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DAEC Plant Support Center
Operated by Nuclear Management Company, LLC

March 23, 2001
NG-01-0382

Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station 0-P1-17
Washington, DC 20555-0001

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License No: DPR-49
Response to Request for Additional Information (RAI) to Technical Specification Change Request TSCR-037 – Alternative Source Term. (TAC # MB0347)

References:
1) NG-00-1504, "Technical Specification Change Request (TSCR-037): 'Alternative Source Term'," dated October 19, 2000.
2) NG-00-1900, "Technical Specification Change Request (TSCR-042): 'Extended Power Uprate'," dated November 16, 2000.

File: A-117, A-225

Dear Sir(s):

On March 20, 2001, a conference call was held with the NRC Staff regarding our Reference 1 amendment request to adopt the Alternate Source Term (AST) as defined in NUREG-1465. In order to complete their review, the Staff has requested additional information to our application. Attachment 1 to this letter contains that additional information.

In addition, we discussed the proposal to segregate a portion of this application regarding the Fuel Handling Accident and its attendant changes to the DAEC Technical Specifications (TS) in the Reference 1 amendment request regarding the movement of irradiated fuel assemblies in the secondary containment. The purpose for this segregation is an earlier review and approval of this portion of the application to support our upcoming refueling outage, as requested in the original submittal. Consequently, we request that a "selective scope" review be conducted on the portion of our Reference 1 amendment request relating to the Fuel Handling Accident. To aid the Staff in this request, Attachment 2 to this letter contains those TS pages germane to this selective scope review. Attachment 3 is a separate evaluation of Environmental Considerations specific to this portion of the original submittal. The Evaluation of Significant Hazards Considerations pursuant to §50.92, submitted with the original application, addressed these specific changes and therefore, need not be revised.

Although our application was not originally based upon the NRC-approved generic TS change, TSTF-51, Rev. 2, in particular, regarding the usage of the term "recently irradiated fuel assemblies," we will adopt the associated commitment in TSTF-51 to

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follow the NUMARC 93-01, Rev 3, Section 11 guidelines on restoration capability of secondary containment.

In addition, in our response to Question 3.b in Attachment 1 we agreed to revise our existing calculation using the Brockmann-Bixler pipe deposition model to remove the vertical piping segments.

Therefore, we hereby make the following formal commitments in this letter:

1. As part of implementation of this license amendment, Nuclear Management Company will revise the guidelines for the assessment of systems removed from service during handling of irradiated fuel assemblies or Core Alterations at the DAEC to implement the provisions of Section 11.3.6.5 of NUMARC 93-01, Rev. 3.

2. The design calculations using the Brockman-Bixler pipe deposition model will be updated to only credit horizontal runs of piping in the next revision of these calculations used to support a DAEC licensing action.

It is our understanding that the Staff will continue its review of the remainder of our original application in a timely manner to support our license amendment request for the Extended Power Uprate (Ref. 2).

Please contact this office should you require additional information regarding this matter.

This letter is true and accurate to the best of my knowledge and belief.

NUCLEAR MANAGEMENT COMPANY, LLC

By Gary Van Middlesworth
Gary Van Middlesworth
DAEC Site General Manager

State of Iowa
(County) of Linn

Signed and sworn to before me on this 23rd day of March, 2001,

by Gary Van Middlesworth

NANCY S. FRANCK
MY COMMISSION EXPIRES
9-28-01

Nancy S. Franck
Notary Public in and for the State of Iowa

9-28-01
Commission Expires

Attachments:
1) Response to Request for Additional Information
2) Proposed Changes To The Duane Arnold Energy Center Technical Specifications For The Alternate Source Term - Fuel Handling Accident
3) Environmental Consideration

Enclosures:
1) Computer Floppy Disk of DAEC Meterological Data
2) Annotated Drawing of DAEC Site Plan
3) Pen & Ink Markups of DAEC Technical Specification & BASES Changes

cc:
T. Browning (w/o Enclosures 1 & 2)
M. Wadley (w/o Enclosures 1 – 3)
M. Shuaibi (NRC-NRR) (w/all)
J. Dyer (Region III) (w/o Enclosure 1)
D. McGhee (State of Iowa) (w/o Enclosure 1)
NRC Resident Office (w/o Enclosure 1)
Docu (w/o Enclosure 1)

Response to Request for Additional Information

The following information is provided in response to an informal list of questions forwarded to DAEC on 3/16/01.

1. In your submittal you have revised the CHI/Q values and the methodology used to determine these values. The related discussion on Pages 2-4 and 2-6 of Attachment 4 to your submittal does not provide sufficient information for the staff to evaluate the appropriateness of the values obtained. For example, you state that the new values are more conservative than those in the current licensing basis. However, the FSAR does not appear to tabulate the accident CHI/Q values to allow the staff to confirm this comparison.

   DAEC Response: The historical CHI/Q data did not meet our current expectations for level of documentation and design bases, and was not sufficient for analysis of new transport pathways in the AST methodology. Therefore, we have performed the reanalysis described in the submittal. Calculations used to derive the original values of CHI/Q's are not available. Original licensing CHI/Q data was obtained from the On Site Meteorological Data supplement of the Final Safety Analysis Report Change 3 dated December 15, 1972. The supplement data was based on observations from the meteorological tower at the site during the period from January 8, 1971 to January 7, 1972. The CHI/Q's for the DAEC were compared to those calculated at the time using AEC Safety Guide 3 methods. In radiological analysis performed to support a DAEC power uprate in 1984 another set of CHI/Q's was developed for the DAEC. These CHI/Q's were also submitted to the staff in association with review of an amendment request to increase allowable MSIV leakage and eliminate the Leakage Control System in 1995. The following table summarizes LPZ CHI/Q results over time as compared to the new values calculated to support the amendment request. This table supports our statement that the values of CHI/Q are more conservative than those used in previous licensing submittals.

Time Period (hrs)	AEC Safety Guide 3 (1971)	DAEC (1971)	DAEC (1984-1995)	DAEC (1997-1999)
0-2	N/A	N/A	5.6E-5	1.34E-4
0-8	4.9E-6	2.4E-6	5.6E-5	6.43E-5
8-24	1.2E-6	6.5E-7	1.82E-5	4.46E-5
24-96	4.4E-7	4.8E-7	6.61E-6	2.01E-5
96-720	1.3E-7	1.4E-7	1.46E-6	6.43E-6

1. (Continued) Table 3 appears to be in error. First, the 1-4 day and 4-30 day values contain typographical errors.

DAEC Response: Agree, see response to question 1.f.

1. (Continued) Second, references in Tables 2-6 and 2-8 suggest that this table ought to include EAB and LPZ values. Please provide the following information:

DAEC Response: Tables for ground release and elevated release CHI/Q's to the LPZ and EAB were calculated using PAVAN and are provided in Table #1 and Table #2 in Attachment 4 of the original submittal. The title of Table #1 in the submittal may have created the confusion that it was only used for releases from the reactor building. In fact, these tables of CHI/Q values were used for all calculations at the EAB and TSC boundaries. The following tables are revised for clarification.

Table No. 1 – Offsite Ground Level CHI/Q's (PAVAN-PC)

Offsite Ground Level Release CHI/Q's (sec/m^3)		
	EAB (629m ENE)	LPZ (3218 m NE)
0 - 2 hours	5.57-4	1.34-4
0 - 8 hours	3.42-4	6.43-5
8 - 24 hours	2.69-4	4.46-5
1 - 4 days	1.59-4	2.01-5
4 - 30 days	7.43-5	6.43-6

Table No. 2 Offsite Elevated Release CHI/Q's from the Off Gas Stack (sec/m^3)

Offsite Elevated Release CHI/Q's (sec/m^3)		
	EAB (936m NW)	LPZ (3218 m NW)
Fumigation	7.03-5	3.15-5
0 - 2 hours	6.95-6	6.69-6
0 - 8 hours	3.61-6	3.58-6
8 - 24 hours	2.61-6	2.61-6
1 - 4 days	1.28-6	1.32-6
4 - 30 days	4.64-7	4.99-7

a. A confirmation that the meteorological data used in generating the CHI/Q values were collected and processed in accordance with the site's meteorological measurements program, as described in the FSAR, ODCM, and/or T/S, which has been shown to meet the guidance of Safety Guide 23 or approved alternatives thereto. The program should be covered by a QA program meeting Part 50 Appendix B, and the data recoverability guidance of Safety Guide 1.23 is achieved.

DAEC Response: The meteorological data used in the DAEC AST submittal dated October 19, 2000 covers times from January 1, 1997 to December 31, 1999. Site and control room CHI/Q's were developed from this data using the codes PAVAN and ARCON96. The hourly meteorological data applied in those calculations was taken from the DAEC meteorological program, which meets the guidelines in Revision 1 to Regulatory Guide 1.23 as described in the Updated Safety Analysis Report for the DAEC Section 1.8.23. The on-site meteorological program, described in DAEC UFSAR Section 2.3.3, is covered by the DAEC Appendix B QA program. Actual data values were extracted using the MIDAS program. As a check of the data, a comparison was performed using raw data from the Plant Process Computer to check consistency with the MIDAS output. The overall quality of this meteorological data has been confirmed via inspection and year-to-year comparisons to ensure that any identified changes are within the expected annual variation. This inspection revealed that greater than 90% data recovery was obtained in each year. For the three years, recovery of wind speed and direction was 96.3% for both upper and lower level instrumentation. Data recovery for stability category was 93.6% over the period. For the PAVAN input data, no single statistical bin of wind speed, stability category, and wind direction contained greater than 2.6% of the total hours of occurrence.

b. A tabulation of the site-specific inputs to the PAVAN and ARCON96 codes that characterize the release points and the receptors (e.g., distances, directions, release point and receptor heights, flow rates, terrain heights, stack radii, mode (gnd, elevated, diffuse). Some but not all of this information is provided in the column headers in Tables 4 to 6. If the diffuse source option was used, provide the initial values of sigma-Y and sigma-Z input to ARCON96. As an alternative, provide copies of the PAVAN and ARCON96 input dump printouts providing these data.

DAEC Response: PAVAN and ARCON96 input dumps are attached. Based on our understanding that the staff had not endorsed this option, the diffuse source option was not used. While investigating potential sources of margin in the calculations, a comparison of the point source option to a diffuse source option for the MSLB turbine building to control room pathway following the guidance in draft NEI-99-03 "Control Room Habitability" was performed. The diffuse source option yielded lower CHI/Q's than those used in our point source model.

DAEC used a slant range over the reactor building for evaluation of the MSLB path from the TB to the CR and TSC based on a point release from the TB Vent of 82 meters. Similarly the FHA was analyzed assuming a single release pathway to the CR and TSC based on a point release at the location of the RB Vent. The releases were modeled as ground releases from these locations, not as vent releases. These assumptions are considered reasonable as they would account for a failure to isolate ventilation on high radiation which would result in the fastest release to the environment. Yet by assuming a ground release the analysis does not credit any holdup, or vertical velocity during the release which would reduce the doses to the CR and TSC.

c. Annotate a site arrangement drawing to show the assumed release points and the intakes for the control room and TSC.

DAEC Response: An annotated site arrangement drawing is attached.

d. On floppy disks, the hourly meteorological observation data (e.g., ARCON96 format for ARCON96, JFD for PAVAN) used in these assessments.

DAEC Response: The enclosed floppy disk contains hourly meteorological data for the period from January 1, 1997 to December 31, 1999 in ARCON96 format. The data contains wind speeds in miles per hour and missing data has been indicated by filling the field with 9's. The data has also been divided into three files containing one year of data in each file. A Microsoft word file is also provided with the Joint Frequency Distribution tables for the same period in RG 1.121 format. The input files for PAVAN provided in response to question 1.b. may also be used as they already contain this data in the PAVAN input format.

e. Cross index the meteorological data citations in Tables 2-3 through 2-8 to the specific CHI/Q Tables 1 through 6.

