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Your ref: Docket No. 52-006
Our ref: DCP/NRC2102

March 18, 2008

Subject: AP1000 COL Response to Request for Additional Information (TR 122)

Westinghouse is submitting a response to the NRC request for additional information (RAI) on AP1000 Standard Combined License Technical Report 122, APP-GW-GLN-122, "Offsite and Control Room Dose Changes". This RAI response is submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in the response is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

A response is provided for RAI-TR122-SPCV-01 as sent in an email from Billy Gleaves to Sam Adams dated November 27, 2007. This response completes all requests received to date for Technical Report 122.

Pursuant to 10 CFR 50.30(b), the response to the request for additional information on Technical Report 122, is submitted as Enclosure 1 under the attached Oath of Affirmation.

Questions or requests for additional information related to the content and preparation of this response should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,

R. B. Sisk

R. B. Sisk, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

D063
NRO

/Attachment

1. "Oath of Affirmation," dated March 18, 2008

/Enclosure

1. Response to Request for Additional Information on Technical Report No. 122

cc:	B. Gleaves	-	U.S. NRC	1E	1A
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ATTACHMENT 1

"Oath of Affirmation"

ATTACHMENT 1

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of:)

AP1000 Design Certification Amendment Application)

NRC Docket Number 52-006)

APPLICATION FOR REVIEW OF
"AP1000 GENERAL INFORMATION"
FOR DESIGN CERTIFICATION AMENDMENT APPLICATION REVIEW

W. E. Cummins, being duly sworn, states that he is Vice President, Regulatory Affairs and Standardization, for Westinghouse Electric Company; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission this document; that all statements made and matters set forth therein are true and correct to the best of his knowledge, information and belief.

W. E. Cummins
Vice President
Regulatory Affairs and Standardization

Subscribed and sworn to
before me this 18th day
of March 2008.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Patricia S. Aston, Notary Public
Murrysville Boro, Westmoreland County
My Commission Expires July 11, 2011
Member, Pennsylvania Association of Notaries

Notary Public

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ENCLOSURE 1

Response to Request for Additional Information on Technical Report No. 122

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information

RAI Number: RAI-TR122-SPCV-01
Revision: 0

Question:

1) <u>Dose Analysis removed from DC</u>

Westinghouse stated that the analysis was removed because this was not an analysis of a limiting case. [Provide] a summary of the design basis of the VES and VBS including the setpoint at which the transfer from VES to VBS occurs.

2) <u>Control Room Accessibility during accident (11-minute [entry time delay] issue)</u>

10 CFR Part 50, Appendix A, GDC 19, "Control Room" requires adequate radiation protection shall "be provided to permit access and occupancy of the control room under accident conditions."

The AP1000 control room, as revised by TR122, does not seem to provide adequate radiation protection to permit access under accident conditions. Instead access to the control room must be delayed procedurally in order to meet the operator dose limits. Please explain how the AP1000 control room design meets the requirements of GDC 19.

3) <u>Question regarding VES actuation and mixing in the Control Room</u>

[Provide] information on CR vent ducts and some basis for a statement saying that W has found mixing to be sufficient in the CR.

Westinghouse Response:

1) As discussed in Section III of TR122, the VBS operating cases in DCD 6.4.4 were removed in TR122 since they assumed continuing VBS operation, even after a High-2 radioactivity signal is reached, which would result in VES actuation and termination of VBS operation. This is not realistic.

DCD 9.4 and subsection 9.4.1.2.3.1 in particular, describe the operation of the VBS for an event where radioactivity is detected in the main control room (MCR) air supply ducts that requires mitigation actions, and eventual VBS and MCR isolation, and VES actuation.

The VBS normally operates in a mode that provides conditioned outside air to the MCR. If a High-1 radioactivity level is detected in the VBS MCR air supply duct, the VBS automatically shifts into a recirculation / supplemental air filtration mode that pressurizes the MCR with filtered air and recirculates the air.

On a High-2 radioactivity level in the VBS MCR air supply duct or if ac power is unavailable, the MCR is isolated from the VBS and the VES is actuated to pressurize the MCR. (The Technical Specification 3.3.2 set point for the MCR / VBS isolation and VES actuation is 1.0E-6 Ci/m^3 of Dose Equivalent I-131, as identified in Item 20.a of Table 3.3.2-1.)

