 and 5, performance of a significant number of required testing and maintenance activities is also required. In MODES 4 and 5, the activities are generally planned and administratively controlled. Relaxations from typical MODES 1, 2, and 3 LCO requirements are acceptable during shutdown MODES, based on:

a. The fact that time in an outage is limited. This is a risk prudent goal as well as an economic consideration.

b. Requiring appropriate compensatory measures for certain conditions. These may include administrative controls, reliance on systems that do not necessarily meet typical design requirements applied to systems credited in operation MODE analyses, or both.

c. Prudent consideration of the risk associated with multiple activities that could affect multiple systems.

d. Maintaining, to the extent practical, the ability to perform required functions (even if not meeting MODES 1, 2, and 3 OPERABILITY requirements) with systems assumed to function during an event.

In the event of an accident during shutdown, this LCO ensures the capability of supporting systems necessary for avoiding immediate difficulty, assuming either a loss of all offsite power or a loss of all onsite (emergency diesel generator (EDG)) power.

The AC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

One offsite circuit capable of supplying the onsite Class 1E power distribution subsystem(s) of LCO 3.8.8, "Distribution Systems—Shutdown," ensures that all required loads are capable of being powered from offsite power. An OPERABLE Division of onsite power, consisting of two EDGs associated with Distribution System Engineered Safety Feature (ESF) buses required OPERABLE by LCO 3.8.8, ensures that a diverse power source is available for providing electrical power support assuming a loss of the offsite circuit. Together, OPERABILITY of the required offsite circuit and EDGs ensures the availability of sufficient AC sources to operate the plant in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents involving handling recently irradiated fuel and reactor vessel draindown).

The qualified offsite circuit(s) must be capable of maintaining rated frequency and voltage while connected to their respective ESF bus(es), and of accepting required loads during an accident. Qualified offsite circuits are those that are described in the UFSAR and are part of the licensing basis for the unit. The offsite circuit consists of incoming breakers and disconnect to the station service 64 or 65 transformer, and the respective circuit path including feeder breakers to all 4.16 kV ESF buses required by LCO 3.8.8.

The required EDGs must be capable of starting, accelerating to rated speed and voltage, connecting to their respective ESF buses on detection of bus undervoltage, and accepting required loads. This sequence must be accomplished within 10 seconds. Each EDG must also be capable of accepting required loads within the assumed loading sequence intervals, and must continue to operate until offsite power can be restored to the ESF buses. These capabilities are required to be met from a variety of initial conditions such as EDG in standby with engine hot and EDG in standby with engine at ambient conditions.

Proper sequencing of loads, including tripping of nonessential loads, is a required function for EDG OPERABILITY.

It is acceptable for divisions to be cross tied during shutdown conditions, permitting a single offsite power circuit to supply all required divisions.

BASES

APPLICABILITY

The AC sources are required to be OPERABLE in MODES 4 and 5 and during movement of recently irradiated fuel assemblies in the secondary containment to provide assurance that:

a. Systems providing adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core in case of an inadvertent draindown of the reactor vessel;

b. Systems needed to mitigate a fuel handling accident involving handling recently irradiated fuel are available. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

AC power requirements for MODES 1, 2, and 3 are covered in LCO 3.8.1.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of irradiated fuel assemblies would not be sufficient reason to require a reactor shutdown.

A.1

An offsite circuit is considered inoperable if it is not

BASES

ACTIONS (continued)

available to one required ESF division. If two or more ESF 4.16 kV buses are required per LCO 3.8.8, one division with offsite power available may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, recently irradiated fuel movement, and operations with a potential for draining the reactor vessel. By the allowance of the option to declare required features inoperable with no offsite power available, appropriate restrictions can be implemented in accordance with the affected required feature(s) LCOs' ACTIONS.

A.2.1, A.2.2, A.2.3, A.2.4, B.1, B.2, B.3, and B.4

With the offsite circuit not available to all required divisions, the option still exists to declare all required features inoperable. Since this option may involve undesired administrative efforts, the allowance for sufficiently conservative actions is made. With one or both required EDGs inoperable, the minimum required diversity of AC power sources is not available. It is, therefore, required to suspend CORE ALTERATIONS, movement of recently irradiated fuel assemblies in the secondary containment, and activities that could result in inadvertent draining of the reactor vessel.

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required AC sources and to continue this action until restoration is accomplished in order to provide the necessary AC power to the plant safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required AC electrical power sources should be completed as quickly as possible in order to minimize the time during which the plant safety systems may be without sufficient power.

Pursuant to LCO 3.0.6, the Distribution System ACTIONS would not be entered even if all AC sources to it are inoperable, resulting in de-energization. Therefore, the Required Actions of Condition A have been modified by a Note to indicate that when Condition A is entered with no AC power to any required ESF bus, ACTIONS for LCO 3.8.8 must be

BASES

ACTIONS (Continued)

immediately entered. This Note allows Condition A to provide requirements for the loss of the offsite circuit whether or not a division is de-energized. LCO 3.8.8 provides the appropriate restrictions for the situation involving a de-energized division.

SURVEILLANCE REQUIREMENTS

SR 3.8.2.1

SR 3.8.2.1 requires the SRs from LCO 3.8.1 that are necessary for ensuring the OPERABILITY of the AC sources in other than MODES 1, 2, and 3. SR 3.8.1.18 is excepted because starting independence is not required with the EDGs that are not required to be OPERABLE. Refer to the corresponding Bases for LCO 3.8.1 for a discussion of each SR.

This SR is modified by a Note. The reason for the Note is to preclude requiring the OPERABLE EDGs from being paralleled with the offsite power network or otherwise rendered inoperable during the performance of SRs, and to preclude deenergizing a required 4160 V ESF bus or disconnecting a required offsite circuit during performance of SRs. With limited AC sources available, a single event could compromise both the required circuit and a required EDG. It is the intent that these SRs must still be capable of being met, but actual performance is not required during periods when the EDGs and offsite circuit are required to be OPERABLE.

REFERENCES None.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.5 DC Sources–Shutdown

BASES

BACKGROUND

A description of the DC sources is provided in the Bases for LCO 3.8.4, "DC Sources–Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume that Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the emergency diesel generators (EDGs), emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum DC electrical power sources during MODES 4 and 5 and during movement of recently irradiated fuel assemblies ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate DC electrical power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident involving handling recently irradiated fuel. Due to radioactive decay, DC electrical power is only required to mitigate fuel handling accidents involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling

BASES

APPLICABLE SAFETY ANALYSIS (Continued)

recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

The DC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

At least one DC electrical power subsystem consisting of two 130 VDC batteries in series, two battery chargers, and the corresponding control equipment and interconnecting cabling is required to be OPERABLE to support required DC distribution subsystems required OPERABLE by LCO 3.8.8, "Distribution Systems-Shutdown." In addition, when the redundant division of the Class 1E DC electrical power subsystem is required by LCO 3.8.8, the other DC source subsystem, consisting of either a battery or a battery charger, the corresponding control equipment and interconnecting cabling, is required to be OPERABLE. This ensures the availability of sufficient DC electrical power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents involving handling recently irradiated fuel and inadvertent reactor vessel draindown).

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 4 and 5 and during movement of recently irradiated fuel assemblies in the secondary containment provide assurance that:

a. Required features to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core in case of an inadvertent draindown of the reactor vessel;

b. Required features needed to mitigate a fuel handling accident involving handling recently irradiated fuel are available. “Recently irradiated fuel” is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, “recently irradiated fuel” is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

BASES

APPLICABILITY (Continued)

c. Required features necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The DC electrical power requirements for MODES 1, 2, and 3 are covered in LCO 3.8.4.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of irradiated fuel assemblies would not be sufficient reason to require a reactor shutdown.

A.1, A.2.1, A.2.2, A.2.3, and A.2.4

If more than one DC distribution subsystem is required according to LCO 3.8.8, the DC subsystems remaining OPERABLE with one or more DC power sources inoperable may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, recently irradiated fuel movement, and operations with a potential for draining the reactor vessel. By allowance of the option to declare required features inoperable with associated DC power sources inoperable, appropriate restrictions are implemented in accordance with the affected system LCOs' ACTIONS. In many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, movement of recently irradiated fuel assemblies, and any activities that could result in inadvertent draining of the reactor vessel).

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required DC electrical power

BASES

ACTIONS (Continued)

subsystems and to continue this action until restoration is accomplished in order to provide the necessary DC electrical power to the plant safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required DC electrical power subsystems should be completed as quickly as possible in order to minimize the time during which the plant safety systems may be without sufficient power.

SURVEILLANCE REQUIREMENTS

SR 3.8.5.1

SR 3.8.5.1 requires performance of all Surveillances required by SR 3.8.4.1 through SR 3.8.4.8. Therefore, see the corresponding Bases for LCO 3.8.4 for a discussion of each SR.

This SR is modified by a Note. The reason for the Note is to preclude requiring the OPERABLE DC sources from being discharged below their capability to provide the required power supply or otherwise rendered inoperable during the performance of SRs. It is the intent that these SRs must still be capable of being met, but actual performance is not required.

REFERENCES

1. UFSAR, Chapter 6.
2. UFSAR, Chapter 15.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.8 Distribution Systems - Shutdown

BASES

BACKGROUND	A description of the AC and DC electrical power distribution system is provided in the Bases for LCO 3.8.7, "Distribution Systems - Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume Engineered Safety Feature (ESF) systems are OPERABLE. The AC and DC electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded.

The OPERABILITY of the AC and DC electrical power distribution system is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum AC and DC electrical power sources and associated power distribution subsystems during MODES 4 and 5, and during movement of recently irradiated fuel assemblies in the secondary containment ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident involving handling recently irradiated fuel. Due to radioactive decay, AC and DC electrical power is only required to mitigate fuel handling accidents involving handling recently irradiated fuel. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in

BASES

APPLICABLE SAFETY ANALYSIS (continued)

Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, " recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

The AC and DC electrical power distribution systems satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Various combinations of subsystems, equipment, and components are required OPERABLE by other LCOs, depending on the specific plant condition. Implicit in those requirements is the required OPERABILITY of necessary support required features. This LCO explicitly requires energization of the portions of the electrical distribution system necessary to support OPERABILITY of Technical Specifications required systems, equipment, and components-both specifically addressed by their own LCO, and implicitly required by the definition of OPERABILITY.

In addition, during the shutdown conditions applicable to this LCO, cross-tie breakers between redundant safety related power distribution systems may be closed.

Maintaining these portions of the distribution system energized ensures the availability of sufficient power to operate the plant in a safe manner to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents involving handling recently irradiated fuel and inadvertent reactor vessel draindown).