DAEC Response:

Pathways (Applicable DBAs)	**χ/Q Table**
Ground Release to LPZ (All)	Table No. 1
Ground Release to EAB (All)	Table No. 1
Elevated Release to LPZ (LOCA Post-PPP)	Table No. 2
Elevated Release to EAB (LOCA Post-PPP)	Table No. 2
Reactor Building to CR (LOCA PPP)	Table No. 5
Reactor Building to TSC (LOCA PPP)	Table No. 5
Turbine Building to CR or TSC (MSLB)	Table No. 3
Condenser to CR (LOCA) *	Table No. 4
Condenser to TSC (LOCA) *	Table No. 4
Elevated (Stack) to CR (LOCA Post-PPP)	Table No. 6
Elevated (Stack) to TSC (LOCA Post-PPP)	Table No. 7
RB to CR (FHA)	Table No. 8
RB to TSC (FHA)	Table No. 8

* **Note:** This would be the predominant release pathway for CR and TSC dose during a CRDA

f. Correct Table 3.

DAEC Response:

Table No. 3– GROUND LEVEL RELEASE TB EXHAUST χ/Q (sec/m^3)

GROUND LEVEL RELEASE χ/Q's (sec/m^3)	
Time Period	ARCON96 D=82 m A=1609 m^2 AZ=153° Sector=90°
0 – 2 hours	9.23-4
2 – 8 hours	7.96-4
8 – 24 hours	3.57-4
1 – 4 days	2.47-4
4 – 30 days	1.88 –4

2. Please provide the following information regarding the modeling used in the control room habitability analyses, or provide a citation to the FSAR where the information may be found:

   a. An explanation of how the 10.5 sec control room isolation delay was derived, including how this delay would be impacted by varying amounts of unfiltered inleakage assumed in the LOCA and MSLB sensitivity analysis.

      DAEC Response: Resolved per telecon of 3/20/01. Answer provided here as documentation of the telecon.

      For the LOCA, the control room isolation setpoint change is based on an analytic limit of 6.82 mrem/hr at the intake radiation monitors. Since the monitors are located in the intake they are not affected by assumed inleakage. A total of 12 seconds of instrument response time and damper closure time was obtained from specifications for the instrumentation and dampers. The total time of four minutes to control room isolation includes allowance for propagation of the release cloud to the intake, buildup of radiation levels in the intake, instrument response to the radiation in the finite volume in the intake. Dose to CR personnel is relatively insensitive to small changes in the instrument and damper response time assumption.

      For the MSLB the maximum control room dose to operators results from instantaneous isolation of the control room at the time the MSLB is isolated by MSIV closure at 10.5 secs, which is 500 msec for instrument response and 10 secs maximum MSIV stroke time (UFSAR 5.4.5.3). Assumed operation in normal ventilation modes for longer periods or with larger assumed values of inleakage serves to dilute the radioactivity drawn into the control room during the release. Although this isolation time is not realistic, it is an assumption which maximizes dose consequences.

   b. A description and results of the analysis of the control room or TSC doses due to a CRDA or, if the analysis was not performed, a justification for this omission.

      DAEC Response: Control Room and TSC doses for the CRDA would result from the same pathways as for MSIV leakage during the LOCA. A comparison of the magnitudes of releases, transport pathways, and EAB, LPZ, CR, and TSC dose results for the LOCA, FHA, and MSLB and the LPZ and EAB results for the CRDA concluded that the dose to the CR and TSC during the CRDA using current CRDA accident scenarios would be bounded by the other events. Therefore, CRDA doses were not analyzed for the CR and TSC.

c. Confirm that the FSAR value for control building volume of 155,000 ft^3 was used in the analyses of control room habitability.

DAEC Response: Resolved per telecon of 3/20/01. Answer provided here as documentation of the telecon.

RADTRAD analyses used 155,000 ft^3 for the control building volume, per UFSAR 6.4.4.5.

d. The TSC net free volume used in analyses of the control room habitability.

DAEC Response: TSC volume used in RADTRAD analysis was 68300 ft^3.

e. An explanation of why you have assumed a control room normal makeup rate of 3150 cfm when FSAR figures show this flow to be 15,900 cfm.

DAEC Response: Resolved per telecon of 3/20/01. Answer provided here as documentation of the telecon.

Although the control building ventilation system is capable of operating in a special purge mode at 15900 cfm, this mode of operation is infrequent. Normal ventilation mode is 3150 cfm.

f. Whether isolation of the control room was assumed in the FHA analysis, and if so, at what time post-accident.

DAEC Response: Control Room Isolation is assumed at 10 minutes post-accident based on manual operator action. The 10 minutes for manual operator action is consistent with other UFSAR evaluations (Section 6.2.2.3.2).

g. Confirm that the selected control room unfiltered in-leakage rate is assumed to start at T=0 and continue for the 30 day duration of the control room exposure period (i.e., the total air supply at T=0 would be 3150 cfm plus unfiltered in-leakage; following isolation 1000 cfm plus unfiltered in-leakage.)

DAEC Response: Resolved per telecon of 3/20/01. Answer provided here as documentation of the telecon.

Control Room and TSC in-leakage pathways are implemented as unfiltered pathways with constant flow for the 30 day duration starting at T=0.

h. Please explain your basis for assuming that 1000 cfm would be the maximum in-leakage for the FHA (and the CRDA?). (For the FHA, the control room dose

increases with increasing unfiltered in-leakage. The staff believes a similar conclusion would be drawn for the control room doses from a CRDA due to the long duration ground level release.)

DAEC Response: The in-leakage value assumed is 100% of the emergency mode ventilation flow rate from the Standby Filter Units. DAEC believes it would be difficult to demonstrate satisfactory performance of the control building positive pressure surveillance, per Technical Specification SR 3.7.4.4, if such a large leakage pathway existed, i.e., the mass flow in and out would be matched. No other inflow or pressurization source exists for the control building that would mask the performance of the Standby Filter Units during SR 3.7.4.4.

As stated in response to question 2.b, CRDA doses in the CR were not analyzed, but comparison of EAB and LPZ doses for these events led us to conclude that the FHA dose in the control room would be bounding compared to the CRDA using similar assumptions for in-leakage and isolation times.

3. With regard to the LOCA, please provide the following information, or provide a citation to the FSAR where the information may be found:

a. The ESF system leakage rate is specified at 1.5 gpm in Table 2-2. Does this value include the 2 x multiplier provided for in §5.2 of Appendix A to RG 1.183?

DAEC Response: Yes

b. Please provide the data entered to the Brockmann-Bixler pipe deposition model, including volume, surface area, gas pressures, temperatures, flow rates. Please confirm that all piping included in this model is horizontal in orientation.

DAEC Response: A drawing of the model used for evaluating the MSIV leakage pathway with annotation for volumes, areas, pressures, flow rates, and temperatures follows this attachment. The piping included both vertical and horizontal piping.

The shortest main steam line pipe length from the RPV to the outboard MSIV at DAEC is approximately 110 ft. This value includes both horizontal and vertical piping. The MSLs exit the RPV high in the drywell and drop approximately 60 ft before exiting the drywell. Thus the total length of pipe is comprised of approximately 60 ft of vertical pipe and 50 ft of horizontal piping.

Rerunning the worst MSIV Leakage case (200 scfh MSIV Leakage with 1000 cfm CR inleakage) using a 42 ft. pipe length as a sensitivity study shows an increase in EAB dose from 0.0459 to 0.0464 Rem TEDE, an increase in LPZ dose from

0.1914 to 0.1931 Rem TEDE, and an increase in CR dose from 1.0059 to 1.0225 Rem TEDE (i.e., less than 2% difference in CR operator dose).

Additionally, other segments of the DAEC RADTRAD MSIV Leakage pipe deposition model may also include vertical sections of piping. However, review of piping isometrics and field sketches indicate this impact is much less for the other piping compared to the main steam line from the RPV to the MSIV. The limiting case above was also run reducing the volume and surface area values described in this piping by 50%. Results of this run show an increase in EAB dose from 0.0459 to 0.0469 Rem TEDE, an increase in LPZ dose from 0.1914 to 0.1946 Rem TEDE, and an increase in CR dose from 1.0059 to 1.0378 Rem TEDE (i.e., less than 3.2% difference in CR operator dose).

Another consideration is that the model already incorporates some degree of conservatism. Only one intact main steam line is modeled and credited for deposition. There would be additional deposition in the other two intact steam lines. The change in volume for the horizontal sections of these lines would nearly offset the vertical drops in the faulted steam line and the unfaulted line. Also, the temperature and gas pressure (550 degF and 3.11 atm) entered into the model are assumed constant at their initial values throughout the 30 day analysis period which reduces predicted deposition.

Thus, even though our analysis included deposition in vertical piping, the resultant dose considering deposition just in the horizontal portion of the piping is only marginally greater. The overall results of the analysis remain conservative. Finally, the contribution of the MSIV leakage is a small contributor to the onsite and offsite doses compared to the containment leakage and ESF pathway during the positive pressure period. DAEC submits that although the inclusion of vertical piping represents a deviation from the staff guidelines, this deviation does not significantly change the results.

However, to ensure future evaluations are done consistent with the requirements of the pipe deposition model, DAEC commits to update the analysis to remove the credit for the vertical piping as part of any future licensing action involving the radiological consequences analyses using the Brockman-Bixler model.

c. Values of the suppression pool liquid mass or volume assumed in the ECCS analyses.

DAEC Response: Resolved per telecon of 3/20/01. Answer provided here as documentation of the telecon.

Technical Specifications Minimum Volume of 58900 ft^3 was used.

d. Confirm net free volumes drywell of 130,000 ft^3, wetwell of 94,070 ft^3, and reactor building of 1.82E6 ft^3

DAEC Response: Resolved per telecon of 3/20/01. Answer provided here as documentation of the telecon.

Per UFSAR Table 6.2-1, Drywell Volume is 130,000 ft^3 and Torus Volume is 155,570 ft^3. Suppression pool is between 58,900 and 61,500 ft^3, the Technical Specification minimum and maximum water levels. Therefore, suppression chamber air space volume is between 94,070 ft^3 and 96,670 ft^3. Reactor building volume of 1.82E6 ft^3 is in agreement with UFSAR 6.2.3.3. This value was not used in our radiological analysis. ESF leakage and containment leakage were treated as direct ground level releases to the environment during the PPP and as filtered releases through the SBGT after the PPP.

All LOCA pathway RADTRAD analyses were performed using 130,000 ft^3 as the combined Drywell/Vent volume into which all LOCA activity is released. Releases via the primary leakage pathway and the ESF leakage pathway assume 2%/day leakage (or equivalent cfm) and thus activity released is independent of modeled volume. For the 200 scfh MSIV leakage pathway, LOCA activity was conservatively modeled in the 130,000 ft^3 volume and excluding the Torus Air Chamber volume.

e. Provide the T=0 core inventory, Ci or µCi, for the radionuclides in the noble gas, halogen, cesium groups.

DAEC Response: See the following table:

Isotope	Inventory (Ci/MWt)
Kr-85	0.4155E+03
Kr-85m	0.6702E+04
Kr-87	0.1274E+05
Kr-88	0.1792E+05
Rb-86	0.7813E+02
I-131	0.2720E+05
I-132	0.3922E+05
I-133	0.5496E+05
I-134	0.6021E+05
I-135	0.5150E+05
Xe-135	0.1980E+05
Cs-134	0.8099E+04
Cs-136	0.2443E+04
Cs-137	0.4644E+04

f. The staff's understanding of the transport model described in the submittal is shown on the attached illustration. If the staff's understanding is in error, provide a sketch of your transport model(s) showing all model nodes, transfer rates between nodes, removals from nodes, etc.