Therefore, as part of the overall changes made in TR122, it was decided to not report doses for the VBS operating cases since VBS does not continue to operate if a High-2 radioactivity level is detected.

However, while operation with the VBS in operation is not the safety-grade case, the resulting MCR dose considering operation of the VBS in the supplemental air filtration mode does provide indication of the capability of the VBS to address a more realistic event.

Therefore, the DCD will be updated to present the results for the case with the VBS operating for the duration of the accident.

2) The VES and MCR design with the modification described in TR122 to re-direct the passive VES discharge air to purge the MCR access vestibule continues to satisfy both of the GDC 19 design basis requirements, to maintain a safe MCR environment by providing adequate protection of personnel from airborne radioactivity, and to provide access to the MCR complex during an accident. The design accommodates the increased MCR atmospheric dispersion factors (X/Q) identified in TR122 with no change in the VES air flow rate or the system sizing design basis.

The AP1000 VES vestibule purge arrangement provides a dose reduction benefit by diluting the air in the vestibule air with air from the MCR. This is sufficient to satisfy the GDC 19 radioactive dose design criteria.

Therefore, the DCD will be updated to present the results for the case without consideration for an MCR entry time delay.

MCR Entry Time Delay Option

An additional dose reduction benefit for the AP1000 MCR personnel can also be provided by implementing a time delay while passing through the vestibule during MCR entry.

The entry time delay is not onerous to overall plant accident operations, does not adversely impact the accident mitigation capability of the plant and, therefore, does not challenge MCR access requirements as specified in GDC 19.

The entry time delay would be considered only for events that have a high activity release such that MCR habitability would be challenged. In that circumstance, the delay is only useful for MCR entries early in the accident (for no more than 24 hours).

The time delay helps to reduce the vestibule airborne contaminant levels by having the operators wait for a short time period after outside entry into the vestibule, and prior to opening the inside vestibule door into the MCR envelope. The time delay allows the VES purge air flow to reduce the activity concentration in the vestibule atmosphere prior to opening the inside vestibule door and mixing the vestibule air with the MCR envelope air.

The MCR entry time delay process can be bypassed for a specific entry to allow immediate MCR access if necessary, or if meteorological conditions, with respect to the MCR, are favorable.

A time delay of 11 minutes has been identified since it provides a reduction in the vestibule airborne concentration by approximately a factor of five.

The MCR entry time delay process was proposed in TR122 for implementation to take advantage of the AP1000 vestibule purge design feature.

As discussed below, administrative controls contribute to the MCR dose control capability for all nuclear power plants and this entry time delay is an extension of the existing plant administrative controls for MCR entry.

Imposing a time delay for personnel entering the MCR does not violate the requirements of GDC 19 to permit access and occupancy of the control room under accident conditions. GDC 19 requires that the plant design provides access to the MCR and the proposed entry delay does not prevent access since an immediate MCR entry can be made if the situation is warranted.

This potential access control process would not interfere with successful performance of specific operator actions during an accident. The access delay is intended to be applied to individuals accessing the MCR when entering the MCR is not urgent – this is expected to be the case for most, if not all, of the AP1000 MCR access operations.

As discussed in the next section under MCR access control, operating plants satisfy GDC 19 criteria using nonsafety-related MCR access control systems and as discussed in Regulatory Guide 1.196, operating plants also satisfy these criteria with administrative control of the MCR boundary by personnel, including opening of the control room boundary and rapidly closing it when the need for main control room isolation is indicated. Both of these MCR access control methods have the potential to cause some MCR access time delays, as discussed below. Therefore, MCR entry access delay is not a fundamental challenge to the GDC 19 criterion for access and occupancy of the MCR under accident conditions.

The AP1000 design with the vestibule purge configuration fully satisfies the GDC 19 design criteria, with or without credit for the use of the entry time delay. Including this MCR access control process provides additional margin to the GDC 19 dose limit.

<u>MCR Access Control</u>

Administrative controls for MCR access in the AP1000 is essentially equivalent to those at any currently operating nuclear power plant to support the 10CFR73 requirements for physical protection of the plant, which include access control to the MCR area.