APPLICABILITY

The AC and DC electrical power distribution subsystems required to be OPERABLE in MODES 4 and 5 and during movement of recently irradiated fuel assemblies in the secondary containment provide assurance that:

a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel in the core in case of an inadvertent draindown of the reactor vessel;

BASES

APPLICABILITY (continued)

b. Systems needed to mitigate a fuel handling accident involving handling recently irradiated fuel are available. "Recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous four days, provided that it is verified that the limits in Footnote 11 of Regulatory Guide 1.183 are not exceeded. Otherwise, "recently irradiated fuel" is fuel that has occupied part of a critical reactor core within the previous 34 days. Handling new (non-irradiated) fuel bundles over the open reactor core or the spent fuel pool is subject to the same requirements of handling recently irradiated fuel, as long as any fuel in the core or fuel pool is recently irradiated.

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The AC and DC electrical power distribution subsystem requirements for MODES 1, 2, and 3 are covered in LCO 3.8.7.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of irradiated fuel assemblies would not be sufficient reason to require a reactor shutdown.

<u>A.1, A.2.1, A.2.2, A.2.3, A.2.4, and A.2.5</u>

Although redundant required features may require redundant divisions of electrical power distribution subsystems to be OPERABLE, one OPERABLE distribution subsystem division may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, recently irradiated fuel movement, and operations with a potential for draining the reactor vessel. By allowing the option to declare

BASES

ACTIONS (continued)

required features associated with an inoperable distribution subsystem inoperable, appropriate restrictions are implemented in accordance with the affected distribution subsystem LCO's Required Actions. In many instances this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made, (i.e., to suspend CORE ALTERATIONS, movement of recently irradiated fuel assemblies in the secondary containment, and any activities that could result in inadvertent draining of the reactor vessel).

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required AC and DC electrical power distribution subsystems and to continue this action until restoration is accomplished in order to provide the necessary power to the plant safety systems.

Notwithstanding performance of the above conservative Required Actions, a required residual heat removal-shutdown cooling (RHR-SDC) subsystem may be inoperable. In this case, Required Actions A.2.1 through A.2.4 do not adequately address the concerns relating to coolant circulation and heat removal. Pursuant to LCO 3.0.6, the RHR-SDC ACTIONS would not be entered. Therefore, Required Action A.2.5 is provided to direct declaring RHR-SDC inoperable and not in operation, which results in taking the appropriate RHR-SDC ACTIONS.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required distribution subsystems should be completed as quickly as possible in order to minimize the time the plant safety systems may be without power.

SURVEILLANCE REQUIREMENTS

SR 3.8.8.1

This Surveillance verifies that the AC and DC electrical power distribution subsystem is functioning properly, with the buses energized. The verification of proper voltage availability on the buses ensures that the required power is readily available for motive as well as control functions for critical system loads connected to these buses. The

BASES

SURVEILLANCE REQUIREMENTS (Continued)

7 day Frequency takes into account the redundant capability of the electrical power distribution subsystems, as well as other indications available in the control room that alert the operator to subsystem malfunctions.

REFERENCES

1. UFSAR, Chapter 6.

2. UFSAR, Chapter 15.

ENCLOSURE 4 TO
NRC-01-0036

FERMI 2 NRC DOCKET NO. 50-341
OPERATING LISENCE NO. NPF-43

ARCON96 Computer Output

```
Program Title:   ARCON96.

Developed For:   U.S. Nuclear Regulatory Commission
                 Office of Nuclear Reactor Regulation
                 Division of Reactor Program Management

Date:            June 25, 1997    11:00 a.m.

NRC Contacts:    J. Y. Lee        Phone: (301) 415 1080
                                  e-mail: jyl1@nrc.gov
                 J. J. Hayes      Phone: (301) 415 3167
                                  e-mail: jjh@nrc.gov
                 L. A  Brown      Phone: (301) 415 1232
                                  e-mail: lab2@nrc.gov

Code Developer:  J. V. Ramsdell   Phone: (509) 372 6316
                                  e-mail: j_ramsdell@pnl.gov

Code Documentation:  NUREG/CR-6331 Rev. 1

The program was prepared for an agency of the United States Government. Neither
the United States Government nor any agency thereof, nor any of their
employees, makes any warranty, expressed or implied, or assumes any legal
liability or responsibilities for any third party's use, or the results of such
use, of any portion of this program or represents that its use by such third
party would not infringe privately owned rights.

Program Run   3/14/2001  at  18:10:37

 ******* ARCON INPUT **********

    Number of Meteorological Data Files  =  5
    Meteorological Data File Names
      W:\ARCON96\DC6086\F1995.MET
      W:\ARCON96\DC6086\F1996.MET
      W:\ARCON96\DC6086\F1997.MET
      W:\ARCON96\DC6086\F1998.MET
      W:\ARCON96\DC6086\F1999.MET

    Height of lower wind instrument (m)  =      10.0
    Height of upper wind instrument (m)  =      60.0
    Wind speeds entered as miles per hour

    Vent release
    Release height (m)                   =      54.3
    Building Area (m^2)                  =    2300.0
    Effluent vertical velocity (m/s)     =       .00
    Vent or stack flow  (m^3/s)          =       .00
    Vent or stack radius (m)             =       .00

    Direction .. intake to source (deg)  =       002
    Wind direction sector width (deg)    =        90
    Wind direction window (deg)          =   317 - 047
    Distance to intake (m)               =      39.3
    Intake height  (m)                   =      18.6
    Terrain elevation difference (m)     =        .0

    Output file names
```

```
SGtoSouth2.log
SGtoSouth2.CFD

Minimum Wind Speed (m/s)                =     .5
Surface roughness length (m)            =    .20
Sector averaging constant               =    4.0

Initial value of sigma y                =    .00
Initial value of sigma z                =    .00

Expanded output for code testing not selected

Total number of hours of data processed =  43805
Hours of missing data                   =   1649
Hours direction in window               =   8002
Hours elevated plume w/ dir. in window  =      0
Hours of calm winds                     =    442
Hours direction not in window or calm   =  33712

DISTRIBUTION SUMMARY DATA BY AVERAGING INTERVAL
  AVER. PER.           1          2          4          8         12
24       96        168        360        720
  UPPER LIM.    1.00E-02   1.00E-02   1.00E-02   1.00E-02   1.00E-02   1.00E-
02  1.00E-02   1.00E-02   1.00E-02   1.00E-02
    LOW LIM.    1.00E-06   1.00E-06   1.00E-06   1.00E-06   1.00E-06   1.00E-
06  1.00E-06   1.00E-06   1.00E-06   1.00E-06
 ABOVE RANGE          0.         0.         0.         0.         0.
0.        0.         0.         0.         0.
    IN RANGE       8444.      9830.     11940.     15182.     17913.
23905.    38705.     41077.     41035.     40460.
 BELOW RANGE          0.         0.         0.         0.         0.
0.        0.         0.         0.         0.
        ZERO      33712.     32294.     30128.     26784.     24178.
18144.     2994.       423.         0.         0.
  TOTAL X/Qs      42156.     42124.     42068.     41966.     42091.
42049.    41699.     41500.     41035.     40460.
   % NON ZERO      20.03      23.34      28.38      36.18      42.56
56.85     92.82      98.98     100.00     100.00

95th PERCENTILE X/Q VALUES
                1.97E-03   1.87E-03   1.73E-03   1.53E-03   1.25E-03   9.01E-
04   5.18E-04   4.31E-04   3.46E-04   3.06E-04

95% X/Q for standard averaging intervals

0 to 2 hours         1.97E-03
2 to 8 hours         1.39E-03
8 to 24 hours        5.85E-04
1 to 4 days          3.90E-04
4 to 30 days         2.74E-04

                           HOURLY VALUE RANGE
                      MAX X/Q                  MIN X/Q
     CENTERLINE       2.82E-03                 1.17E-04
     SECTOR-AVERAGE   1.77E-03                 7.31E-05

NORMAL PROGRAM COMPLETION
```

```
Program Title:  ARCON96.

Developed For:  U.S. Nuclear Regulatory Commission
                Office of Nuclear Reactor Regulation
                Division of Reactor Program Management

Date:           June 25, 1997    11:00 a.m.

NRC Contacts:   J. Y. Lee       Phone: (301) 415 1080
                                e-mail: jyl1@nrc.gov
                J. J. Hayes     Phone: (301) 415 3167
                                e-mail: jjh@nrc.gov
                L. A  Brown     Phone: (301) 415 1232
                                e-mail: lab2@nrc.gov

Code Developer: J. V. Ramsdell  Phone: (509) 372 6316
                                e-mail: j_ramsdell@pnl.gov

Code Documentation:  NUREG/CR-6331 Rev. 1
```

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```
Program Run   3/14/2001  at  18:13:33

 ******* ARCON INPUT **********

    Number of Meteorological Data Files  =  5
    Meteorological Data File Names
      W:\ARCON96\DC6086\F1995.MET
      W:\ARCON96\DC6086\F1996.MET
      W:\ARCON96\DC6086\F1997.MET
      W:\ARCON96\DC6086\F1998.MET
      W:\ARCON96\DC6086\F1999.MET

    Height of lower wind instrument (m)  =     10.0
    Height of upper wind instrument (m)  =     60.0
    Wind speeds entered as miles per hour

    Ground-level release
    Release height (m)                   =       .0
    Building Area (m^2)                  =   2300.0
    Effluent vertical velocity (m/s)     =      .00
    Vent or stack flow  (m^3/s)          =      .00
    Vent or stack radius (m)             =      .00

    Direction .. intake to source (deg)  =      002
    Wind direction sector width (deg)    =       90
    Wind direction window (deg)          =  317 - 047
    Distance to intake (m)               =     53.1
    Intake height  (m)                   =       .0
    Terrain elevation difference (m)     =       .0

    Output file names
```

```
  SGtoSouthGrnd.log
  SGtoSouthGrnd.CFD

Minimum Wind Speed (m/s)                 =        .5
Surface roughness length (m)             =        .20
Sector averaging constant                =       4.0

Initial value of sigma y                 =        .00
Initial value of sigma z                 =        .00

Expanded output for code testing not selected

Total number of hours of data processed =  43805
Hours of missing data                   =   1649
Hours direction in window               =   8312
Hours elevated plume w/ dir. in window  =      0
Hours of calm winds                     =    292
Hours direction not in window or calm   =  33552

DISTRIBUTION SUMMARY DATA BY AVERAGING INTERVAL
 AVER. PER.             1           2           4           8          12
24        96        168         360         720
 UPPER LIM.     1.00E-02    1.00E-02    1.00E-02    1.00E-02    1.00E-02    1.00E-
02  1.00E-02   1.00E-02   1.00E-02   1.00E-02
   LOW LIM.     1.00E-06    1.00E-06    1.00E-06    1.00E-06    1.00E-06    1.00E-
06  1.00E-06   1.00E-06   1.00E-06   1.00E-06
ABOVE RANGE           0.          0.          0.          0.          0.
0.        0.         0.          0.          0.
   IN RANGE        8604.      10194.      12560.      16073.      18958.
25027.    38705.     40943.      41028.      40460.
BELOW RANGE           0.          0.          0.          0.          0.
0.        0.         0.          0.          0.
       ZERO       33552.      31930.      29508.      25893.      23133.
17022.     2994.       557.          7.          0.
 TOTAL X/Qs       42156.      42124.      42068.      41966.      42091.
42049.    41699.     41500.      41035.      40460.
 % NON ZERO        20.41       24.20       29.86       38.30       45.04
59.52      92.82      98.66       99.98      100.00

 95th PERCENTILE X/Q VALUES
                1.86E-03    1.80E-03    1.69E-03    1.52E-03    1.24E-03    8.97E-
04   5.15E-04   4.27E-04   3.47E-04   3.12E-04

 95% X/Q for standard averaging intervals

 0 to 2 hours          1.86E-03
 2 to 8 hours          1.40E-03
 8 to 24 hours         5.88E-04
 1 to 4 days           3.88E-04
 4 to 30 days          2.80E-04

                       HOURLY VALUE RANGE
                      MAX X/Q                  MIN X/Q
     CENTERLINE      2.59E-03                 2.49E-04
     SECTOR-AVERAGE  1.62E-03                 1.56E-04

NORMAL PROGRAM COMPLETION
```

```
Program Title:  ARCON96.