DAEC Response: Resolved per telecon of 3/20/01. Answer provided here as documentation of the telecon.

NRC reviewer indicated he had already revised the drawing and in discussion, the model was well understood.

g. An explanation of the basis of the 5 minute duration of the secondary containment positive pressure period. Is the ability of the SGTS to meet this assumption evaluated as part of a periodic surveillance?

DAEC Response: The DAEC current licensing basis does not require verification of the drawdown time response in a periodic surveillance. Consequently, the time assumed in the analysis for drawdown has been selected at a conservative value, absent actual plant data. The five minute assumption is 250% longer than the typical plant surveillance requirement in standard technical specifications (120 secs) for plants with similar SGTS designs. Existing DAEC Technical Specification Surveillance Requirements would detect significant increases in secondary containment leakage (SR 3.6.4.1.3) or SGTS performance degradation (SR 3.6.4.3.1) prior to exceeding this 5 minute drawdown time assumption. Hence, the existing DAEC Technical Specifications are adequate to ensure this analysis assumption is met.

4. With regard to the FHA and CRDA analyses, please provide the following information, or provide a citation to the FSAR where the information may be found:

a. Number of fuel rods in the DAEC core for the GE12 and GE14 fuel

DAEC Response: There are 368 fuel bundles in the DAEC Core. The analysis used for radiological consequences assumed a full equilibrium core load of GE14 fuel operating at 1950 MWt. (102% of requested power uprate (from 1658MWt) to 1912 MWt). During the next cycle (Cycle 18) DAEC will operate with 104 bundles of GE10, 128 bundles of GE12, and 136 bundles of GE14 fuel. GE10 bundles are 8x8 design with a water rod and 60 full length rods. GE12 and GE 14 fuel bundles are 10x10 designs with two water rods, 14 partial length rods and 78 full length rods.

b. Please confirm that the 0.77% fuel melt for the CRDA refers to 0.77% of the rods that have exceeded DNB and not 0.77% of the core.

DAEC Response: DAEC is a Group Notch plant which imposes Banked Position Withdrawl Sequence (BPWS) for control rod withdrawal. This ensures that fuel enthalpy resulting from a CRDA will be well below the 280 cal/gm safety limit for fuel dispersion. DNB is not applicable to this analysis. For GE12 and GE14 fuel generic analysis predicts the number of rods which exceed the lower threshold for clad damage and fuel melting of 170 cal/gm. The fraction of these rods experiencing fuel melt will be no greater than 0.0077. Plant analysis predicts that the actual peak fuel enthalpy for the DAEC will remain below this enthalpy threshold, but the generic fuel damage predictions were used for conservatism.

c. Please confirm that your analysis of the CRDA used the gap release and melt release fractions identified in Appendix C of RG 1.183.

DAEC Response: Gap release fractions were in accordance with DG-1081 Table 3. As stated in section 1.3 of Attachment 4 in our original amendment request:

"1.3 DEVIATIONS FROM REGULATORY GUIDELINES

Work had been completed on some analyses using the guidelines of DG-1081. Changes in the guidelines were included in the final version of RG 1.183. As a result, the following deviation was taken from the final RG at this time:

- Non-LOCA Fission Product release fractions for the CRDA were used from DG-1081 rather than from RG 1.183 fractions. The release fractions for all isotope groups are more conservative in the DG except for the fraction for alkali metals which is 0.10 compared to a release fraction of 0.12 in RG 1.183. The overall effect of this deviation is a conservative over prediction of personnel doses by about one-third."

The cover letter discussed this deviation further as follows:

"Recognizing the conservative nature of the deviations taken from the final Regulatory Guide 1.183, DAEC does not intend to conduct conforming analyses at this time. However, at such time these analyses are reperformed to support future projects, these analyses will be brought in compliance."

In additional discussions during our telecon related to the CRDA analysis, the impact of considering the release of 50% of the halogen inventory as compared to 30% in accordance with DG-1081 was raised. The write-up following these responses (CRDA Impact of Using DG-1081 Guidelines for Release Fractions) contains the results of our evaluation of this impact.

5. Table 2-6 identifies the MSLB mass release as "same as existing design basis." The FSAR identifies this as 80,000 lbs. Please confirm this value.

DAEC Response: Resolved per telecon of 3/20/01. Answer provided here as documentation of the telecon.

DAEC UFSAR 15.6.5.1.3 discusses the conservatism of this value and concludes that the mass release consists of 15,000 lbm of steam and 80,000 lbm of liquid.

Example PAVAN Input Ground Release File

```
1     00010 01101 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
2      Duane Arnold        1-97/12-99          GROUND LEVEL RELEASE
3      10.0 METER
4     DAEC
5      S 600 M ESE 570 M 3218 M
6          7 24597     0
7           .500  1609.000     43.000     10.000     10.000
8        4.000  2.000  1.000105.000173.000135.000366.000
9        2.000   .000  6.000  1.000  7.000  6.000 14.000 21.000 17.000  6.000  5.000   .000   .000   .000   .000  3.000
9        9.000 11.000 22.000 37.000 57.000 44.000 78.000157.000189.000 63.000 32.000 29.000 11.000  6.000 17.000 14.000
9       11.000 16.000 51.000 41.000 28.000 30.000 42.000100.000172.000113.000 39.000 39.000 34.000 20.000 25.000 30.000
9       13.000   .000 12.000 12.000  2.000  5.000  3.000  5.000 24.000 37.000 29.000 17.000 34.000 41.000 33.000 58.000
9        1.000  1.000  1.000   .000   .000   .000   .000  2.000  5.000 11.000  4.000  4.000  5.000  9.000 13.000 11.000
9         .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  5.000  4.000   .000
9         .000  1.000  1.000  1.000  3.000  4.000  6.000  4.000  6.000  7.000  4.000  1.000  1.000   .000  1.000   .000
9        6.000  5.000 12.000 12.000 23.000 10.000 17.000 25.000 37.000 26.000 17.000 10.000  8.000  6.000  6.000  8.000
9        5.000 14.000 18.000 20.000 10.000 10.000 14.000 14.000 29.000 12.000 21.000 10.000 21.000 11.000 14.000 20.000
9        9.000  3.000  5.000  5.000   .000  1.000  1.000  1.000  9.000 11.000 14.000  5.000  8.000 10.000 10.000 39.000
9         .000   .000   .000   .000   .000   .000   .000   .000  1.000   .000   .000   .000  3.000  2.000 10.000  3.000
9         .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  2.000   .000  3.000   .000
9        3.000  2.000  4.000   .000  3.000  6.000  5.000  4.000  8.000  1.000  3.000   .000  2.000  2.000  2.000   .000
9        6.000  5.000 17.000 18.000 18.000 12.000 20.000 22.000 27.000 27.000 28.000 12.000  7.000  9.000 10.000 10.000
9       12.000 12.000 21.000 16.000 15.000  6.000 18.000 16.000 32.000 20.000 17.000  9.000 15.000 24.000 21.000 40.000
9       10.000  1.000  6.000  4.000   .000  1.000   .000  1.000  7.000 13.000  7.000  3.000  9.000 21.000 17.000 25.000
9         .000  1.000   .000   .000   .000   .000   .000   .000  1.000  1.000   .000   .000  2.000  8.000  6.000  2.000
9         .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  1.000  1.000   .000   .000  1.000   .000
9       21.000 30.000 42.000 52.000 94.000 65.000 71.000 56.000 58.000 51.000 44.000 33.000 22.000 25.000 26.000 21.000
9      108.000 96.000247.000261.000307.000265.000291.000277.000298.000157.000138.000138.000122.000149.000228.000200.000
9      193.000131.000304.000260.000195.000149.000172.000112.000203.000162.000107.000 93.000148.000273.000412.000658.000
9       69.000 72.000128.000 87.000 16.000 18.000 20.000 11.000 51.000 65.000 34.000 25.000 73.000239.000278.000310.000
9        9.000  9.000  9.000  3.000   .000  1.000   .000   .000  4.000  9.000  3.000  3.000 24.000 67.000 81.000 64.000
9         .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  4.000  9.000 11.000 12.000 16.000  2.000
9       54.000 55.000 60.000 59.000119.000114.000125.000114.000138.000116.000 85.000 64.000 50.000 38.000 40.000 18.000
9       83.000106.000213.000169.000175.000192.000373.000361.000559.000243.000153.000 97.000115.000147.000239.000192.000
9       72.000 45.000114.000 89.000 25.000 64.000 85.000183.000429.000204.000 83.000 34.000 60.000 90.000157.000280.000
9       28.000 36.000 26.000  2.000  4.000  5.000 13.000 20.000 77.000 50.000 13.000 12.000 18.000 30.000 37.000 36.000
9        9.000  7.000  1.000   .000   .000   .000   .000   .000  2.000   .000  5.000  2.000   .000  3.000  5.000  9.000
9         .000   .000   .000   .000   .000   .000   .000   .000   .000  1.000  1.000  2.000   .000   .000   .000  1.000
9       19.000 25.000 49.000 58.000 52.000 61.000 76.000 90.000160.000119.000 89.000 81.000 39.000 32.000 18.000  4.000
9        8.000 18.000102.000 46.000 23.000 20.000 39.000 71.000 93.000 73.000 63.000 57.000 43.000 36.000 42.000 23.000
9         .000  6.000  8.000  3.000  1.000   .000   .000  1.000  5.000  2.000  7.000  6.000  3.000  7.000  6.000  5.000
9         .000  3.000  1.000   .000   .000   .000   .000   .000   .000   .000  1.000   .000   .000   .000   .000  2.000
9        1.000   .000  1.000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  1.000
9         .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000
9       14.000 25.000 82.000153.000125.000 95.000 98.000135.000187.000226.000249.000170.000103.000 47.000 15.000 10.000
```

9	.000	8.000	71.000	45.000	9.000	6.000	6.000	6.000	19.000	18.000	26.000	21.000	7.000	5.000	2.000	1.000
9	.000	2.000	11.000	.000	1.000	.000	.000	.000	.000	1.000	.000	1.000	2.000	.000	.000	.000
9	2.000	1.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	3.000
9	2.000	.000	.000	.000	.000	.000	.000	.000	1.000	.000	.000	.000	1.000	.000	1.000	2.000
9	3.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
10	-1.	.450	1.340	3.130	5.360	8.000	10.700	16.000	.000	.000	.000	.000	.000	.000	.000	
11	600.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	570.	0.	0.
11	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.