Personnel at any plant who must have access to the MCR complex are administratively limited by MCR access control procedures which minimize unnecessary access and intrusions into the MCR and, in particular, prevent unnecessary distractions to MCR operators, especially during accident conditions.

Physical MCR access control to satisfy 10CFR73 at operating plants is typically implemented by the use of a nonsafety-related, computer-based access control system that may, for example, use a keycard or employee identification card entry scheme. This prevents site personnel from entering the MCR unless they have met the administrative MCR access control requirements, have an appropriate need for entry in a given situation, and are those authorized for MCR entry access at that time. These 10CFR73 access control systems are not safety-related access controls.

Regulatory Guide 1.196 recognizes the backup administrative MCR access control provided by the plant personnel that help to protect main control room habitability required by GDC 19. This is discussed in the following excerpt from Section 2.7.2:

> *"...the staff endorses the method of breach control contained in the [Standard Technical Specifications]..., which allows the control room boundary to be opened intermittently under administrative controls. For entry and exit through doors, the administrative control of the opening is performed by the persons entering or exiting the area. For other openings, these controls consist of stationing a dedicated individual at the opening who is in continuous communication with the control room. This individual will have a method to rapidly close the opening when a need for control room isolation is indicated."*

Technical Specification Traveler Form (TSTF) 448 provides the Standard Technical Specification changes that are help to assure conformance with Regulatory Guide 1.196.

For the AP1000 Generic Technical Specifications, there is a note for LCO 3.7.6 that explicitly incorporates the exception in the equivalent TS 3.7.10 of NUREG-1431, Revision 2. The AP1000 note states that "the MCR boundary may be opened intermittently under administrative control." This reinforces the staff position that MCR access and conformance with GDC 19 credits administrative controls provided by plant personnel to allow MCR access, beyond those provided by the nonsafety-related MCR access control system. The manual operator access control process would include confirmation that personnel requesting MCR access have the need for access under accident conditions.

As part of the administrative MCR access controls, authorized MCR personnel are thoroughly trained in the MCR access procedures, particularly accident condition entry, and they are also specifically trained to recognize and to be alert to conditions that potentially challenge MCR habitability and the plant notification scheme when MCR envelope habitability is challenged.

The same types of administrative controls and operator alerting schemes will be used in AP1000 that are followed in current plants so that operators understand the specific plant accident conditions and are appropriately sensitive to the need to maintain the MCR envelope boundary integrity for an event.

This is particularly important for situations where the existence of a high radioactivity release requires all other site personnel to evacuate or to take appropriate radiological protection actions. The AP1000 response is expected to be equivalent to operating plants.

The entry time delay to the AP1000 MCR access procedures is not considered to be fundamental change in either the MCR access dependence on plant administrative ~~controls and~~controls and procedures, or the need for proper and complete plant personnel compliance with these procedures in order to meet the requirements of GDC 19.

Accident Timing for MCR Access

Event timing and the relative need to perform specific operator actions are two other important considerations in evaluating the operational impact of the entry time delay.

It is unlikely that the MCR entry time delay would have an adverse impact on MCR staffing and/or on successful completion of important accident mitigation operator actions. The COL entry time delay operational guidance would be expected to allow operators to bypass the time delay if it potentially challenged successful completion of accident mitigation actions.

The preliminary assessment of the need for and timing of MCR access considered two aspects, specific Emergency Operating Procedure (EOP) and other accident mitigation procedure operator actions and access requirements related to MCR staffing requirements.

As discussed in DCD 7.5.3.1, there are no specific preplanned, manually-controlled actions for safety-related systems to mitigate design basis events in the AP1000 design. Therefore, there is no associated need for priority AP1000 MCR access for those actions.

Several relevant AP1000 EOPs were briefly reviewed for the purpose of identifying steps that required MCR entry, and there are no actions requiring MCR access from outside for the identified EOPs that were reviewed, which include:

- E-1, Loss of Reactor or Secondary Coolant
- E-3, Steam Generator Tube Rupture
- FR-Z.3, Response to High Containment Vessel Radiation
- SDP-3, Response to High Containment Radiation During Shutdown

The AP1000 Abnormal Operating Procedure for High Radiation will direct MCR operator actions following VES actuation and will identify if and when the MCR entry time delay would be implemented.