Developed For:  U.S. Nuclear Regulatory Commission
                Office of Nuclear Reactor Regulation
                Division of Reactor Program Management

Date:           June 25, 1997    11:00 a.m.

NRC Contacts:   J. Y. Lee        Phone: (301) 415 1080
                                 e-mail: jyl1@nrc.gov
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                L. A  Brown      Phone: (301) 415 1232
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Code Developer: J. V. Ramsdell   Phone: (509) 372 6316
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Code Documentation:  NUREG/CR-6331 Rev. 1

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use, of any portion of this program or represents that its use by such third
party would not infringe privately owned rights.

Program Run   3/14/2001  at  18:06:21

 ******* ARCON INPUT **********

    Number of Meteorological Data Files  =  5
    Meteorological Data File Names
      W:\ARCON96\DC6086\F1995.MET
      W:\ARCON96\DC6086\F1996.MET
      W:\ARCON96\DC6086\F1997.MET
      W:\ARCON96\DC6086\F1998.MET
      W:\ARCON96\DC6086\F1999.MET

    Height of lower wind instrument (m)   =     10.0
    Height of upper wind instrument (m)   =     60.0
    Wind speeds entered as miles per hour

    Vent release
    Release height (m)                    =     54.3
    Building Area (m^2)                   =   2300.0
    Effluent vertical velocity (m/s)      =      .00
    Vent or stack flow  (m^3/s)           =      .00
    Vent or stack radius (m)              =      .00

    Direction .. intake to source (deg)   =      241
    Wind direction sector width (deg)     =       90
    Wind direction window (deg)           =   196 - 286
    Distance to intake (m)                =     16.8
    Intake height  (m)                    =     18.4
    Terrain elevation difference (m)      =       .0

    Output file names
```

```
 SGtoNorth2.log
 SGtoNorth2.CFD

Minimum Wind Speed (m/s)                 =      .5
Surface roughness length (m)             =      .20
Sector averaging constant                =     4.0

Initial value of sigma y                 =      .00
Initial value of sigma z                 =      .00

Expanded output for code testing not selected

Total number of hours of data processed =  43805
Hours of missing data                   =   1649
Hours direction in window               =  14687
Hours elevated plume w/ dir. in window  =      0
Hours of calm winds                     =    442
Hours direction not in window or calm   =  27027

DISTRIBUTION SUMMARY DATA BY AVERAGING INTERVAL
  AVER. PER.            1           2           4           8          12
24         96         168         360         720
  UPPER LIM.    1.00E-02    1.00E-02    1.00E-02    1.00E-02    1.00E-02    1.00E-
02    1.00E-02    1.00E-02    1.00E-02    1.00E-02
    LOW LIM.    1.00E-06    1.00E-06    1.00E-06    1.00E-06    1.00E-06    1.00E-
06    1.00E-06    1.00E-06    1.00E-06    1.00E-06
 ABOVE RANGE          0.          0.          0.          0.          0.
0.          0.          0.          0.          0.
    IN RANGE      15129.      16779.      19228.      22799.      25614.
31155.      40393.      41403.      41035.      40460.
 BELOW RANGE          0.          0.          0.          0.          0.
0.          0.          0.          0.          0.
        ZERO      27027.      25345.      22840.      19167.      16477.
10894.       1306.         97.          0.          0.
 TOTAL X/Qs       42156.      42124.      42068.      41966.      42091.
42049.      41699.      41500.      41035.      40460.
   % NON ZERO      35.89       39.83       45.71       54.33       60.85
74.09       96.87       99.77      100.00      100.00

95th PERCENTILE X/Q VALUES
                3.61E-03    3.49E-03    3.28E-03    3.04E-03    2.49E-03    1.81E-
03    1.16E-03    9.98E-04    8.78E-04    8.01E-04

95% X/Q for standard averaging intervals

0 to 2 hours        3.61E-03
2 to 8 hours        2.85E-03
8 to 24 hours       1.19E-03
1 to 4 days         9.47E-04
4 to 30 days        7.46E-04

                          HOURLY VALUE RANGE
                         MAX X/Q                    MIN X/Q
      CENTERLINE         5.00E-03                   1.16E-04
      SECTOR-AVERAGE     3.13E-03                   7.30E-05

NORMAL PROGRAM COMPLETION
```

```
Program Title:  ARCON96.

Developed For:  U.S. Nuclear Regulatory Commission
                Office of Nuclear Reactor Regulation
                Division of Reactor Program Management

Date:           June 25, 1997     11:00 a.m.

NRC Contacts:   J. Y. Lee        Phone: (301) 415 1080
                                 e-mail: jyl1@nrc.gov
                J. J. Hayes      Phone: (301) 415 3167
                                 e-mail: jjh@nrc.gov
                L. A  Brown      Phone: (301) 415 1232
                                 e-mail: lab2@nrc.gov

Code Developer: J. V. Ramsdell   Phone: (509) 372 6316
                                 e-mail: j_ramsdell@pnl.gov