Example PAVAN Input Elevated Release File

```
1     00010 01101 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
2      Duane Arnold          1-97/12-99          ELEVATED RELEASE
3      10.0 METER
4     DAEC
5      S 455 M WNW 722 M ESE 455 M S  3218 M WNW 3218 M
6          7 24597      3
7           .500  1609.000     43.000     97.600     10.000
8       4.000  2.000  1.000105.000173.000135.000366.000
9       2.000   .000  6.000  1.000  7.000  6.000 14.000 21.000 17.000  6.000  5.000   .000   .000   .000   .000  3.000
9       9.000 11.000 22.000 37.000 57.000 44.000 78.000157.000189.000 63.000 32.000 29.000 11.000  6.000 17.000 14.000
9      11.000 16.000 51.000 41.000 28.000 30.000 42.000100.000172.000113.000 39.000 39.000 34.000 20.000 25.000 30.000
9      13.000   .000 12.000 12.000  2.000  5.000  3.000  5.000 24.000 37.000 29.000 17.000 34.000 41.000 33.000 58.000
9       1.000  1.000  1.000   .000   .000   .000   .000  2.000  5.000 11.000  4.000  4.000  5.000  9.000 13.000 11.000
9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  5.000  4.000   .000
9        .000  1.000  1.000  1.000  3.000  4.000  6.000  4.000  6.000  7.000  4.000  1.000  1.000   .000  1.000   .000
9       6.000  5.000 12.000 12.000 23.000 10.000 17.000 25.000 37.000 26.000 17.000 10.000  8.000  6.000  6.000  8.000
9       5.000 14.000 18.000 20.000 10.000 10.000 14.000 14.000 29.000 12.000 21.000 10.000 21.000 11.000 14.000 20.000
9       9.000  3.000  5.000  5.000   .000  1.000  1.000  1.000  9.000 11.000 14.000  5.000  8.000 10.000 10.000 39.000
9        .000   .000   .000   .000   .000   .000   .000   .000  1.000   .000   .000   .000  3.000  2.000 10.000  3.000
9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  2.000   .000  3.000   .000
9       3.000  2.000  4.000   .000  3.000  6.000  5.000  4.000  8.000  1.000  3.000   .000  2.000  2.000  2.000   .000
9       6.000  5.000 17.000 18.000 18.000 12.000 20.000 22.000 27.000 27.000 28.000 12.000  7.000  9.000 10.000 10.000
9      12.000 12.000 21.000 16.000 15.000  6.000 18.000 16.000 32.000 20.000 17.000  9.000 15.000 24.000 21.000 40.000
9      10.000  1.000  6.000  4.000   .000  1.000   .000  1.000  7.000 13.000  7.000  3.000  9.000 21.000 17.000 25.000
9        .000  1.000   .000   .000   .000   .000   .000   .000  1.000  1.000   .000   .000  2.000  8.000  6.000  2.000
9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  1.000  1.000   .000   .000  1.000   .000
9      21.000 30.000 42.000 52.000 94.000 65.000 71.000 56.000 58.000 51.000 44.000 33.000 22.000 25.000 26.000 21.000
9     108.000 96.000247.000261.000307.000265.000291.000277.000298.000157.000138.000138.000122.000149.000228.000200.000
9     193.000131.000304.000260.000195.000149.000172.000112.000203.000162.000107.000 93.000148.000273.000412.000658.000
9      69.000 72.000128.000 87.000 16.000 18.000 20.000 11.000 51.000 65.000 34.000 25.000 73.000239.000278.000310.000
9       9.000  9.000  9.000  3.000   .000  1.000   .000   .000  4.000  9.000  3.000  3.000 24.000 67.000 81.000 64.000
9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  4.000  9.000 11.000 12.000 16.000  2.000
9      54.000 55.000 60.000 59.000119.000114.000125.000114.000138.000116.000 85.000 64.000 50.000 38.000 40.000 18.000
9      83.000106.000213.000169.000175.000192.000373.000361.000559.000243.000153.000 97.000115.000147.000239.000192.000
9      72.000 45.000114.000 89.000 25.000 64.000 85.000183.000429.000204.000 83.000 34.000 60.000 90.000157.000280.000
9      28.000 36.000 26.000  2.000  4.000  5.000 13.000 20.000 77.000 50.000 13.000 12.000 18.000 30.000 37.000 36.000
9       9.000  7.000  1.000   .000   .000   .000   .000   .000  2.000   .000  5.000  2.000   .000  3.000  5.000  9.000
9        .000   .000   .000   .000   .000   .000   .000   .000   .000  1.000  1.000  2.000   .000   .000   .000  1.000
9      19.000 25.000 49.000 58.000 52.000 61.000 76.000 90.000160.000119.000 89.000 81.000 39.000 32.000 18.000  4.000
9       8.000 18.000102.000 46.000 23.000 20.000 39.000 71.000 93.000 73.000 63.000 57.000 43.000 36.000 42.000 23.000
9        .000  6.000  8.000  3.000  1.000   .000   .000  1.000  5.000  2.000  7.000  6.000  3.000  7.000  6.000  5.000
9        .000  3.000  1.000   .000   .000   .000   .000   .000   .000   .000  1.000   .000   .000   .000   .000  2.000
9       1.000   .000  1.000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  1.000
9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000
9      14.000 25.000 82.000153.000125.000 95.000 98.000135.000187.000226.000249.000170.000103.000 47.000 15.000 10.000
```

9	.000	8.000	71.000	45.000	9.000	6.000	6.000	6.000	19.000	18.000	26.000	21.000	7.000	5.000	2.000	1.000
9	.000	2.000	11.000	.000	1.000	.000	.000	.000	.000	1.000	.000	1.000	2.000	.000	.000	.000
9	2.000	1.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	3.000
9	2.000	.000	.000	.000	.000	.000	.000	.000	1.000	.000	.000	.000	1.000	.000	1.000	2.000
9	3.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
10	-1.	.450	1.340	3.130	5.360	8.000	10.700	16.000	.000	.000	.000	.000	.000	.000	.000	
11	455.	0.	0.	0.	0.	722.	0.	0.	0.	0.	0.	0.	0.	455.	0.	0.
11	3218.	0.	0.	0.	0.	3218.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	500.	500.	500.	500.	500.	500.	500.	500.	500.	500.	500.	500.	500.	500.	500.	500.
14	0.	0.	0.	0.	0.	0.	12.	16.	0.	0.	0.	0.	17.	0.	0.	0.
13	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.
14	0.	0.	0.	0.	8.	31.	38.	0.	23.	16.	22.	39.	46.	46.	19.	0.

```
ARCON96 Turbine Building Vent to CR and TSC (MSLB)

     Number of Meteorological Data Files  =  1
     Meteorological Data File Names
       C:\ARCON96\DAECMET.MET

     Height of lower wind instrument (m)  =     10.0
     Height of upper wind instrument (m)  =     47.5
     Wind speeds entered as miles per hour

     Ground-level release
     Release height (m)                   =       .0
     Building Area (m^2)                  =   1609.0
     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)  =      153
     Wind direction sector width (deg)    =       90
     Wind direction window (deg)          =   108 - 198
     Distance to intake (m)               =     82.0
     Intake height  (m)                   =       .0
     Terrain elevation difference (m)     =       .0

     Output file names
       tboverf.log
       tboverf.cfd

     Minimum Wind Speed (m/s)             =       .5
     Surface roughness length (m)         =       .10
     Sector averaging constant            =      4.0

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

Condenser to Control Room

```
Number of Meteorological Data Files  =  1
Meteorological Data File Names
  C:\ARCON96\DAECMET.MET

Height of lower wind instrument (m)  =     10.0
Height of upper wind instrument (m)  =     47.5
Wind speeds entered as miles per hour

Ground-level release
Release height (m)                   =       .0
Building Area (m^2)                  =   1609.0
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)  =      137
Wind direction sector width (deg)    =       90
Wind direction window (deg)          =   092 - 182
Distance to intake (m)               =     60.8
Intake height  (m)                   =     13.0
Terrain elevation difference (m)     =       .0

Output file names
  condcrf.log
  condcrf.cfd

Minimum Wind Speed (m/s)             =       .5
Surface roughness length (m)         =       .10
Sector averaging constant            =      4.0

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

Condenser to TSC

```
Number of Meteorological Data Files  =  1
Meteorological Data File Names
  C:\ARCON96\DAECMET.MET

Height of lower wind instrument (m)  =     10.0
Height of upper wind instrument (m)  =     47.5
Wind speeds entered as miles per hour

Ground-level release
Release height (m)                   =       .0
Building Area (m^2)                  =   1609.0
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)  =      168
Wind direction sector width (deg)    =       90
Wind direction window (deg)          =   123 - 213
Distance to intake (m)               =     52.5
Intake height  (m)                   =      5.5
Terrain elevation difference (m)     =       .0

Output file names
  condtscf.log
  condtscf.cfd

Minimum Wind Speed (m/s)             =       .5
Surface roughness length (m)         =       .10
Sector averaging constant            =      4.0

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

Reactor Building to Control Room
(Positive Pressure Period ESF Leakage and Containment Leakage)

```
Number of Meteorological Data Files  =  1
Meteorological Data File Names
  C:\ARCON96\DAECMET.MET

Height of lower wind instrument (m)  =     10.0
Height of upper wind instrument (m)  =     47.5
Wind speeds entered as miles per hour

Ground-level release
Release height (m)                   =       .0
Building Area (m^2)                  =   1609.0
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)  =      180
Wind direction sector width (deg)    =       90
Wind direction window (deg)          =   135 - 225
Distance to intake (m)               =     15.8
Intake height  (m)                   =     13.0
Terrain elevation difference (m)     =       .0

Output file names
  rbcrf1.log
  rbcrf1.cfd

Minimum Wind Speed (m/s)             =       .5
Surface roughness length (m)         =       .10
Sector averaging constant            =      4.0

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

```
Reactor Building to TSC

Number of Meteorclogical Data Files  =  1
     Meteorological Data File Names
       C:\ARCON96\DAECMET.MET

     Height of lower wind instrument (m)  =     10.0
     Height of upper wind instrument (m)  =     47.5
     Wind speeds entered as miles per hour

     Ground-level release
     Release height (m)                   =     18.0
     Building Area (m^2)                  =   1609.0
     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)  =      192
     Wind direction sector width (deg)    =       90
     Wind direction window (deg)          =   147 - 237
     Distance to intake (m)               =     22.6
     Intake height  (m)                   =      5.5
     Terrain elevation difference (m)     =       .0

     Output file names
       rbtscf.log
       rbtscf.cfd

     Minimum Wind Speed (m/s)             =       .5
     Surface roughness length (m)         =       .10
     Sector averaging constant            =      4.0

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

```
Elevated Stack Release to Control Room

Number of Meteorological Data Files  =  1
     Meteorological Data File Names
       C:\ARCON96\DAECMET.MET

     Height of lower wind instrument (m)  =     10.0
     Height of upper wind instrument (m)  =     47.5
     Wind speeds entered as miles per hour

     Elevated release
     Release height (m)                   =    100.0
     Building Area (m^2)                  =       .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)  =      165
     Wind direction sector width (deg)    =       90
     Wind direction window (deg)          =  120 - 210
     Distance to intake (m)               =    210.0
     Intake height  (m)                   =     13.0
     Terrain elevation difference (m)     =     -2.6

     Output file names
       elcrf.log
       elcrf.cfd

     Minimum Wind Speed (m/s)             =       .5
     Surface roughness length (m)         =      .10
     Sector averaging constant            =      4.0

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

```
Elevated to TSC

Number of Meteorological Data Files  =  1
     Meteorological Data File Names
       C:\ARCON96\DAECMET.MET

     Height of lower wind instrument (m)  =     10.0
     Height of upper wind instrument (m)  =     47.5
     Wind speeds entered as miles per hour

     Elevated release
     Release height (m)                   =    100.0
     Building Area (m^2)                  =       .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)  =      173
     Wind direction sector width (deg)    =       90
     Wind direction window (deg)          =  128 - 218
     Distance to intake (m)               =    214.0
     Intake height  (m)                   =      5.5
     Terrain elevation difference (m)     =     -2.6

     Output file names
       eltscf.log
       eltscf.cfd

     Minimum Wind Speed (m/s)             =       .5
     Surface roughness length (m)         =      .10
     Sector averaging constant            =      4.0

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

PAVAN Input for Elevated Release to CR (Fumigation Value)