The plant staff personnel are grouped into three categories – shift staff personnel, backup shift emergency support personnel, and other miscellaneous plant personnel.

In general for these three groups, there are no priority EOP accident mitigation actions that have to be performed by these personnel, and their MCR entry is generally expected before the potential for MCR isolation would occur following an accident that would result in MCR isolation. There may be priority MCR access needs related to specific plant shift staff assignments that are not directly related to specific accident mitigation actions.

The Shift Technical Advisor (STA) may be required by plant operational staffing policy to report to the control room within a specified time (for example, within 10 minutes or so) from the transition from EOP E-0 to E-1, in the event of a plant Loss-of-Coolant Accident (LOCA). The STA may or may not be in the MCR when the accident occurs.

For the EOP transition from E-0 to E-3 following a steam generator tube rupture, the STA would be required to enter the MCR.

These two EOP transitions and the associated MCR entries would be made before any site radioactivity levels initiate MCR isolation.

If the Shift Manager is outside of the Main Control Room when the event occurs, the Shift Manager would need to access the MCR to support and direct the crew's actions, to ascertain plant conditions to make the appropriate Emergency Action Level declarations, and to make the timely responses to the NRC and state agencies.

Only a limited number of emergency personnel would be reporting to the MCR, which would include some backup operators to support MCR personnel as communicators, additional operators, and as otherwise directed by the Emergency Plan. Additional outside support, which could include auxiliary operators and radiological technicians, would report to a muster area and would not require accident MCR access.

Other miscellaneous plant staff personnel who may require MCR entry could include the plant operations manager, other plant staff managers, and the NRC resident inspector(s). The need for immediate MCR access is less likely for this group of personnel.

Conclusion

The VES and MCR design satisfies the GDC 19 design basis requirements to provide radiation protection of MCR personnel and to provide access to the MCR complex during an accident.

The implementation of the vestibule purge design satisfies the requirements of GDC 19 with or without implementation of an MCR entry delay time.

The DCD markups showing dose without credit for the MCR entry time delay are provided in the TR122 markups below.

Implementation of an entry time delay for MCR provides a beneficial MCR dose reduction that increases the plant margin to the GDC 19 radioactivity limit. The delay:

- Would only be used for the first 24 hours or less during an accident with high activity releases
- Does not prevent personnel MCR access during an accident
- Does not adversely impact the operators' capabilities to successfully implement accident mitigation actions
- Can easily be integrated with the existing administrative MCR access controls
- Can be bypassed for MCR entry if the circumstances dictate this need

3) The MCR design provides active air circulation and mixing when the VBS is operating and passive air circulation and mixing following VBS / MCR isolation and VES actuation.

DCD 6.4 describes the MCR habitability system's use of the air damper discharge flow to purge the MCR access vestibule purge has no adverse impact on MCR air circulation and mixing. This design provides two air circulation benefits through more centralized air discharge and by no longer having air damper inlet flow pass through the main control area of the MCR envelope, where most of the MCR operators are expected to be working.

VES Design

The VES delivers the required air flow to the MCR to meet the design basis ventilation and pressurization requirements for 72 hours, based on the performance requirements of DCD subsection 6.4.1.1.

The VES air pressurization is sufficient to purge the MCR envelope and to maintain the carbon dioxide levels below 0.5 percent concentration for the occupants, and to maintain air quality within the guidelines of ASHRAE Standard 62-1989, as specified in DCD 6.4.3.2.

The VES design considers the impact on MCR personnel and MCR envelope habitability from three potential airborne contamination effects.

- The VES air pressurization provides dilution of any airborne contaminants that entered the MCR envelope prior to isolation of the MCR and actuation of the VES air pressurization.
- The VES air pressurization prevents contaminated outside air from entering the MCR envelope due to leaks in the MCR envelope boundaries by establishing a positive pressure in the MCR.
- MCR envelope access (entry and exit) operations during an event result in the mixing of some of the entry vestibule air with the air in the MCR envelope operations work area each time the vestibule inside door to the MCR is opened.

Following VES actuation, MCR access is only permitted via the entry vestibule. The door to the remote shutdown room is administratively controlled so that MCR entry and exit access is not permitted through this door.