Code Documentation:   NUREG/CR-6331 Rev. 1
```

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```
Program Run   3/14/2001  at  18:08:39

 ******* ARCON INPUT **********

    Number of Meteorological Data Files  =  5
    Meteorological Data File Names
      W:\ARCON96\DC6086\F1995.MET
      W:\ARCON96\DC6086\F1996.MET
      W:\ARCON96\DC6086\F1997.MET
      W:\ARCON96\DC6086\F1998.MET
      W:\ARCON96\DC6086\F1999.MET

    Height of lower wind instrument (m)  =     10.0
    Height of upper wind instrument (m)  =     60.0
    Wind speeds entered as miles per hour

    Ground-level release
    Release height (m)                   =       .0
    Building Area (m^2)                  =   2300.0
    Effluent vertical velocity (m/s)     =      .00
    Vent or stack flow  (m^3/s)          =      .00
    Vent or stack radius (m)             =      .00

    Direction .. intake to source (deg)  =      241
    Wind direction sector width (deg)    =       90
    Wind direction window (deg)          =   196 - 286
    Distance to intake (m)               =     39.6
    Intake height  (m)                   =       .0
    Terrain elevation difference (m)     =       .0

    Output file names
```

```
   SGtoNorthGrnd.log
   SGtoNorthGrnd.CFD

 Minimum Wind Speed (m/s)                  =      .5
 Surface roughness length (m)              =      .20
 Sector averaging constant                 =     4.0

 Initial value of sigma y                  =      .00
 Initial value of sigma z                  =      .00

 Expanded output for code testing not selected

 Total number of hours of data processed =  43805
 Hours of missing data                     =   1649
 Hours direction in window                 =  14174
 Hours elevated plume w/ dir. in window    =      0
 Hours of calm winds                       =    292
 Hours direction not in window or calm     =  27690

 DISTRIBUTION SUMMARY DATA BY AVERAGING INTERVAL
    AVER. PER.           1           2           4           8          12
24         96         168         360         720
    UPPER LIM.    1.00E-02    1.00E-02    1.00E-02    1.00E-02    1.00E-02    1.00E-
02    1.00E-02    1.00E-02    1.00E-02    1.00E-02
      LOW LIM.    1.00E-06    1.00E-06    1.00E-06    1.00E-06    1.00E-06    1.00E-
06    1.00E-06    1.00E-06    1.00E-06    1.00E-06
   ABOVE RANGE          0.          0.          0.          0.          0.
0.          0.          0.          0.          0.
      IN RANGE      14466.      16361.      19025.      22733.      25665.
31462.      40578.      41413.      41035.      40460.
   BELOW RANGE          0.          0.          0.          0.          0.
0.          0.          0.          0.          0.
          ZERO      27690.      25763.      23043.      19233.      16426.
10587.       1121.         87.          0.          0.
    TOTAL X/Qs      42156.      42124.      42068.      41966.      42091.
42049.      41699.      41500.      41035.      40460.
    % NON ZERO       34.32       38.84       45.22       54.17       60.98
74.82       97.31       99.79      100.00      100.00

 95th PERCENTILE X/Q VALUES
                  3.50E-03    3.42E-03    3.29E-03    3.15E-03    2.67E-03    2.06E-
03    1.29E-03    1.12E-03    9.62E-04    8.76E-04

 95% X/Q for standard averaging intervals

 0 to 2 hours        3.50E-03
 2 to 8 hours        3.04E-03
 8 to 24 hours       1.52E-03
 1 to 4 days         1.03E-03
 4 to 30 days        8.13E-04

                          HOURLY VALUE RANGE
                        MAX X/Q                 MIN X/Q
      CENTERLINE        4.99E-03                5.08E-04
      SECTOR-AVERAGE    3.12E-03                3.18E-04

NORMAL PROGRAM COMPLETION
```

```
Program Title:  ARCON96.

Developed For:  U.S. Nuclear Regulatory Commission
                Office of Nuclear Reactor Regulation
                Division of Reactor Program Management

Date:           June 25, 1997    11:00 a.m.

NRC Contacts:   J. Y. Lee        Phone: (301) 415 1080
                                 e-mail: jyl1@nrc.gov
                J. J. Hayes      Phone: (301) 415 3167
                                 e-mail: jjh@nrc.gov
                L. A  Brown      Phone: (301) 415 1232
                                 e-mail: lab2@nrc.gov

Code Developer: J. V. Ramsdell   Phone: (509) 372 6316
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Code Documentation:  NUREG/CR-6331 Rev. 1

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party would not infringe privately owned rights.

Program Run   3/14/2001  at  18:02:34

 ******* ARCON INPUT **********

    Number of Meteorological Data Files  =  5
    Meteorological Data File Names
      W:\ARCON96\DC6086\F1995.MET
      W:\ARCON96\DC6086\F1996.MET
      W:\ARCON96\DC6086\F1997.MET
      W:\ARCON96\DC6086\F1998.MET
      W:\ARCON96\DC6086\F1999.MET

    Height of lower wind instrument (m)  =     10.0
    Height of upper wind instrument (m)  =     60.0
    Wind speeds entered as miles per hour

    Vent release
    Release height (m)                   =     54.3
    Building Area (m^2)                  =   2300.0
    Effluent vertical velocity (m/s)     =       .00
    Vent or stack flow  (m^3/s)          =       .00
    Vent or stack radius (m)             =       .00

    Direction .. intake to source (deg)  =      301
    Wind direction sector width (deg)    =       90
    Wind direction window (deg)          =   256 - 346
    Distance to intake (m)               =     11.6
    Intake height  (m)                   =     18.6
    Terrain elevation difference (m)     =       .0

    Output file names
```

```
    RBtoSouth2.log
    RBtoSouth2.CFD

  Minimum Wind Speed (m/s)                     =       .5
  Surface roughness length (m)                 =       .20
  Sector averaging constant                    =      4.0

  Initial value of sigma y                     =       .00
  Initial value of sigma z                     =       .00

  Expanded output for code testing not selected

  Total number of hours of data processed =  43805
  Hours of missing data                   =   1649
  Hours direction in window               =  12335
  Hours elevated plume w/ dir. in window  =      0
  Hours of calm winds                     =    442
  Hours direction not in window or calm   =  29379

  DISTRIBUTION SUMMARY DATA BY AVERAGING INTERVAL
 AVER. PER.            1          2          4          8         12
24       96       168        360        720
 UPPER LIM.    1.00E-02   1.00E-02   1.00E-02   1.00E-02   1.00E-02   1.00E-
02   1.00E-02   1.00E-02   1.00E-02   1.00E-02
   LOW LIM.    1.00E-06   1.00E-06   1.00E-06   1.00E-06   1.00E-06   1.00E-
06   1.00E-06   1.00E-06   1.00E-06   1.00E-06
 ABOVE RANGE          0.         0.         0.         0.         0.
0.        0.         0.         0.         0.
   IN RANGE       12777.     14400.     16834.     20374.     23259.
29367.    40404.     41320.     41035.     40460.
 BELOW RANGE          0.         0.         0.         0.         0.
0.        0.         0.         0.         0.
       ZERO       29379.     27724.     25234.     21592.     18832.
12682.     1295.       180.          0.         0.
 TOTAL X/Qs       42156.     42124.     42068.     41966.     42091.
42049.    41699.     41500.     41035.     40460.
 % NON ZERO        30.31      34.18      40.02      48.55      55.26
69.84     96.89      99.57     100.00     100.00

  95th PERCENTILE X/Q VALUES
               4.02E-03   3.88E-03   3.66E-03   3.31E-03   2.70E-03   1.96E-
03   1.17E-03   9.84E-04   8.67E-04   7.51E-04

  95% X/Q for standard averaging intervals

  0 to 2 hours         4.02E-03
  2 to 8 hours         3.07E-03
  8 to 24 hours        1.29E-03
  1 to 4 days          9.08E-04
  4 to 30 days         6.86E-04

                          HOURLY VALUE RANGE
                        MAX X/Q                 MIN X/Q
       CENTERLINE       5.55E-03                1.29E-04
       SECTOR-AVERAGE   3.48E-03                8.09E-05

 NORMAL PROGRAM COMPLETION
```

```
Program Title:  ARCON96.

Developed For:  U.S. Nuclear Regulatory Commission
                Office of Nuclear Reactor Regulation
                Division of Reactor Program Management

Date:           June 25, 1997    11:00 a.m.

NRC Contacts:   J. Y. Lee       Phone: (301) 415 1080
                                e-mail: jyl1@nrc.gov
                J. J. Hayes     Phone: (301) 415 3167
                                e-mail: jjh@nrc.gov
                L. A  Brown     Phone: (301) 415 1232
                                e-mail: lab2@nrc.gov

Code Developer: J. V. Ramsdell  Phone: (509) 372 6316
                                e-mail: j_ramsdell@pnl.gov

Code Documentation:  NUREG/CR-6331 Rev. 1

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the United States Government nor any agency thereof, nor any of their
employees, makes any warranty, expressed or implied, or assumes any legal
liability or responsibilities for any third party's use, or the results of such
use, of any portion of this program or represents that its use by such third
party would not infringe privately owned rights.

Program Run   3/14/2001  at  18:04:20

 ******* ARCON INPUT **********

    Number of Meteorological Data Files  =  5
    Meteorological Data File Names
      W:\ARCON96\DC6086\F1995.MET
      W:\ARCON96\DC6086\F1996.MET
      W:\ARCON96\DC6086\F1997.MET
      W:\ARCON96\DC6086\F1998.MET
      W:\ARCON96\DC6086\F1999.MET

    Height of lower wind instrument (m)  =     10.0
    Height of upper wind instrument (m)  =     60.0
    Wind speeds entered as miles per hour

    Ground-level release
    Release height (m)                   =       .0
    Building Area (m^2)                  =   2300.0
    Effluent vertical velocity (m/s)     =      .00
    Vent or stack flow  (m^3/s)          =      .00
    Vent or stack radius (m)             =      .00

    Direction .. intake to source (deg)  =      301
    Wind direction sector width (deg)    =       90
    Wind direction window (deg)          =   256 - 346
    Distance to intake (m)               =     37.5
    Intake height  (m)                   =       .0
    Terrain elevation difference (m)     =       .0

    Output file names
```

```
    RBtoSouthGrnd.log
    RBtoSouthGrnd.CFD

  Minimum Wind Speed (m/s)                  =       .5
  Surface roughness length (m)              =       .20
  Sector averaging constant                 =      4.0

  Initial value of sigma y                  =       .00
  Initial value of sigma z                  =       .00

  Expanded output for code testing not selected

  Total number of hours of data processed =  43805
  Hours of missing data                     =   1649
  Hours direction in window                 =  12202
  Hours elevated plume w/ dir. in window    =      0
  Hours of calm winds                       =    292
  Hours direction not in window or calm     =  29662

  DISTRIBUTION SUMMARY DATA BY AVERAGING INTERVAL
   AVER. PER.         1          2          4          8          12
24      96        168        360        720
   UPPER LIM.   1.00E-02   1.00E-02   1.00E-02   1.00E-02   1.00E-02   1.00E-
02   1.00E-02   1.00E-02   1.00E-02   1.00E-02
     LOW LIM.   1.00E-06   1.00E-06   1.00E-06   1.00E-06   1.00E-06   1.00E-
06   1.00E-06   1.00E-06   1.00E-06   1.00E-06
  ABOVE RANGE         0.         0.         0.         0.         0.
0.        0.         0.         0.         0.
     IN RANGE     12494.     14228.     16765.     20505.     23562.
29988.    40544.     41372.     41035.     40460.
  BELOW RANGE         0.         0.         0.         0.         0.
0.        0.         0.         0.         0.
         ZERO     29662.     27896.     25303.     21461.     18529.
12061.     1155.       128.         0.         0.
   TOTAL X/Qs     42156.     42124.     42068.     41966.     42091.
42049.    41699.     41500.     41035.     40460.
   % NON ZERO      29.64      33.78      39.85      48.86      55.98
71.32      97.23      99.69     100.00     100.00

  95th PERCENTILE X/Q VALUES
                3.64E-03   3.52E-03   3.37E-03   3.09E-03   2.55E-03   1.91E-
03   1.12E-03   9.47E-04   8.11E-04   7.21E-04

  95% X/Q for standard averaging intervals

  0 to 2 hours        3.64E-03
  2 to 8 hours        2.91E-03
  8 to 24 hours       1.32E-03
  1 to 4 days         8.52E-04
  4 to 30 days        6.60E-04

                            HOURLY VALUE RANGE
                          MAX X/Q                MIN X/Q
      CENTERLINE          5.08E-03              6.40E-04
      SECTOR-AVERAGE      3.18E-03              4.01E-04

 NORMAL PROGRAM COMPLETION
```

```
Program Title:  ARCON96.

Developed For:  U.S. Nuclear Regulatory Commission
                Office of Nuclear Reactor Regulation
                Division of Reactor Program Management

Date:           June 25, 1997    11:00 a.m.

NRC Contacts:   J. Y. Lee       Phone: (301) 415 1080
                                e-mail: jyl1@nrc.gov
                J. J. Hayes     Phone: (301) 415 3167
                                e-mail: jjh@nrc.gov
                L. A  Brown     Phone: (301) 415 1232
                                e-mail: lab2@nrc.gov

Code Developer: J. V. Ramsdell  Phone: (509) 372 6316
                                e-mail: j_ramsdell@pnl.gov

Code Documentation:   NUREG/CR-6331 Rev. 1

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liability or responsibilities for any third party's use, or the results of such
use, of any portion of this program or represents that its use by such third
party would not infringe privately owned rights.

Program Run   4/10/2001  at  13:04:08

 ******* ARCON INPUT **********

    Number of Meteorological Data Files  =  5
    Meteorological Data File Names
      W:\ARCON96\DC6086\F1995.MET
      W:\ARCON96\DC6086\F1996.MET
      W:\ARCON96\DC6086\F1997.MET
      W:\ARCON96\DC6086\F1998.MET
      W:\ARCON96\DC6086\F1999.MET

    Height of lower wind instrument (m)  =     10.0
    Height of upper wind instrument (m)  =     60.0
    Wind speeds entered as miles per hour

    Vent release
    Release height (m)                   =     54.3
    Building Area (m^2)                  =   2300.0
    Effluent vertical velocity (m/s)     =       .00
    Vent or stack flow  (m^3/s)          =       .00
    Vent or stack radius (m)             =       .00

    Direction .. intake to source (deg)  =      214
    Wind direction sector width (deg)    =       90
    Wind direction window (deg)          =   169 - 259
    Distance to intake (m)               =     48.3
    Intake height  (m)                   =     18.4
    Terrain elevation difference (m)     =       .0

    Output file names
```

```
RBtoNorth2.log
RBtoNorth2.CFD

Minimum Wind Speed (m/s)              =      .5
Surface roughness length (m)          =      .20
Sector averaging constant             =     4.0

Initial value of sigma y              =      .00
Initial value of sigma z              =      .00

Expanded output for code testing not selected

Total number of hours of data processed =  43805
Hours of missing data                   =   1649
Hours direction in window               =  13357