```
1     00010 01101 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
  2      Duane Arnold        1-97/12-99         ELEVATED 84.4 M
  3      10.0 METER
  4     DAEC
  5      Control Room
  6          7 24597     2
  7           .500  1609.000     42.800     84.400     10.000
  8       4.000  2.000  1.000105.000173.000135.000366.000
  9       2.000   .000  6.000  1.000  7.000  6.000 14.000 21.000 17.000  6.000  5.000   .000   .000   .000   .000  3.000
  9       9.000 11.000 22.000 37.000 57.000 44.000 78.000157.000189.000 63.000 32.000 29.000 11.000  6.000 17.000 14.000
  9      11.000 16.000 51.000 41.000 28.000 30.000 42.000100.000172.000113.000 39.000 39.000 34.000 20.000 25.000 30.000
  9      13.000   .000 12.000 12.000  2.000  5.000  3.000  5.000 24.000 37.000 29.000 17.000 34.000 41.000 33.000 58.000
  9       1.000  1.000  1.000   .000   .000   .000   .000  2.000  5.000 11.000  4.000  4.000  5.000  9.000 13.000 11.000
  9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  5.000  4.000   .000
  9        .000  1.000  1.000  1.000  3.000  4.000  6.000  4.000  6.000  7.000  4.000  1.000  1.000   .000  1.000   .000
  9       6.000  5.000 12.000 12.000 23.000 10.000 17.000 25.000 37.000 26.000 17.000 10.000  8.000  6.000  6.000  8.000
  9       5.000 14.000 18.000 20.000 10.000 10.000 14.000 14.000 29.000 12.000 21.000 10.000 21.000 11.000 14.000 20.000
  9       9.000  3.000  5.000  5.000   .000  1.000  1.000  1.000  9.000 11.000 14.000  5.000  8.000 10.000 10.000 39.000
  9        .000   .000   .000   .000   .000   .000   .000   .000  1.000   .000   .000   .000  3.000  2.000 10.000  3.000
  9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  2.000   .000  3.000   .000
  9       3.000  2.000  4.000   .000  3.000  6.000  5.000  4.000  8.000  1.000  3.000   .000  2.000  2.000  2.000   .000
  9       6.000  5.000 17.000 18.000 18.000 12.000 20.000 22.000 27.000 27.000 28.000 12.000  7.000  9.000 10.000 10.000
  9      12.000 12.000 21.000 16.000 15.000  6.000 18.000 16.000 32.000 20.000 17.000  9.000 15.000 24.000 21.000 40.000
  9      10.000  1.000  6.000  4.000   .000  1.000   .000  1.000  7.000 13.000  7.000  3.000  9.000 21.000 17.000 25.000
  9        .000  1.000   .000   .000   .000   .000   .000   .000  1.000  1.000   .000   .000  2.000  8.000  6.000  2.000
  9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  1.000  1.000   .000   .000  1.000   .000
  9      21.000 30.000 42.000 52.000 94.000 65.000 71.000 56.000 58.000 51.000 44.000 33.000 22.000 25.000 26.000 21.000
  9     108.000 96.000247.000261.000307.000265.000291.000277.000298.000157.000138.000138.000122.000149.000228.000200.000
  9     193.000131.000304.000260.000195.000149.000172.000112.000203.000162.000107.000 93.000148.000273.000412.000658.000
  9      69.000 72.000128.000 87.000 16.000 18.000 20.000 11.000 51.000 65.000 34.000 25.000 73.000239.000278.000310.000
  9       9.000  9.000  9.000  3.000   .000  1.000   .000   .000  4.000  9.000  3.000  3.000 24.000 67.000 81.000 64.000
  9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  4.000  9.000 11.000 12.000 16.000  2.000
  9      54.000 55.000 60.000 59.000119.000114.000125.000114.000138.000116.000 85.000 64.000 50.000 38.000 40.000 18.000
  9      83.000106.000213.000169.000175.000192.000373.000361.000559.000243.000153.000 97.000115.000147.000239.000192.000
  9      72.000 45.000114.000 89.000 25.000 64.000 85.000183.000429.000204.000 83.000 34.000 60.000 90.000157.000280.000
  9      28.000 36.000 26.000  2.000  4.000  5.000 13.000 20.000 77.000 50.000 13.000 12.000 18.000 30.000 37.000 36.000
  9       9.000  7.000  1.000   .000   .000   .000   .000   .000  2.000   .000  5.000  2.000   .000  3.000  5.000  9.000
  9        .000   .000   .000   .000   .000   .000   .000   .000   .000  1.000  1.000  2.000   .000   .000   .000  1.000
  9      19.000 25.000 49.000 58.000 52.000 61.000 76.000 90.000160.000119.000 89.000 81.000 39.000 32.000 18.000  4.000
  9       8.000 18.000102.000 46.000 23.000 20.000 39.000 71.000 93.000 73.000 63.000 57.000 43.000 36.000 42.000 23.000
  9        .000  6.000  8.000  3.000  1.000   .000   .000  1.000  5.000  2.000  7.000  6.000  3.000  7.000  6.000  5.000
  9        .000  3.000  1.000   .000   .000   .000   .000   .000   .000   .000  1.000   .000   .000   .000   .000  2.000
  9       1.000   .000  1.000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  1.000
  9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000
  9      14.000 25.000 82.000153.000125.000 95.000 98.000135.000187.000226.000249.000170.000103.000 47.000 15.000 10.000
```

9	.000	8.000	71.000	45.000	9.000	6.000	6.000	6.000	19.000	18.000	26.000	21.000	7.000	5.000	2.000	1.000
9	.000	2.000	11.000	.000	1.000	.000	.000	.000	.000	1.000	.000	1.000	2.000	.000	.000	.000
9	2.000	1.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	3.000
9	2.000	.000	.000	.000	.000	.000	.000	.000	1.000	.000	.000	.000	1.000	.000	1.000	2.000
9	3.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
10	-1.	.450	1.340	3.130	5.360	8.000	10.700	16.000	.000	.000	.000	.000	.000	.000	.000	
11	210.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	210.
11	0.	0.	0.	0.	0.	0.	0.	300.	0.	0.	0.	0.	0.	0.	0.	300.
13	455.	455.	455.	455.	455.	455.	455.	455.	455.	455.	455.	455.	455.	455.	455.	455.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.
14	100.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	100.	0.	0.

Dispersion Model Input Files

PAVAN Input Elevated Release to TSC (Fumigation Value)

```
1     00010 01101 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
  2      Duane Arnold        1-97/12-99         ELEVATED 91.1 M
  3      10.0 METER
  4      DAEC
  5      TSC
  6          7 24597     2
  7           .500  1609.000    42.800    91.100    10.000
  8       4.000  2.000  1.000105.000173.000135.000366.000
  9       2.000   .000  6.000  1.000  7.000  6.000 14.000 21.000 17.000  6.000  5.000   .000   .000   .000   .000  3.000
  9       9.000 11.000 22.000 37.000 57.000 44.000 78.000157.000189.000 63.000 32.000 29.000 11.000  6.000 17.000 14.000
  9      11.000 16.000 51.000 41.000 28.000 30.000 42.000100.000172.000113.000 39.000 39.000 34.000 20.000 25.000 30.000
  9      13.000   .000 12.000 12.000  2.000  5.000  3.000  5.000 24.000 37.000 29.000 17.000 34.000 41.000 33.000 58.000
  9       1.000  1.000  1.000   .000   .000   .000   .000  2.000  5.000 11.000  4.000  4.000  5.000  9.000 13.000 11.000
  9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  5.000  4.000   .000
  9        .000  1.000  1.000  1.000  3.000  4.000  6.000  4.000  6.000  7.000  4.000  1.000  1.000   .000  1.000   .000
  9       6.000  5.000 12.000 12.000 23.000 10.000 17.000 25.000 37.000 26.000 17.000 10.000  8.000  6.000  6.000  8.000
  9       5.000 14.000 18.000 20.000 10.000 10.000 14.000 14.000 29.000 12.000 21.000 10.000 21.000 11.000 14.000 20.000
  9       9.000  3.000  5.000  5.000   .000  1.000  1.000  1.000  9.000 11.000 14.000  5.000  8.000 10.000 10.000 39.000
  9        .000   .000   .000   .000   .000   .000   .000   .000  1.000   .000   .000   .000  3.000  2.000 10.000  3.000
  9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  2.000   .000  3.000   .000
  9       3.000  2.000  4.000   .000  3.000  6.000  5.000  4.000  8.000  1.000  3.000   .000  2.000  2.000  2.000   .000
  9       6.000  5.000 17.000 18.000 18.000 12.000 20.000 22.000 27.000 27.000 28.000 12.000  7.000  9.000 10.000 10.000
  9      12.000 12.000 21.000 16.000 15.000  6.000 18.000 16.000 32.000 20.000 17.000  9.000 15.000 24.000 21.000 40.000
  9      10.000  1.000  6.000  4.000   .000  1.000   .000  1.000  7.000 13.000  7.000  3.000  9.000 21.000 17.000 25.000
  9        .000  1.000   .000   .000   .000   .000   .000   .000  1.000  1.000   .000   .000  2.000  8.000  6.000  2.000
  9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  1.000  1.000   .000   .000  1.000   .000
  9      21.000 30.000 42.000 52.000 94.000 65.000 71.000 56.000 58.000 51.000 44.000 33.000 22.000 25.000 26.000 21.000
  9     108.000 96.000247.000261.000307.000265.000291.000277.000298.000157.000138.000138.000122.000149.000228.000200.000
  9     193.000131.000304.000260.000195.000149.000172.000112.000203.000162.000107.000 93.000148.000273.000412.000658.000
  9      69.000 72.000128.000 87.000 16.000 18.000 20.000 11.000 51.000 65.000 34.000 25.000 73.000239.000278.000310.000
  9       9.000  9.000  9.000  3.000   .000  1.000   .000   .000  4.000  9.000  3.000  3.000 24.000 67.000 81.000 64.000
  9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  4.000  9.000 11.000 12.000 16.000  2.000
  9      54.000 55.000 60.000 59.000119.000114.000125.000114.000138.000116.000 85.000 64.000 50.000 38.000 40.000 18.000
  9      83.000106.000213.000169.000175.000192.000373.000361.000559.000243.000153.000 97.000115.000147.000239.000192.000
  9      72.000 45.000114.000 89.000 25.000 64.000 85.000183.000429.000204.000 83.000 34.000 60.000 90.000157.000280.000
  9      28.000 36.000 26.000  2.000  4.000  5.000 13.000 20.000 77.000 50.000 13.000 12.000 18.000 30.000 37.000 36.000
  9       9.000  7.000  1.000   .000   .000   .000   .000   .000  2.000   .000  5.000  2.000   .000  3.000  5.000  9.000
  9        .000   .000   .000   .000   .000   .000   .000   .000   .000  1.000  1.000  2.000   .000   .000   .000  1.000
  9      19.000 25.000 49.000 58.000 52.000 61.000 76.000 90.000160.000119.000 89.000 81.000 39.000 32.000 18.000  4.000
  9       8.000 18.000102.000 46.000 23.000 20.000 39.000 71.000 93.000 73.000 63.000 57.000 43.000 36.000 42.000 23.000
  9        .000  6.000  8.000  3.000  1.000   .000   .000  1.000  5.000  2.000  7.000  6.000  3.000  7.000  6.000  5.000
  9        .000  3.000  1.000   .000   .000   .000   .000   .000   .000   .000  1.000   .000   .000   .000   .000  2.000
  9       1.000   .000  1.000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000  1.000
  9        .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000   .000
  9      14.000 25.000 82.000153.000125.000 95.000 98.000135.000187.000226.000249.000170.000103.000 47.000 15.000 10.000
```

9	.000	8.000	71.000	45.000	9.000	6.000	6.000	6.000	19.000	18.000	26.000	21.000	7.000	5.000	2.000	1.000
9	.000	2.000	11.000	.000	1.000	.000	.000	.000	.000	1.000	.000	1.000	2.000	.000	.000	.000
9	2.000	1.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	3.000
9	2.000	.000	.000	.000	.000	.000	.000	.000	1.000	.000	.000	.000	1.000	.000	1.000	2.000
9	3.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
10	-1.	.450	1.340	3.130	5.360	8.000	10.700	16.000	.000	.000	.000	.000	.000	.000	.000	
11	214.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	214.
11	0.	0.	0.	0.	0.	0.	0.	300.	0.	0.	0.	0.	0.	0.	0.	300.
13	455.	455.	455.	455.	455.	455.	455.	455.	455.	455.	455.	455.	455.	455.	455.	455.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.	3218.
14	100.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	100.	0.	0.