Background Information - MCR Air Circulation / Mixing / In-Leakage

Following termination of active HVAC equipment operation, isolation of the MCR envelope, and VES actuation and pressurization of the MCR envelope, there are three primary passive mechanisms that contribute to internal air movement, circulation, and mixing:

a. Air Circulation - VES Pressurization

The VES pressurization contributes to a general air movement driven by the differential pressure between the VES air supply discharge point and purge point from the MCR envelope at the inlet opening to the air dampers (and to a much smaller extent at the inlets to small cracks or other leakage openings in the MCR envelope boundaries, including MCR door seals)

b. Air Circulation - Convection Cooling

The second passive air circulation and mixing mechanism is due to passive air cooling via convective air circulation resulting from the MCR layout and structural design. As discussed in DCD 3.8.4.1.2, the passive MCR cooling design includes a finned-ceiling module configuration that along with the cooler MCR walls and floors, provides cooling of the room air within the MCR.

The convection air flow movement results from the buoyant thermal air currents established by heat sources within the room, which cause the warmed air to rise toward the ceiling, become passively cooled by the ceiling [heat transfer cooling] fins. Then it moves back down along the cooler MCR envelope exterior walls, where additional cooling can occur, providing an overall natural air circulation and mixing path.

The natural convection air flow within the main control area results from having workstations and other electronic equipment heat sources at relatively low MCR elevations.

c. Air Circulation - Physical Personnel Movement

The third passive air circulation and mixing mechanism is physical movement within the MCR complex, which provides localized mixing as personnel move around the room and within the MCR complex from one room to another, opening and closing non-boundary interior doors, and any other motions that cause air drafts or movement.

Conclusion

The passive VES provides sufficient post-accident air purging, circulation and mixing, to satisfy the requirements of GDC 19. The design described in TR122 has no adverse impacts on MCR air circulation and mixing and provides a benefit through improved balancing of the passive VES pressurization air flow within the MCR envelope.

Design Control Document (DCD) Revision:

See the DCD markups to Revision 16 that are provided as revisions to TR122 below, in a new Attachment B to TR122, that updates the VBS operating cases from Item 1) and removes credit for the MCR entry time delay from Item 2).

PRA Revision:

None

Technical Report (TR) Revision:

The text in TR122 will be revised in Sections II and III to address removing credit in the dose calculation for an MCR entry time delay and to add the VBS operating case.

Attachment A to TR122 (Revisions 0 and 1) includes the DCD markups to support the information provided in DCD Revision 16.

Attachment B to TR122 Revision 1 will be added to include the markups to Revision 16 of the DCD to remove credit in the dose calculation for an MCR entry time delay and to add the VBS operating case.

II. TECHNICAL DESCRIPTION AND JUSTIFICATION

BACKGROUND

Main Control Room Emergency Habitability System (VES) Purge Design Change [pg 6 of 30]

This configuration change uses the main control room purge air flow to provide a continuous purge of the vestibule area. -aAfter the relatively clean air leaves the main control room, and direct this the air passes through the vestibule before it is discharged to the outside atmosphere. This effectively maintains the vestibule air space at the same activity concentration as that in the main control room.

OnceWhen plant personnel enter the vestibule from the outside prior to entering the main control room, there is assumed to be an incursion of contaminated air into the vestibule. With the purge flow acting to reduce the activity in the vestibule, there would be an additional dose benefit if they personnel weremay be directed to wait for some specified period of time to allow in the event of high radioactivity for the vestibule purge flow to reduce vestibule radioactivity levels. (Note that the design basis LOCA dose analysesis do not assumes that, credit for any entry time delay.during the first 24 hours post accident, However, if personnel entering the main control room would spend approximately 11 minutes in the entry vestibule to allow the purge to dilute the vestibule radioactivity, this would to reduce the air concentration by a factor of five. This results in the reduction in unfiltered inleakage to the main control room from the 5 cfm associated with no vestibule purge to 0.531 cfm. With no credit for a waiting period in the vestibule, the effective unfiltered inleakage is 2.654 cfm.) The personnel couldmay also be directed to use portable equipment to monitor airborne levels and wait for specified levels or activity reductions to be reached prior to opening the main control room access door. Depending on the access frequency and outside airborne radioactivity levels, these access requirements could potentially be variedy and relaxations could be made at lower outside radioactivity levels.