Hours elevated plume w/ dir. in window  =      0
Hours of calm winds                     =    442
Hours direction not in window or calm   =  28357

DISTRIBUTION SUMMARY DATA BY AVERAGING INTERVAL
 AVER. PER.           1          2          4          8          12
24          96         168        360        720
 UPPER LIM.   1.00E-02   1.00E-02   1.00E-02   1.00E-02   1.00E-02   1.00E-
02   1.00E-02   1.00E-02   1.00E-02   1.00E-02
   LOW LIM.   1.00E-06   1.00E-06   1.00E-06   1.00E-06   1.00E-06   1.00E-
06   1.00E-06   1.00E-06   1.00E-06   1.00E-06
ABOVE RANGE          0.         0.         0.         0.         0.
0.          0.         0.         0.         0.
   IN RANGE     13799.     15445.     17978.     21650.     24583.
30505.      40467.     41456.     41035.     40460.
BELOW RANGE          0.         0.         0.         0.         0.
0.          0.         0.         0.         0.
       ZERO     28357.     26679.     24090.     20316.     17508.
11544.       1232.        44.         0.         0.
 TOTAL X/Qs     42156.     42124.     42068.     41966.     42091.
42049.      41699.     41500.     41035.     40460.
 % NON ZERO      32.73      36.67      42.74      51.59      58.40
72.55        97.05      99.89     100.00     100.00

95th PERCENTILE X/Q VALUES
              1.59E-03   1.55E-03   1.44E-03   1.32E-03   1.09E-03   8.03E-
04   5.10E-04   4.35E-04   3.65E-04   3.42E-04

95% X/Q for standard averaging intervals

0 to 2 hours       1.59E-03
2 to 8 hours       1.23E-03
8 to 24 hours      5.44E-04
1 to 4 days        4.12E-04
4 to 30 days       3.17E-04

                       HOURLY VALUE RANGE
                     MAX X/Q                 MIN X/Q
     CENTERLINE      2.22E-03                7.99E-05
     SECTOR-AVERAGE  1.39E-03                5.01E-05

NORMAL PROGRAM COMPLETION
```

```
Program Title:  ARCON96.

Developed For:  U.S. Nuclear Regulatory Commission
                Office of Nuclear Reactor Regulation
                Division of Reactor Program Management

Date:           June 25, 1997    11:00 a.m.

NRC Contacts:   J. Y. Lee       Phone: (301) 415 1080
                                e-mail: jyl1@nrc.gov
                J. J. Hayes     Phone: (301) 415 3167
                                e-mail: jjh@nrc.gov
                L. A  Brown     Phone: (301) 415 1232
                                e-mail: lab2@nrc.gov

Code Developer: J. V. Ramsdell  Phone: (509) 372 6316
                                e-mail: j_ramsdell@pnl.gov

Code Documentation:  NUREG/CR-6331 Rev. 1

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the United States Government nor any agency thereof, nor any of their
employees, makes any warranty, expressed or implied, or assumes any legal
liability or responsibilities for any third party's use, or the results of such
use, of any portion of this program or represents that its use by such third
party would not infringe privately owned rights.

Program Run   3/14/2001  at  17:59:01

 ******* ARCON INPUT **********

    Number of Meteorological Data Files  =  5
    Meteorological Data File Names
      W:\ARCON96\DC6086\F1995.MET
      W:\ARCON96\DC6086\F1996.MET
      W:\ARCON96\DC6086\F1997.MET
      W:\ARCON96\DC6086\F1998.MET
      W:\ARCON96\DC6086\F1999.MET

    Height of lower wind instrument (m)  =     10.0
    Height of upper wind instrument (m)  =     60.0
    Wind speeds entered as miles per hour

    Ground-level release
    Release height (m)                   =       .0
    Building Area (m^2)                  =   2300.0
    Effluent vertical velocity (m/s)     =       .00
    Vent or stack flow  (m^3/s)          =       .00
    Vent or stack radius (m)             =       .00

    Direction .. intake to source (deg)  =      214
    Wind direction sector width (deg)    =       90
    Wind direction window (deg)          =   169 - 259
    Distance to intake (m)               =     60.1
    Intake height  (m)                   =       .0
    Terrain elevation difference (m)     =       .0

    Output file names
```

```
  RBtoNorthGrnd.log
  RBtoNorthGrnd.CFD

Minimum Wind Speed (m/s)            =      .5
Surface roughness length (m)        =      .20
Sector averaging constant           =     4.0

Initial value of sigma y            =      .00
Initial value of sigma z            =      .00

Expanded output for code testing not selected

Total number of hours of data processed =  43805
Hours of missing data                   =   1649
Hours direction in window               =  13687
Hours elevated plume w/ dir. in window  =      0
Hours of calm winds                     =    292
Hours direction not in window or calm   =  28177

DISTRIBUTION SUMMARY DATA BY AVERAGING INTERVAL
   AVER. PER.           1          2          4          8         12
24       96       168       360       720
   UPPER LIM.    1.00E-02   1.00E-02   1.00E-02   1.00E-02   1.00E-02   1.00E-
02   1.00E-02   1.00E-02   1.00E-02   1.00E-02
     LOW LIM.    1.00E-06   1.00E-06   1.00E-06   1.00E-06   1.00E-06   1.00E-
06   1.00E-06   1.00E-06   1.00E-06   1.00E-06
  ABOVE RANGE          0.         0.         0.         0.         0.
0.         0.        0.        0.        0.
     IN RANGE      13979.     15772.     18405.     22097.     25027.
30924.     40482.    41431.    41035.    40460.
  BELOW RANGE          0.         0.         0.         0.         0.
0.         0.        0.        0.        0.
         ZERO      28177.     26352.     23663.     19869.     17064.
11125.      1217.       69.        0.        0.
   TOTAL X/Qs      42156.     42124.     42068.     41966.     42091.
42049.     41699.    41500.    41035.    40460.
   % NON ZERO       33.16      37.44      43.75      52.65      59.46
73.54       97.08     99.83    100.00    100.00

95th PERCENTILE X/Q VALUES
                 1.60E-03   1.58E-03   1.55E-03   1.50E-03   1.26E-03   9.72E-
04   6.17E-04   5.31E-04   4.54E-04   4.14E-04

95% X/Q for standard averaging intervals

0 to 2 hours        1.60E-03
2 to 8 hours        1.46E-03
8 to 24 hours       7.10E-04
1 to 4 days         4.98E-04
4 to 30 days        3.83E-04

                         HOURLY VALUE RANGE
                       MAX X/Q                MIN X/Q
     CENTERLINE        2.22E-03               2.33E-04
     SECTOR-AVERAGE    1.39E-03               1.46E-04

NORMAL PROGRAM COMPLETION
```

```
Program Title:  ARCON96.

Developed For:  U.S. Nuclear Regulatory Commission
                Office of Nuclear Reactor Regulation
                Division of Reactor Program Management

Date:           June 25, 1997    11:00 a.m.

NRC Contacts:   J. Y. Lee       Phone: (301) 415 1080
                                e-mail: jyl1@nrc.gov
                J. J. Hayes     Phone: (301) 415 3167
                                e-mail: jjh@nrc.gov
                L. A  Brown     Phone: (301) 415 1232
                                e-mail: lab2@nrc.gov

Code Developer: J. V. Ramsdell  Phone: (509) 372 6316
                                e-mail: j_ramsdell@pnl.gov

Code Documentation:  NUREG/CR-6331 Rev. 1

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liability or responsibilities for any third party's use, or the results of such
use, of any portion of this program or represents that its use by such third
party would not infringe privately owned rights.

Program Run   3/14/2001  at  17:56:03

 ******* ARCON INPUT **********

    Number of Meteorological Data Files  =  5
    Meteorological Data File Names
      W:\ARCON96\DC6086\F1995.MET
      W:\ARCON96\DC6086\F1996.MET
      W:\ARCON96\DC6086\F1997.MET
      W:\ARCON96\DC6086\F1998.MET
      W:\ARCON96\DC6086\F1999.MET

    Height of lower wind instrument (m)  =     10.0
    Height of upper wind instrument (m)  =     60.0
    Wind speeds entered as miles per hour

    Ground-level release
    Release height (m)                   =        .0
    Building Area (m^2)                  =   2300.0
    Effluent vertical velocity (m/s)     =       .00
    Vent or stack flow  (m^3/s)          =       .00
    Vent or stack radius (m)             =       .00

    Direction .. intake to source (deg)  =      262
    Wind direction sector width (deg)    =       90
    Wind direction window (deg)          =   217 - 307
    Distance to intake (m)               =     47.8
    Intake height  (m)                   =        .0
    Terrain elevation difference (m)     =        .0

    Output file names
```

```
  TEtoSouthGrnd.log
  TEtoSouthGrnd.CFD

Minimum Wind Speed (m/s)              =       .5
Surface roughness length (m)          =       .20
Sector averaging constant             =      4.0

Initial value of sigma y              =       .00
Initial value of sigma z              =       .00

Expanded output for code testing not selected

Total number of hours of data processed =  43805
Hours of missing data                   =   1649
Hours direction in window               =  14082
Hours elevated plume w/ dir. in window  =      0
Hours of calm winds                     =    292
Hours direction not in window or calm   =  27782

DISTRIBUTION SUMMARY DATA BY AVERAGING INTERVAL
 AVER. PER.          1           2           4           8          12
24         96         168         360         720
 UPPER LIM.    1.00E-02    1.00E-02    1.00E-02    1.00E-02    1.00E-02    1.00E-
02   1.00E-02    1.00E-02    1.00E-02    1.00E-02
   LOW LIM.    1.00E-06    1.00E-06    1.00E-06    1.00E-06    1.00E-06    1.00E-
06   1.00E-06    1.00E-06    1.00E-06    1.00E-06
ABOVE RANGE           0.          0.          0.          0.          0.
0.         0.          0.          0.          0.
   IN RANGE       14374.      16173.      18720.      22395.      25337.
31299.     40494.      41221.      41035.      40460.
BELOW RANGE           0.          0.          0.          0.          0.
0.         0.          0.          0.          0.
       ZERO       27782.      25951.      23348.      19571.      16754.
10750.      1205.        279.          0.          0.
 TOTAL X/Qs       42156.      42124.      42068.      41966.      42091.
42049.     41699.      41500.      41035.      40460.
 % NON ZERO        34.10       38.39       44.50       53.36       60.20
74.43      97.11       99.33      100.00      100.00

 95th PERCENTILE X/Q VALUES
               2.36E-03    2.30E-03    2.22E-03    2.11E-03    1.77E-03    1.36E-
03   8.55E-04    7.31E-04    6.28E-04    5.76E-04

 95% X/Q for standard averaging intervals

 0 to 2 hours        2.36E-03
 2 to 8 hours        2.03E-03
 8 to 24 hours       9.90E-04
 1 to 4 days         6.85E-04
 4 to 30 days        5.33E-04

                          HOURLY VALUE RANGE
                        MAX X/Q              MIN X/Q
      CENTERLINE       3.17E-03             4.10E-04
      SECTOR-AVERAGE   1.99E-03             2.57E-04

NORMAL PROGRAM COMPLETION
```

```
Program Title:  ARCON96.

Developed For:  U.S. Nuclear Regulatory Commission
                Office of Nuclear Reactor Regulation
                Division of Reactor Program Management

Date:           June 25, 1997    11:00 a.m.

NRC Contacts:   J. Y. Lee       Phone: (301) 415 1080
                                e-mail: jyl1@nrc.gov
                J. J. Hayes     Phone: (301) 415 3167
                                e-mail: jjh@nrc.gov
                L. A  Brown     Phone: (301) 415 1232
                                e-mail: lab2@nrc.gov

Code Developer: J. V. Ramsdell  Phone: (509) 372 6316
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Code Documentation:  NUREG/CR-6331 Rev. 1

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use, of any portion of this program or represents that its use by such third
party would not infringe privately owned rights.

Program Run   3/14/2001   at   17:52:01

 ******* ARCON INPUT **********

    Number of Meteorological Data Files  =  5
    Meteorological Data File Names
      W:\ARCON96\DC6086\F1995.MET
      W:\ARCON96\DC6086\F1996.MET
      W:\ARCON96\DC6086\F1997.MET
      W:\ARCON96\DC6086\F1998.MET
      W:\ARCON96\DC6086\F1999.MET

    Height of lower wind instrument (m)  =     10.0
    Height of upper wind instrument (m)  =     60.0
    Wind speeds entered as miles per hour

    Ground-level release
    Release height (m)                   =       .0
    Building Area (m^2)                  =   2300.0
    Effluent vertical velocity (m/s)     =      .00
    Vent or stack flow  (m^3/s)          =      .00
    Vent or stack radius (m)             =      .00

    Direction .. intake to source (deg)  =      261
    Wind direction sector width (deg)    =       90
    Wind direction window (deg)          =   216 - 306
    Distance to intake (m)               =     34.7
    Intake height  (m)                   =       .0
    Terrain elevation difference (m)     =       .0

    Output file names
```

```
  DWEEBtoSouthGrnd.log
  DWEEBtoSouthGrnd.CFD

Minimum Wind Speed (m/s)                 =      .5
Surface roughness length (m)             =     .20
Sector averaging constant                =     4.0

Initial value of sigma y                 =     .00
Initial value of sigma z                 =     .00

Expanded output for code testing not selected

Total number of hours of data processed =  43805
Hours of missing data                   =   1649
Hours direction in window               =  14160
Hours elevated plume w/ dir. in window  =      0
Hours of calm winds                     =    292
Hours direction not in window or calm   =  27704

DISTRIBUTION SUMMARY DATA BY AVERAGING INTERVAL
 AVER. PER.          1          2          4          8         12
24          96        168        360        720
 UPPER LIM.   1.00E-02   1.00E-02   1.00E-02   1.00E-02   1.00E-02   1.00E-
02   1.00E-02   1.00E-02   1.00E-02   1.00E-02
   LOW LIM.   1.00E-06   1.00E-06   1.00E-06   1.00E-06   1.00E-06   1.00E-
06   1.00E-06   1.00E-06   1.00E-06   1.00E-06
 ABOVE RANGE        0.         0.         0.         0.         0.
0.          0.         0.         0.         0.
   IN RANGE     14452.     16224.     18750.     22410.     25344.
31318.      40493.     41227.     41035.     40460.
 BELOW RANGE        0.         0.         0.         0.         0.
0.          0.         0.         0.         0.
       ZERO     27704.     25900.     23318.     19556.     16747.
10731.       1206.       273.         0.         0.
 TOTAL X/Qs     42156.     42124.     42068.     41966.     42091.
42049.      41699.     41500.     41035.     40460.
 % NON ZERO      34.28      38.51      44.57      53.40      60.21
74.48        97.11      99.34     100.00     100.00

95th PERCENTILE X/Q VALUES
              4.23E-03   4.19E-03   4.09E-03   3.90E-03   3.27E-03   2.52E-
03   1.58E-03   1.35E-03   1.17E-03   1.07E-03

95% X/Q for standard averaging intervals

0 to 2 hours        4.23E-03
2 to 8 hours        3.79E-03
8 to 24 hours       1.83E-03
1 to 4 days         1.26E-03
4 to 30 days        9.92E-04

                         HOURLY VALUE RANGE
                       MAX X/Q                 MIN X/Q
     CENTERLINE        5.88E-03                7.45E-04
     SECTOR-AVERAGE    3.68E-03                4.67E-04

NORMAL PROGRAM COMPLETION
```