```
Reactor Building Vent to Control Room (FHA)

Height of lower wind instrument (m)  =     10.0
     Height of upper wind instrument (m)  =     47.5
     Wind speeds entered as miles per hour

     Ground-level release
     Release height (m)                    =       .0
     Building Area (m^2)                   =   1609.0
     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)   =      125
     Wind direction sector width (deg)     =       90
     Wind direction window (deg)           =   080 - 170
     Distance to intake (m)                =     29.2
     Intake height  (m)                    =     32.7
     Terrain elevation difference (m)      =       .0

     Output file names
       rbvcrf.log
       rbvcrf.cfd

     Minimum Wind Speed (m/s)              =       .5
     Surface roughness length (m)          =       .10
     Sector averaging constant             =      4.0

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

```
Reactor Building Vent to TSC (FHA)

Number of Meteorological Data Files  =  1
     Meteorological Data File Names
       C:\ARCON96\DAECMET.MET

     Height of lower wind instrument (m)  =     10.0
     Height of upper wind instrument (m)  =     47.5
     Wind speeds entered as miles per hour

     Ground-level release
     Release height (m)                   =       .0
     Building Area (m^2)                  =   1609.0
     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)  =      196
     Wind direction sector width (deg)    =       90
     Wind direction window (deg)          =   151 - 241
     Distance to intake (m)               =     24.4
     Intake height  (m)                   =     40.2
     Terrain elevation difference (m)     =       .0

     Output file names
       rbvtscf.log
       rbvtscf.cfd

     Minimum Wind Speed (m/s)             =       .5
     Surface roughness length (m)         =       .10
     Sector averaging constant            =      4.0

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

CRDA Impact of Using DG-1081 Guidelines for Release Fractions

In the cover letter of our original amendment request (Ref. 1), we stated that we followed the DG-1081 release guidance for the CRDA. The Staff pointed out that the halogen release fraction in the RG 1.183 is larger than that in the Draft Guide. We did use the gap release fractions in Table 3 and the total fuel melt release fractions from Table 1 for gap and EIV release. We have conducted a comparison of using DG-1081 instead of Appendix C of RG 1.183 for the CRDA and this summary is provided.

The first step was to calculate how much of the core inventory is released using the two different guidelines.

In the gap release the DG guidance releases 15% of Kr-85, 10% of the other Noble Gasses, 12% of I-131 and 10% of other Halogens, as compared to the 10% for each under the RG. The DG also releases 10% of alkali metals, but since they are particulates that are retained in the coolant, they didn't really enter into our analysis. We used the generic predictions for fuel clad damage and melt fraction. The gap release fractions for the DG include 12% of the I-131, 15% of the Kr-85 and 10% of the remaining Halogens and Noble Gasses. For the melt, 100% of Noble Gasses are released in both the DG and RG. In the RG, however, 50% of the halogens are to be released and the DG only required a net release of 30%.

The net difference is that 0.5845% of the core Kr-85 is released in the DG compared to 0.3993% in the RG, and, 0.4533% of the core I-131 is released in the DG compared to 0.3849% for the RG. For the other Halogens, however, the DG guidance releases 0.3791% rather than the 0.3849% expected under the RG.

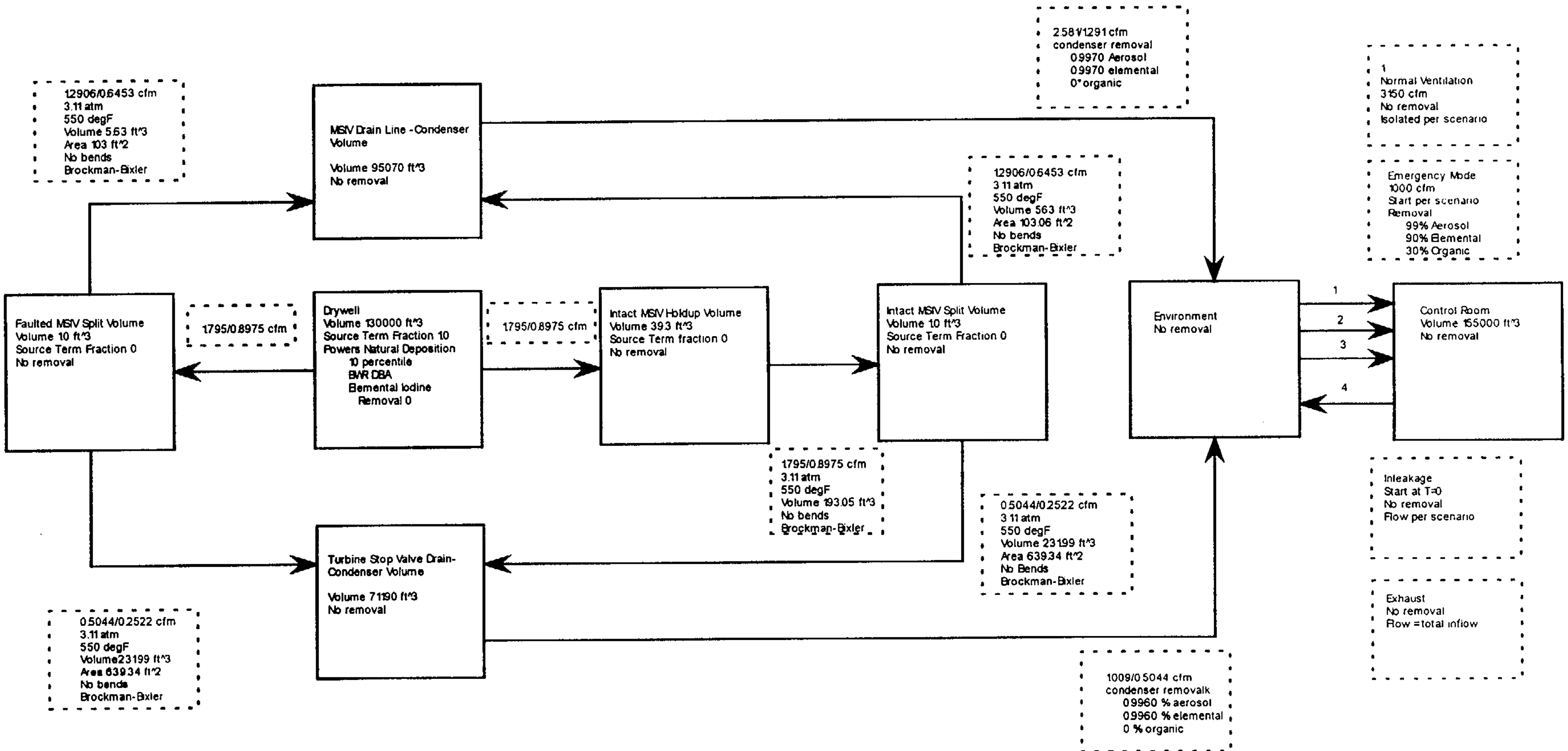
The total inventory of Noble Gasses and Halogens released is 2.23E+06 curies for the DG and 2.19E+06 curies for the RG at T=0. To perform an estimate of dose consequences, we used half life calculations using our core inventory to identify the total release curie content at T=0, T= 2 hours, and T=30 days. We then used the cloudshine effective DCFs from RADTRAD for the isotopes to weight the inventory of each isotope relative to I-131. Clearly, the conservative DG fractions for I-131 and Kr-85 are important because over time their concentration remains higher due to their longer half lives. The DCF evaluation, however, accounts for the isotopes that may have greater impact on effective dose. This evaluation does not account for transport or removal. It simply compares the total CRDA release source term inventories for the DG and RG, adjusted for dose.

The initial conservatism of the DG release for KR-85 and I-131 does not quite compensate for the higher DCFs for the other Halogens, but the net difference at T=0 is only 0.76%, which decreases to 0.27% at 2 hours. By the end of the 30 day analysis period, the DG results in about a 17.8% conservative dose consequence compared to the RG.

CRDA Impact of Using DG-1081 Guidelines for Release Fractions

Since our estimated EAB and LPZ doses for the CRDA are on the order of 1% of the regulatory limit of 6.25 rem TEDE, we do not consider the difference between the DG and the RG to be significant.

As stated in the cover letter to our original amendment request (Ref. 1), we committed to update the analysis to conform with RG 1.183 in any future re-analysis involving these calculations.



DAEC MSIV Leakage Path Model

PROPOSED CHANGES TO THE DUANE ARNOLD ENERGY CENTER TECHNICAL SPECIFICATIONS FOR THE ALTERNATE SOURCE TERM - FUEL HANDLING ACCIDENT

The holders of license DPR-49 for the Duane Arnold Energy Center propose to amend the Technical Specifications as summarized below. Enclosure 3 to this letter contains the "pen & ink" markups illustrating the changes to these pages.

SUMMARY OF CHANGES

Page	Description of Change
3.3-65	Remove footnote (b) ("During CORE ALTERATIONS and during movement of irradiated fuel assemblies in secondary containment.") from Table 3.3.6.2-1.
3.6-35	Remove "During movement of irradiated fuel assemblies in the secondary containment" and "During CORE ALTERATIONS," from the APPLICABILITY of LCO 3.6.4.1. Remove "movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during" from Condition C. Delete REQUIRED ACTION C.1, "Suspend movement of irradiated fuel assemblies in the secondary containment. AND" and delete associated COMPLETION TIME.
3.6-36	Remove REQUIRED ACTION C.2, "Suspend CORE ALTERATIONS. AND" and associated COMPLETION TIME. Renumber remaining REQUIRED ACTION and associated COMPLETION TIME from "C.3" to "C.1".
3.6-37	Remove "During movement of irradiated fuel assemblies in the secondary containment" and "During CORE ALTERATIONS," from the APPLICABILITY of LCO 3.6.4.2.
3.6-39	Remove "movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during" from CONDITION D. Delete REQUIRED ACTIONs D.1 (excluding note) and D.2. Delete associated COMPLETION TIMEs. Renumber remaining REQUIRED ACTION AND COMPLETION TIME from D.3 to D.1.
3.6-41	Remove "During movement of irradiated fuel assemblies in the secondary containment" and "During CORE ALTERATIONS," from the APPLICABILITY of LCO 3.6.4.3. Remove "movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during" from Condition C.

3.6-42 Delete REQUIRED ACTION C.2.1 and C.2.2 and associated COMPLETION TIMEs. Renumber REQUIRED ACTION C.2.3 to C.2. [Note: an editorial change was made from the original submittal. Originally this was marked to be renumbered as C.2.1, which is not consistent with the Writer's Guide for Improved Standard Technical Specifications.] Remove "movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during" from CONDITION E. Delete REQUIRED ACTION E.1 (excluding note) and associated COMPLETION TIME.

3.6-43 Delete REQUIRED ACTION E.2 and associated COMPLETION TIME. Renumber remaining REQUIRED ACTION and COMPLETION TIME from E.3 to E.1.

3.6-44 Relocate text from page 3.6-44 to 3.6-43 and delete page 3.6-44 (Typist instructions only).

Proposed changes to the following BASES Sections have been included for information only. DAEC will incorporate the appropriate changes to the BASES in accordance with the TS 5.5.10, the TS BASES Control Program.

B 3.3.6.2 Secondary Containment Isolation Instrumentation
B 3.6.4.1 Secondary Containment
B 3.6.4.2 SCIV/Ds
B 3.6.4.3 SBGT System

ENVIRONMENTAL CONSIDERATION

10 CFR Section 51.22(c)(9) identifies certain licensing and regulatory actions which are eligible for categorical exclusion from the requirement to perform an environmental assessment. A proposed amendment to an operating license for a facility requires no environmental assessment if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant hazards consideration; (2) result in a significant change in the types or significant increase in the amounts of any effluents that may be released off site; and (3) result in a significant increase in individual or cumulative occupational radiation exposure. DAEC has reviewed this request and determined that this "selective scope" application of the Alternative Source Term (NUREG-1465) to the Fuel Handling Accident and associated Technical Specification changes meet the eligibility criteria for categorical exclusion set forth in 10 CFR Section 51.22(c)(9). Pursuant to 10 CFR Section 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of the amendment. The basis for this determination follows:

Basis

The change meets the eligibility criteria for categorical exclusion set forth in 10 CFR Section 51.22(c)(9) for the following reasons:

1. As demonstrated in the original submittal (Ref. 1 to this letter), the "full scope" application of the Alternative Source Term and proposed license amendment do not involve a significant hazards consideration. The "full scope" application clearly bounds this "selective scope" application, as the LOCA consequences in the "full scope" application bound those of the Fuel Handling Accident.

2. Adoption of the Alternative Source Term to the Fuel Handling Accident and the associated Technical Specification changes, which implement certain conservative assumptions in the Alternative Source Term analyses, will not result in modifications to the plant or changes in its operation which could alter the type or amount of effluents that may be released offsite beyond those considered in the original Final Environmental Statement.

3. The adoption of the Alternative Source Term does not affect the design or operation of the facility; rather, once the occurrence of a Fuel Handling Accident has been postulated, the Alternative Source Term is an input to evaluate the consequences. The implementation of the Alternative Source Term has been evaluated in revisions to the analyses of the limiting design bases accidents at DAEC, the Fuel Handling Accident being one of these. Based on the results of these analyses, it has been demonstrated that, with the requested Technical Specification changes, the dose consequences of the Fuel Handling Accident are within the regulatory limits of 10 CFR 50.67 and 10 CFR Part 50, Appendix A, General Design Criterion 19. Thus, there will be no significant increase in either individual or cumulative occupational radiation exposure.

Table 3.3.6.2-1 (page 1 of 1)
Secondary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Reactor Vessel Water Level - Low	1,2,3, (a)	2	SR 3.3.6.2.1 SR 3.3.6.2.3 SR 3.3.6.2.4 SR 3.3.6.2.5	≥ 165.6 inches
2. Drywell Pressure - High	1,2,3	2	SR 3.3.6.2.3 SR 3.3.6.2.4 SR 3.3.6.2.5	≤ 2.2 psig
3. Reactor Building Exhaust Shaft - High Radiation	1,2,3, (a),(b)	1	SR 3.3.6.2.2 SR 3.3.6.2.3 SR 3.3.6.2.4 SR 3.3.6.2.5	≤ 12.8 mR/hr
4. Refueling Floor Exhaust Duct - High Radiation	1,2,3, (a),(b)	1	SR 3.3.6.2.2 SR 3.3.6.2.3 SR 3.3.6.2.4 SR 3.3.6.2.5	≤ 10.6 mR/hr

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

~~(b) During CORE ALTERATIONS and during movement of irradiated fuel assemblies in secondary containment.~~

3.6 CONTAINMENT SYSTEMS

3.6.4.1 Secondary Containment

LCO 3.6.4.1 The secondary containment shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
~~During movement of irradiated fuel assemblies in the secondary containment,~~
~~During CORE ALTERATIONS,~~
During Operations with a Potential for Draining the Reactor Vessel (OPDRVs).

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Secondary containment inoperable in MODE 1, 2, or 3.	A.1 Restore secondary containment to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	12 hours 36 hours
C. Secondary containment inoperable during ~~movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during~~ OPDRVs.	C.1 --------NOTE-------- LCO 3.0.3 is not applicable. -------------------- ~~Suspend movement of irradiated fuel assemblies in the secondary containment.~~ ~~AND~~	 Immediately

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~C. (continued)~~	C.2 Suspend CORE ALTERATIONS. AND C.3 Initiate action to suspend OPDRVs.	~~Immediately~~ ~~Immediately~~

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.4.1.1	Verify all secondary containment equipment hatches are closed.	31 days
SR 3.6.4.1.2	------------------NOTE------------------ Doors in high radiation areas may be verified by administrative means. -- Verify that either the outer door(s) or the inner door(s) in each secondary containment access opening are closed.	31 days
SR 3.6.4.1.3	Verify each SBGT subsystem can maintain ≥ 0.25 inch of vacuum water gauge in the secondary containment at a flow rate ≤ 4000 cfm.	24 months on a STAGGERED TEST BASIS

3.6 CONTAINMENT SYSTEMS

3.6.4.2 Secondary Containment Isolation Valves/Dampers (SCIV/Ds)

LCO 3.6.4.2 Each SCIV/D shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
~~During movement of irradiated fuel assemblies in the secondary containment,~~
~~During CORE ALTERATIONS,~~
During Operations with a Potential for Draining the Reactor Vessel (OPDRVs).

ACTIONS

------------------------------------NOTES------------------------------------

1. Penetration flow paths may be unisolated intermittently under administrative controls.

2. Separate Condition entry is allowed for each penetration flow path.

3. Enter applicable Conditions and Required Actions for systems made inoperable by SCIV/Ds.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more penetration flow paths with one SCIV/D inoperable.	A.1	Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve/damper, closed manual valve, or blind flange.	8 hours
	<u>AND</u>		(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A or B not met during ~~movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during~~ OPDRVs.	~~D.1~~ --------NOTE-------- LCO 3.0.3 is not applicable. -------------------- ~~Suspend movement of irradiated fuel assemblies in the secondary containment.~~	Immediately
	~~AND~~	
	~~D.2 Suspend CORE ALTERATIONS.~~	~~Immediately~~
	~~AND~~	
	~~D.3~~ Initiate action to suspend OPDRVs.	~~Immediately~~

3.6 CONTAINMENT SYSTEMS

3.6.4.3 Standby Gas Treatment (SBGT) System

LCO 3.6.4.3 Two SBGT subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
~~During movement of irradiated fuel assemblies in the secondary containment,~~
~~During CORE ALTERATIONS,~~
During Operations with a Potential for Draining the Reactor Vessel (OPDRVs).

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One SBGT subsystem inoperable.	A.1 Restore SBGT subsystem to OPERABLE status.	7 days
B. Required Action and associated Completion Time of Condition A not met in MODE 1, 2, or 3.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	12 hours 36 hours
C. Required Action and associated Completion Time of Condition A not met during ~~movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during~~ OPDRVs.	------------NOTE------------ LCO 3.0.3 is not applicable. ---------------------------- C.1 Place OPERABLE SBGT subsystem in operation. OR	Immediately (continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. (continued)	C.2.1 Suspend movement of irradiated fuel assemblies in secondary containment. AND C.2.2 Suspend CORE ALTERATIONS. AND C.2.3 Initiate action to suspend OPDRVs.	Immediately ~~Immediately~~ ~~Immediately~~
D. Two SBGT subsystems inoperable in MODE 1, 2, or 3.	D.1 Enter LCO 3.0.3.	Immediately
E. Two SBGT subsystems inoperable during movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during OPDRVs.	E.1 --------NOTE--------- LCO 3.0.3 is not applicable. --------------------- Suspend movement of irradiated fuel assemblies in secondary containment. AND	 Immediately (continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~E. (continued)~~	E.2 Suspend CORE ALTERATIONS. AND E.3 Initiate action to suspend OPDRVs.	~~Immediately~~ ~~Immediately~~

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.4.3.1	Operate each SBGT subsystem for ≥ 10 continuous hours with heaters operating.	31 days
SR 3.6.4.3.2	-----------------NOTE------------------- When a SBGT subsystem is placed in an inoperable status solely for the performance of VFTP testing required by this Surveillance <u>on the other subsystem</u>, entry into associated Conditions and Required Actions may be delayed for up to 1 hour. --------------------------------------- Perform required SBGT filter testing in accordance with the Ventilation Filter Testing Program (VFTP).	 In accordance with the VFTP

~~(continued)~~

~~SURVEILLANCE REQUIREMENTS (continued)~~

move to previous page

SURVEILLANCE		FREQUENCY
SR 3.6.4.3.3	Verify each SBGT subsystem actuates on an actual or simulated initiation signal.	24 months
SR 3.6.4.3.4	Verify each SBGT filter cooler bypass damper can be opened and the fan started.	24 months

BASES (continued)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2. Drywell Pressure-High (continued)

dose release. The isolation on high drywell pressure supports actions to ensure that any offsite releases are within the limits calculated in the safety analysis. However, the Drywell Pressure-High Function associated with the isolation is not assumed in any UFSAR accident or transient analyses. It is retained for the overall redundancy and diversity of the secondary containment isolation instrumentation.

High drywell pressure signals are initiated from pressure switches that sense the pressure in the drywell. Four channels of Drywell Pressure-High Functions are available and are required to be OPERABLE to ensure that no single instrument failure can preclude performance of the isolation function.

The Allowable Value was chosen to be the same as the ECCS drywell Pressure-High Function Allowable Value (LCO 3.3.5.1) since this is indicative of a Loss of Coolant Accident (LOCA).

The Drywell Pressure-High Function is required to be OPERABLE in MODES 1, 2, and 3 where considerable energy exists in the RCS; thus, there is a probability of pipe breaks resulting in significant releases of radioactive steam and gas. This Function is not required in MODES 4 and 5 because the probability and consequences of these events are low due to the RCS pressure and temperature limitations of these MODES.

3, 4. Reactor Building Exhaust Shaft and Refueling Floor Exhaust Duct - High Radiation

High secondary containment exhaust radiation is an indication of possible gross failure of the fuel cladding. The release may have originated from the primary containment due to a break in the RCPB ~~or the refueling floor due to a fuel handling accident~~. When Exhaust - High Radiation is detected, secondary containment isolation and actuation of the SBGT System are initiated to limit the release of fission products as assumed in the UFSAR safety analyses (Ref. 3).

(continued)

BASES (continued)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

<u>3, 4. Reactor Building Exhaust Shaft and Refueling Floor Exhaust Duct - High Radiation</u> (continued)

The Exhaust - High Radiation signals are initiated from radiation detectors that are located either in the reactor building exhaust shaft or in the exhaust duct coming from the refueling floor, respectively. The signal from each detector is input to an individual monitor whose trip outputs are assigned to an isolation channel. Two channels of Reactor Building Exhaust Shaft - High Radiation Function and two channels of Refueling Floor Exhaust Duct - High Radiation 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 Reactor Building Exhaust Shaft and Refueling Floor Exhaust Duct - High Radiation Functions are 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 a pipe break is low due to the RCS pressure and temperature limitations of these MODES; thus, these Functions are not required. In addition, the Functions are also required to be OPERABLE during ~~CORE ALTERATIONS,~~ OPDRVs~~,~~ ~~and movement of 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.

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,

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(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.6.2.5 (continued)

Operating experience has shown that these components usually pass the Surveillance when performed at the 24 month Frequency.

REFERENCES

1. UFSAR, Section 6.2.3
2. UFSAR, Chapter 15.
3. UFSAR, Sections 15.6.6 ~~and 15.7.1.~~
4. NEDC-30851P-A Supplement 2, "Technical Specifications Improvement Analysis for BWR Isolation Instrumentation Common to RPS and ECCS Instrumentation," March 1989.
5. NEDC-31677P-A, "Technical Specification Improvement Analysis for BWR Isolation Actuation Instrumentation," July 1990.

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 (SBGT) 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. 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/Dampers (SCIV/Ds)," and LCO 3.6.4.3, "Standby Gas Treatment (SBGT) System."

APPLICABLE SAFETY ANALYSES

~~There are two DBAs for which credit is taken for secondary containment OPERABILITY. These are a~~ The DBA Loss of Coolant Accident (LOCA) takes credit for secondary containment OPERABILITY (Ref. 1) ~~and a fuel handling accident inside secondary containment (Ref. 2)~~. 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

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)	products entrapped within the secondary containment structure will be treated by the SBGT 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 irradiated fuel assemblies in the secondary containment~~.
ACTIONS	A.1 If secondary containment is inoperable, 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

(continued)

BASES

ACTIONS

A.1 (continued)

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.

B.1 and B.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 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, and C.3~~

~~Movement of irradiated fuel assemblies in the secondary containment, CORE ALTERATIONS, and~~ OPDRVs can be postulated to cause fission product release to the secondary containment. In such cases, the secondary containment is the only barrier to the release of fission products to the environment. ~~CORE ALTERATIONS and movement of 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,~~ ~~a~~ 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.

When OPDRVs can occur LCO 3.0.3 is not applicable in MODE 4 or 5. ~~However, since irradiated fuel assembly movement can occur in MODE 1, 2 or 3,~~ Required Action C.1 has 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~~

~~(continued)~~

BASES

ACTIONS C.1, C.2, and C.3 (continued)

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

SURVEILLANCE REQUIREMENTS

SR 3.6.4.1.1 and SR 3.6.4.1.2

Verifying that secondary containment equipment hatches (e.g., the Refueling Floor roof hatch and the HPCI/RCIC room roof hatches) and that either the outer door(s) or the inner door(s) 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. Maintaining secondary containment OPERABILITY requires verifying that either the outer door(s) or the inner door(s) in each access opening are closed. However, each secondary containment access door is normally kept closed, except when the access opening is being used for entry and exit or when maintenance is being performed on an access. 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 (alarmed security/secondary containment doors, frequent plant tours by operations and security personnel and unexplained drops in reactor building to outside atmosphere differential pressure while secondary containment is isolated with SBGT in service). SR 3.6.4.1.2 is modified by a Note that applies to doors located in high radiation areas and allows them to be verified by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted. Therefore, the probability of misalignment of these doors, once they have been verified to be in the proper position, is low.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.4.1.3