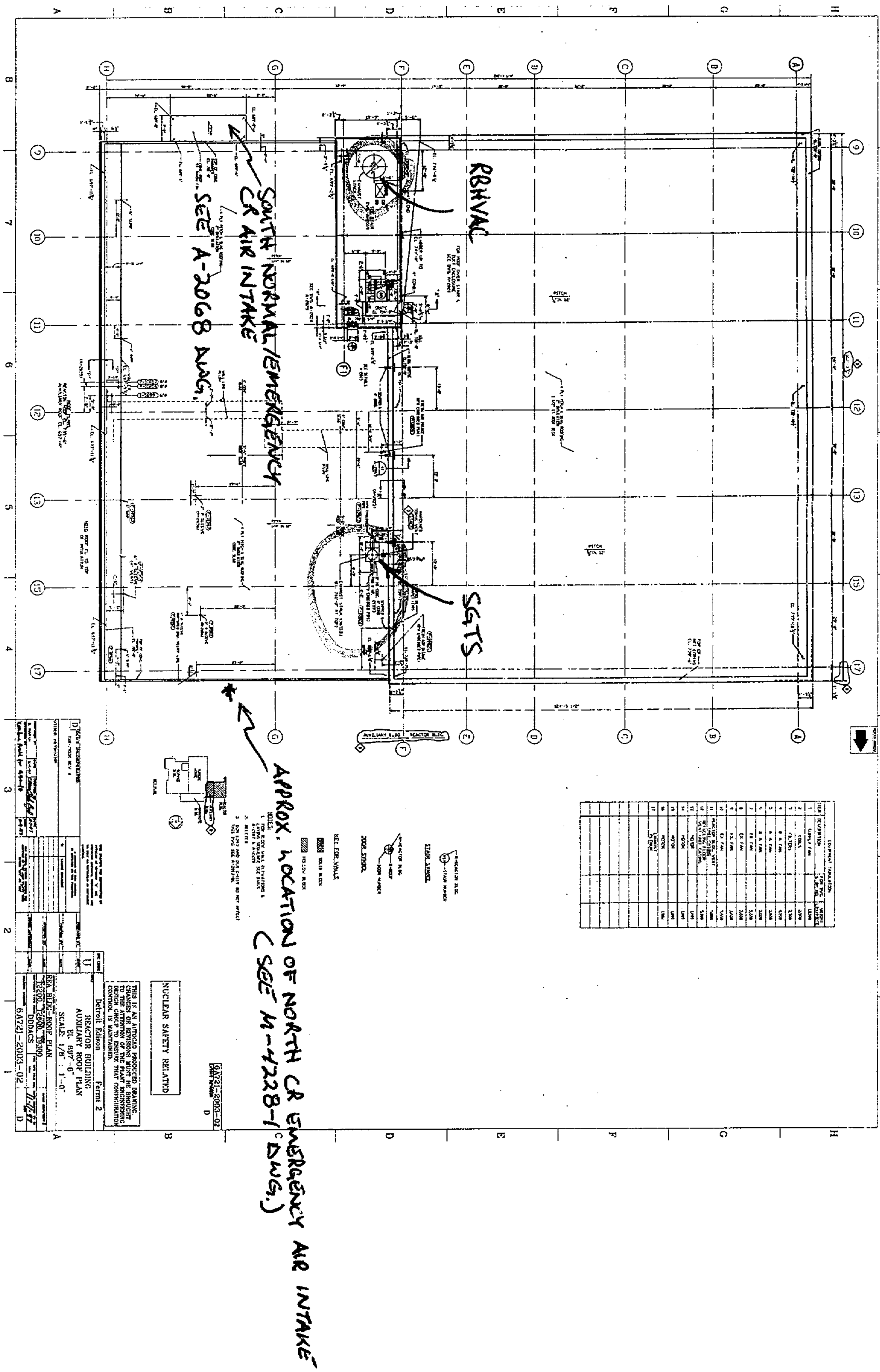
ENCLOSURE 5 TO
NRC-01-0036

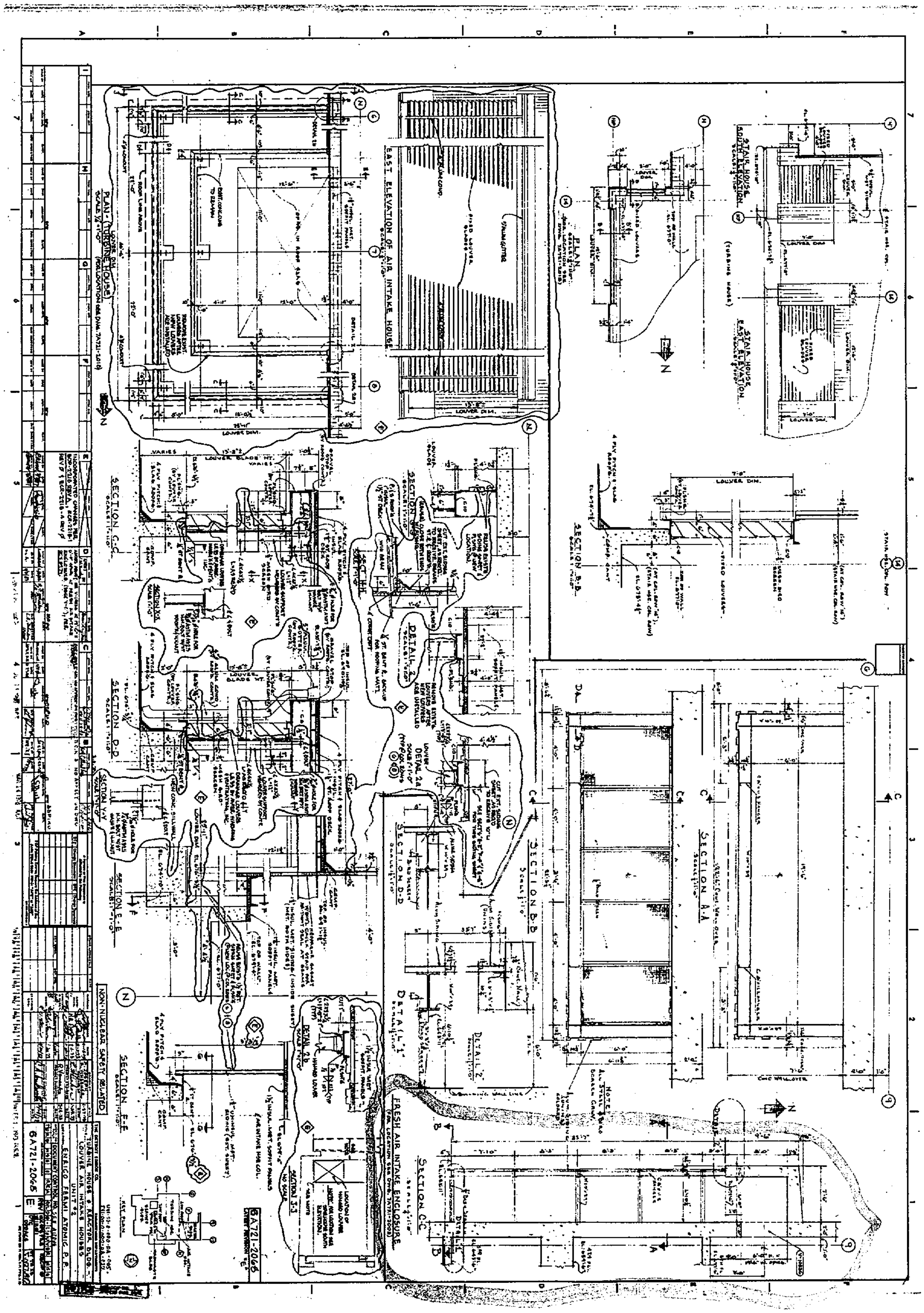
FERMI 2 NRC DOCKET NO. 50-341
OPERATING LISENCE NO. NPF-43