The SBGT System exhausts the secondary containment atmosphere to the environment through appropriate treatment equipment. SR 3.6.4.1.3 demonstrates that one SBGT subsystem can maintain ≥ 0.25 inches of vacuum water gauge under calm wind conditions (i.e. less than 15 mph wind speed) at a flow rate ≤ 4000 cfm. This cannot be accomplished if the secondary containment boundary is not intact. Therefore, this test is used to ensure secondary containment boundary integrity. Since this SR is a secondary containment test, it need not be performed with each SBGT subsystem. The SBGT subsystems are tested on a STAGGERED TEST BASIS, however, to ensure that in addition to the requirements of LCO 3.6.4.3, either SBGT subsystem will perform this test, and also to ensure that the secondary containment remains sufficiently leak tight, even with a worst case single failure present (i.e., a lockout relay failure that results in either all of the inboard or all of the outboard SCIV/Ds failing to close). Operating experience has shown these components usually pass the Surveillance when performed at the 24 month Frequency.

Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

REFERENCES

1. UFSAR, Section 15.6.6.

~~2. UFSAR, Section 15.7.1.~~

BASES (continued)

APPLICABLE SAFETY ANALYSES

The SCIV/Ds must be OPERABLE to ensure the secondary containment barrier to fission product releases is established. The principal accident~~s~~ for which the secondary containment boundary is required ~~are~~ is a loss of coolant accident (Ref. 1) ~~and a fuel handling accident inside secondary containment (Ref. 2)~~. The secondary containment performs no active function in response to either of these limiting events, but the boundary established by SCIV/Ds is required to ensure that leakage from the primary containment is processed by the Standby Gas Treatment (SBGT) System before being released to the environment.

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

SCIV/Ds satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

SCIV/Ds form a part of the secondary containment boundary. The SCIV/D 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. A controlled list of Secondary Containment Automatic Isolation Valves/Dampers covered by this LCO, along with their associated stroke times, are listed in Plant Administrative Procedures.

The normally closed isolation valves or blind flanges are considered OPERABLE when manual valves are closed or open in accordance with appropriate administrative controls, automatic SCIV/Ds are de-activated and secured in their closed position, and blind flanges are in place. A blind flange (e.g. - a utility penetration) may be opened, in accordance with applicable administrative procedures, if the secondary containment negative pressure surveillance is performed with an equivalent (or larger) penetration open, with secondary containment still considered OPERABLE.

(continued)

BASES (continued)

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 SCIV/Ds 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 SCIV/Ds 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 assemblies in the secondary containment. Moving irradiated fuel assemblies in the secondary containment may also occur in MODES 1, 2, and 3~~.

ACTIONS

The ACTIONS are modified by three Notes. The first Note allows penetration flow paths to be unisolated intermittently under administrative controls. For isolation devices requiring local operation, 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. For isolation devices that can be operated remotely from the control room, the isolation device handswitch is tagged per plant procedures, identifying that the isolation device is open under administrative control and must be closed should an isolation signal occur. In the event of an isolation signal, plant procedures direct control room operators to verify all automatic actions occur, and to manually initiate those automatic actions that should have occurred but did not. This will ensure the control room operators verify any isolation devices open under administrative control close in response to an isolation signal. If any of the open isolation devices are unable or fail to close automatically, the control room operators will manually close them.

Note 1 also expands upon the allowance of LCO 3.0.5, which would only allow the penetration to be opened for testing, by allowing the penetration to be opened for other operational reasons, such as draining, venting, etc.

(continued)

BASES (continued)

ACTIONS

C.1 and C.2 (continued)

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.

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, Required Action D.1 has 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.

when OPDRVs can occur

SURVEILLANCE REQUIREMENTS

SR 3.6.4.2.1

Verifying that the isolation time of each power operated automatic SCIV/D is within limits is required to demonstrate OPERABILITY. The isolation time test ensures that the SCIV/D will isolate in a time period less than or equal to that assumed in the safety analyses. The Frequency of this SR is 92 days.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.4.2.2

Verifying that each automatic SCIV/D closes on a secondary containment isolation signal is required to prevent leakage of radioactive material from secondary containment following a DBA or which are released during certain operations when primary containment is not required to be OPERABLE or take place outside primary containment. This SR ensures that each automatic SCIV/D will actuate to the isolation position on a secondary containment isolation signal. The LOGIC SYSTEM FUNCTIONAL TEST in LCO 3.3.6.2, "Secondary Containment Isolation Instrumentation," overlaps this SR to provide complete testing of the safety function. The 24 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 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

REFERENCES

1. UFSAR, Section 15.6.6.

~~2. UFSAR, Section 15.7.1.~~

BASES

BACKGROUND (continued)

10 CFR 100 guidelines with an assumed efficiency of 99% for the adsorber. Operation of the fans significantly different from the design flow envelope will change the removal efficiency of the HEPA filters and charcoal adsorbers.

The sizing of the SBGT System equipment and components is based on the results of an infiltration analysis, as well as an exfiltration analysis of the secondary containment. The internal pressure of the SBGT System boundary region is maintained at a negative pressure of at least 0.25 inches water gauge (as determined by averaging pressure readings from different faces of the Secondary Containment boundary) when the system is in operation, which represents an internal pressure that ensures zero exfiltration of air from the building when exposed to calm wind conditions (< 15 mph). Maintaining a negative pressure of 0.25 inches water gauge under calm wind conditions ensures a negative pressure under worst case conditions. Therefore, a negative pressure of 0.25 inches water gauge includes some margin to a negative pressure that ensures zero exfiltration.

The demister 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 SBGT System automatically starts and operates in response to secondary containment isolation 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 SBGT System is to mitigate the consequences of a loss of coolant accident ~~and fuel handling accidents~~ (Ref. 3). For all events analyzed, the SBGT subsystem is shown to be automatically initiated to reduce, via filtration and adsorption, the radioactive material

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

released to the environment. Only one of the two SBGT subsystems is needed to clean up the reactor building atmosphere upon containment isolation.

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

LCO

Following a DBA, a minimum of one SBGT 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 SBGT 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, SBGT 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 SBGT 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 irradiated fuel assemblies in the secondary containment~~.

ACTIONS

A.1

With one SBGT subsystem inoperable, the inoperable subsystem must be restored to OPERABLE status in 7 days. In this Condition, the remaining OPERABLE SBGT 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

(continued)

BASES

ACTIONS

A.1 (continued)

availability of the OPERABLE redundant SBGT subsystem and the low probability of a DBA occurring during this period.

B.1 and B.2

If the SBGT 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 and 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 SBGT 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 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.

(continued)

ACTIONS

C.1, C.2.1, C.2.2, and C.2.3 (continued)

LCO 3.0.3 is not applicable in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, 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 SBGT subsystems are inoperable in MODE 1, 2, or 3, the SBGT 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, E.2, and E.3

When two SBGT 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.

LCO 3.0.3 is not applicable in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, Required Action E.1 has 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

(continued)

BASES

ACTIONS E.1, E.2, and E.3 (continued)

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

SURVEILLANCE REQUIREMENTS

SR 3.6.4.3.1

Operating each SBGT subsystem ensures that both subsystems are OPERABLE and that all associated controls are functioning properly. It also ensures that blockage or fan or motor failure, 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 is sufficient to ensure potential moisture build-up does not impact the adsorption and filtering function. The 31 day Frequency was also developed in consideration of the known reliability of fan motors and controls and the redundancy available in the system, however these components are not the most-limiting for overall system reliability at this SR Frequency. It is not necessary to run the system for the full 10 hours to demonstrate Operability following maintenance, if that maintenance did not affect the filters and charcoal beds.

SR 3.6.4.3.2

This SR verifies that the required SBGT filter testing is performed in accordance with Specification 5.5.7, Ventilation Filter Testing Program (VFTP). The VFTP includes testing HEPA filter performance, charcoal adsorber efficiency, system flow capability, 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.

A Note has been added to this SR delaying the entry into associated Conditions and Required Actions for up to one hour. This is necessary because, due to a cross-tie duct between the two SBGT subsystems, the flow path through the SBGT subsystem not being tested must be isolated, making it inoperable, to establish conditions necessary to ensure the tested SBGT subsystem meets the filter train differential

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.6.4.3.2 (continued)

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pressure requirements of the VFTP. During the testing, the ability to draw a vacuum on Secondary Containment is maintained by the subsystem under test. One hour minimizes the amount of time the SBGT subsystem is inoperable while providing enough time to perform the required testing. Additionally, LCO 3.0.5 provides allowances for post-maintenance testing required to return a SBGT subsystem to Operable status. The allowance provided by the Note avoids potential entry into LCO 3.0.3 (Condition D) during required routine surveillances and during demonstration of Operability for a previously inoperable subsystem under LCO 3.0.5.

SR 3.6.4.3.3

This SR verifies that each SBGT subsystem starts 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 24 month Frequency. The LOGIC SYSTEM FUNCTIONAL TEST in LCO 3.3.6.2, "Secondary Containment Isolation Instrumentation," 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 opened and the fan started. This ensures that the ventilation mode of SBGT System operation is available. This Surveillance can be performed with the reactor at power and operating experience has shown that these components usually pass the Surveillance when performed at the 24 month Frequency. Therefore, the Frequency was found to be acceptable from a reliability standpoint.

~~(continued)~~

~~BASES (continued)~~

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REFERENCES

1. UFSAR. Section 3.1.2.4.12.
2. UFSAR. Section 6.5.3.3.
3. UFSAR. Section 6.2.3.

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