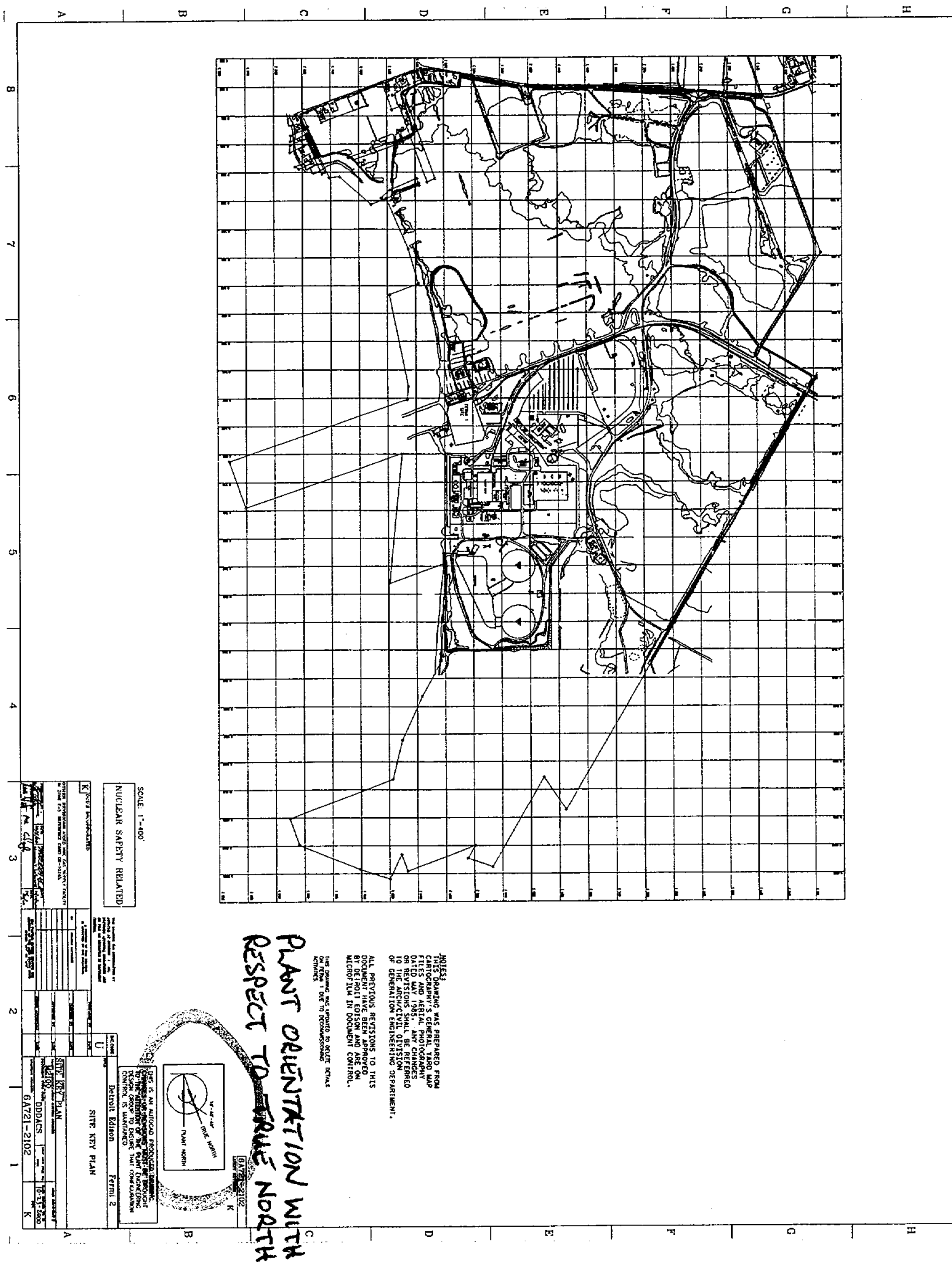
Selected Plant Drawings:

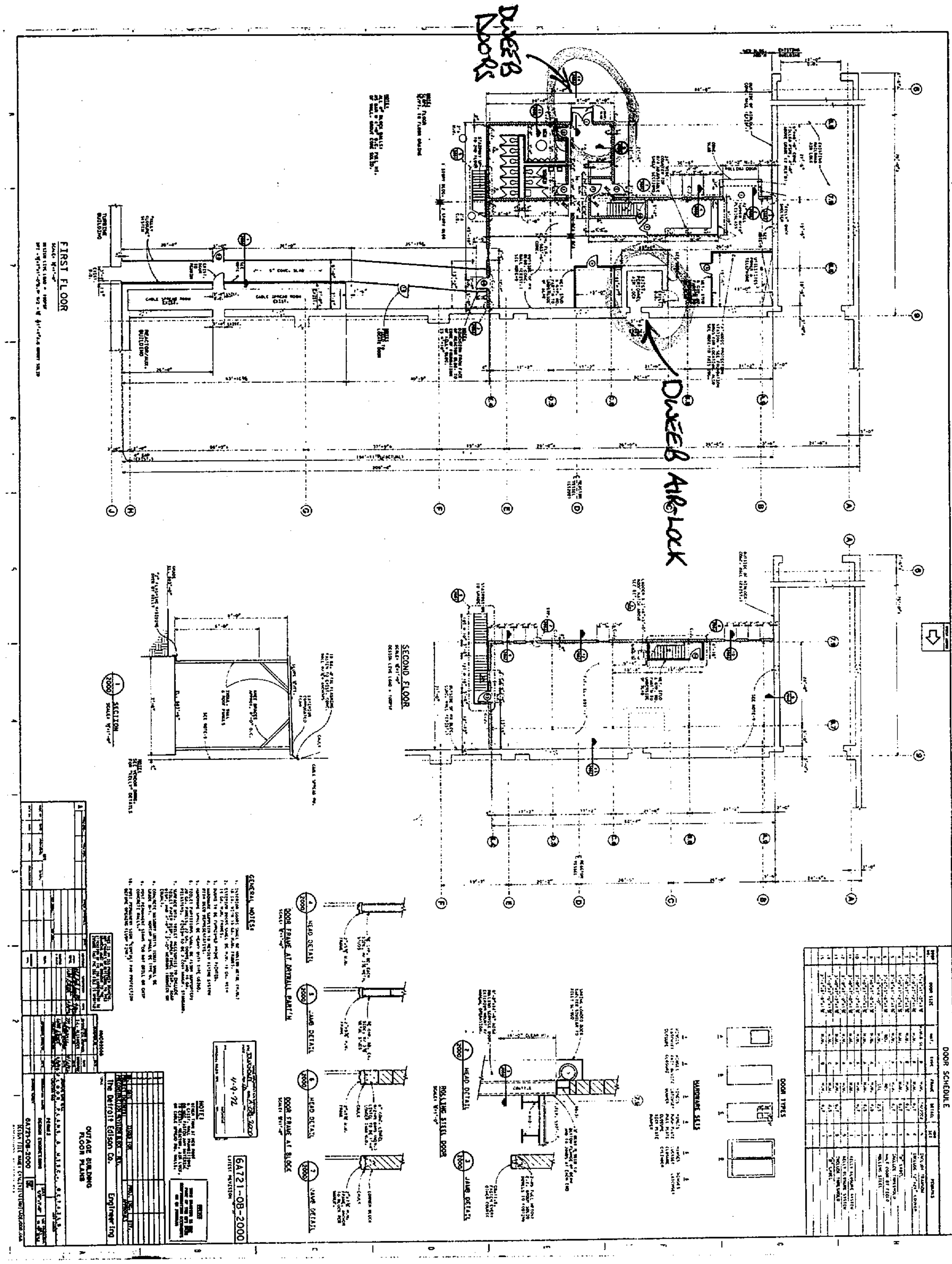
A-2003-02 (UFSAR Figure 9.1-3, sheet 2 of 3)
A-2068
A-2102 (UFSAR Figure 1.2-5)
A-OB-2000
M-2257
M-4228-1

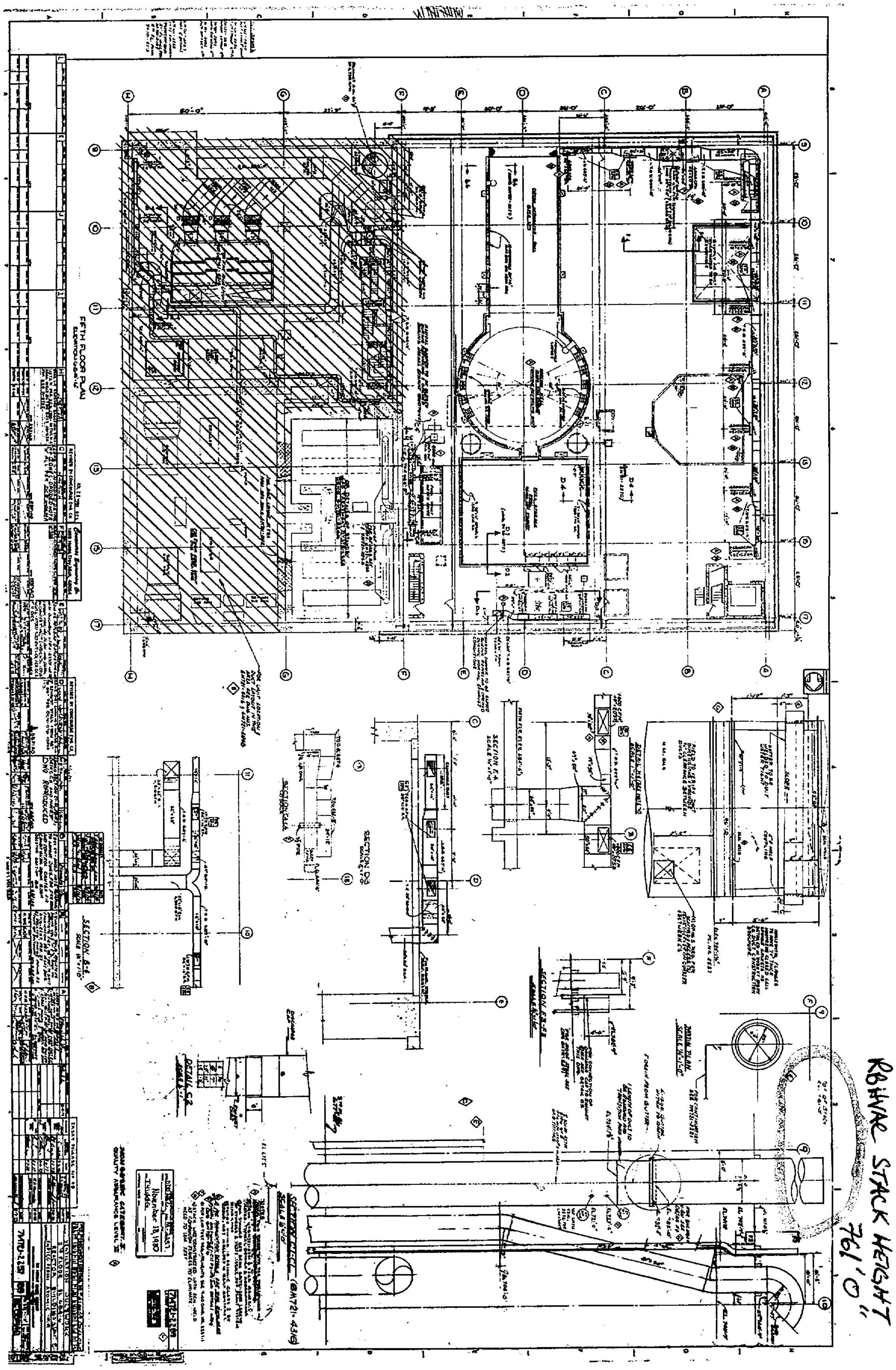
Drawing Number	Revision	Title
A-2003-02	D	Reactor Building Auxiliary Roof Plan Elevation 697'-6"
A-2068	E	Louver Air Intake Houses, Reactor Building
A-2102	K	Site Key Plan
A-OB-2000	0	Outage Building Floor Plans
M-2257	H	Vent and Duct Layout, 5^{th} Floor Reactor Building 684'-6"
M-4228-1	A	Isometric, Emergency Outside Air Intake to Makeup Filter

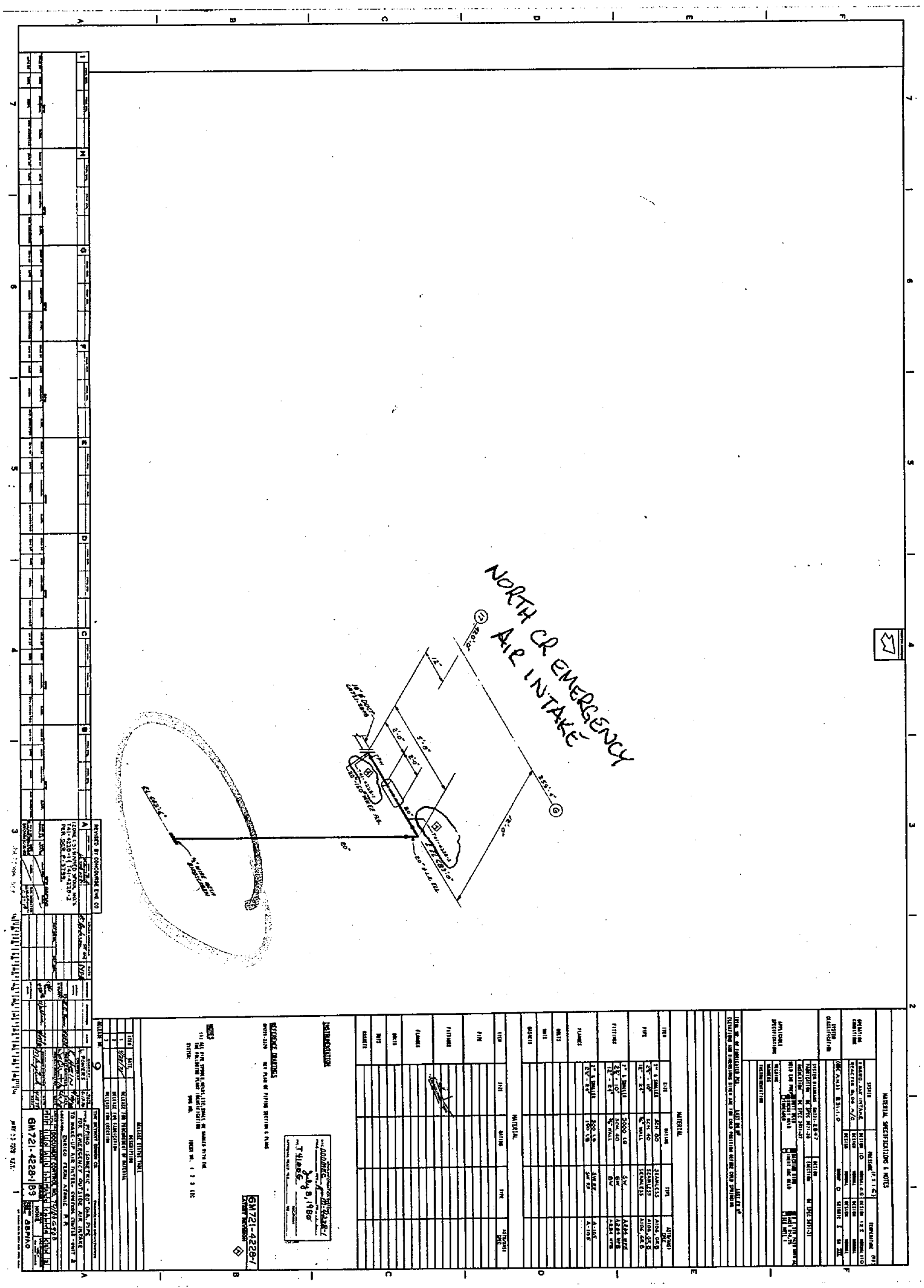

RBHVAC
SOUTH NORMAL/EMERGENCY CR AIR INTAKE SEE A-2068 DWG.
SGTS
APPROX. LOCATION OF NORTH CR EMERGENCY AIR INTAKE (SEE M-4228-1 DWG.)
NUCLEAR SAFETY RELATED
Detroit Edison Fermi 2
REACTOR BUILDING AUXILIARY ROOF PLAN
6A721-2003-02




PLANT ORIENTATION WITH RESPECT TO TRUE NORTH
NUCLEAR SAFETY RELATED
SITE KEY PLAN
Detroit Edison
Fermi 2
6A721-2102


FIRST FLOOR
SECOND FLOOR
DOOR SCHEDULE
The Detroit Edison Co.
OUTAGE BUILDING FLOOR PLANS
6A721-08-2000


RBHVAC STACK HEIGHT 761'0"
FIFTH FLOOR PLAN


NORTH CR EMERGENCY
AIR INTAKE
6M721-4228-1

William T. O'Connor, Jr.
Vice President, Nuclear Generation

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Detroit Edison

A DTE Energy Company

10CFR50.67

May 2, 2001
NRC-01-0036

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington D C 20555-0001

References: 1) Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

2) Detroit Edison Letter to NRC, "Proposed License Amendment for a Limited Scope Application of the Alternative Source Term Guidelines in NUREG-1465 Related to the Re-evaluation of the Fuel Handling Accident Dose Consequences," NRC-00-0073, dated December 29, 2000

Subject: Response to NRC Request for Additional Information Regarding the Application of the Alternative Source Term Guidelines to the <u>Re-analysis of the Fuel Handling Accident Dose Consequences</u>

In Reference 2, Detroit Edison requested NRC approval of a proposed license amendment to modify the Technical Specification requirements for handling irradiated fuel and performing Core Alterations. The NRC staff requested additional information to help complete their review of the proposed amendment. Several telephone conversations between Detroit Edison personnel and the NRC staff clarified the requested additional information and discussed Detroit Edison's planned response. As a result, Detroit Edison has revised the re-analysis of the Fuel Handling Accident to address the NRC request. Details of the re-analysis and summaries of the results are provided in the responses to NRC questions in Enclosure 1. The information in Enclosure 1 supersedes information provided in Reference 2.

Enclosure 2 provides a revised analysis, using the standards of 10 CFR 50.92, indicating that no significant hazards consideration is involved. Enclosure 3 provides revised marked up pages of the existing Technical Specification (TS) Bases to show the proposed changes and a typed version of the affected TS Bases pages with the proposed changes incorporated. There are no changes to the marked up and retyped TS pages submitted in Reference 2. Enclosure 4 provides copies of the requested ARCON96 computer program output printouts and Enclosure 5 provides copies of plant drawings to help in the NRC review.

Should you have any questions or require additional information, please contact Mr. Norman K. Peterson of my staff at (734) 586-4258.

Sincerely,

William J. O'Connor Jr

Enclosures

cc: M. A. Ring
M. A. Shuaibi
NRC Resident Office
Regional Administrator, Region III
Supervisor, Electric Operators,
Michigan Public Service Commission

I, William T. O'Connor, Jr., do hereby affirm that the foregoing statements are based on facts and circumstances which are true and accurate to the best of my knowledge and belief.

William T. O'Connor Jr.
William T. O'Connor, Jr.
Vice President, Nuclear Generation

On this 2nd day of May, 2001 before me personally appeared William T. O'Connor, Jr., being first duly sworn and says that he executed the foregoing as his free act and deed.

Karen M Reed
Notary Public

KAREN M. REED
Notary Public, Monroe County, MI
My Commission Expires 09/02/2005

bcc: G. D. Cerullo
P. Fessler
R. W. Libra
W. T. O'Connor, Jr.
N. K. Peterson
S. Stasek

Electronic Licensing Library (ELL) (200 TAC)
Information Management (140 NOC)
Dave Minnaar, Nuclear Facilities Unit (MDEQ)
NSRG Secretary/ISEG Coordinator (220 TAC)
NRR Chron File
A. I. Hassoun
G. Wojtowicz