Therefore, the improvement to provide the vestibule purge, supplemented by main control room access procedures during a radioactivity release event, will help to reduce the radioactivity levels in the main control room and the control room dose for a plant accident with no required change in the VES storage tank capacity.

III. DCD MARK-UP

See the attached DCD markup pages in Attachment A.

The DCD dose calculations in DCD 6.4.4 were updated in TR122 Revision 0 to identify a single bounding main control room accident dose for each event. For these events, the Nuclear Island Nonradioactive Ventilation System (VBS) is assumed to initially operate without credit for air filtration (which maximizes main control room radioactivity inputs) for these accidents until the VBS is isolated and the VES is actuated. The VES operation maintains acceptable main control room doses with or without credit for VBS operation.

The VBS operating cases in DCD 6.4.4 were removed in TR122 Revision 0 since they assumed continuing VBS operation after VES actuation, which is not realistic based on actual VBS operation. The VBS normally operates in a mode that provides conditioned outside air to the main control room. If high radioactivity is detected in the VBS main control room air supply duct, the VBS automatically shifts into a recirculation / supplemental air filtration mode that pressurizes the main control room. On a high-high radioactivity in the VBS main control room air supply duct or if ac power is unavailable, the main control room is isolated from the VBS and the VES is actuated to pressurize the main control room. Therefore, it is unnecessary to evaluate doses for the second set of VBS operating cases since VBS does not operate in parallel with VES.

However, the DCD markups in Attachment B of TR122 Revision 1 update the DCD Revision 16 to present the results for a case with the VBS operating, as discussed in the DCD markup.

TR122 Attachment B

Markups of DCD Revision 16 for TR122 Revision 1

6. Tier 2, DCD 6.4.4, pgs 6.4-8 and 6.4-9

6.4.4 System Safety Evaluation

In the event of an accident involving the release of radioactivity to the environment, the nuclear island nonradioactive ventilation system (VBS) is expected to switch from the normal operating mode to the supplemental air filtration mode to protect the main control room personnel. Although the VBS is not a nonsafety--related system, it is expected to be available to provide the necessary protection for realistic events. However, the accident doses were calculated based on operation of the safety related emergency habitability system (VES), which is relied upon to limit the amount of activity the personnel are exposed to. Doses were determined for the following design basis accidents: However, the design basis accident doses reported in Chapter 15 utilize highly conservative assumptions and the main control room doses were calculated based on operation of the safety-related emergency habitability system (VES) since this is the system which is relied upon to limit the amount of activity the personnel are exposed to. The analyses assume that the VBS is initially in operation but fails to enter the supplemental air filtration mode on a High-1 radioactivity indication in the main control room atmosphere. VES operation is then assumed to be initiated once the High-2 level for control room atmosphere activity is reached.

Doses were also calculated assuming that the VBS does operate in the supplemental air filtration mode as designed, but with no switchover to VES operation, despite the fact that the High-2 radioactivity level would be exceeded for the design basis accidents. This VBS operating case demonstrates the defense-in-depth that is provided by the system and also shows that, in the event of an accident with more realistic assumptions, the VBS would be more than adequate to protect the control room operators without depending on VES operation.

Doses were determined for the following design basis:

	VES Operating	VBS Operating
Large Break LOCA	3.5~~0~~ rem TEDE	4.1 rem TEDE
Fuel Handling Accident	3.1 rem TEDE	1.6 rem TEDE
Steam Generator Tube Rupture		
(Pre-existing iodine spike)	4.8 rem TEDE	3.4 rem TEDE
(Accident-initiated iodine spike)	2.1 rem TEDE	1.8 rem TEDE
Steam Line Break		
(Pre-existing iodine spike)	3.4 rem TEDE	2.1 rem TEDE
(Accident-initiated iodine spike)	3.7 rem TEDE	4.9 rem TEDE
Rod Ejection Accident	2.5~~3~~ rem TEDE	1.8 rem TEDE
Locked Rotor Accident		
(Accident without feedwater available)	0.9 rem TEDE	0.9 rem TEDE
(Accident with feedwater available)	0.7 rem TEDE	1.6 rem TEDE
Small Line Break Outside Containment	1.4 rem TEDE	0.3 rem TEDE

15. Tier 2, DCD 15.6.5.3.5, pg 15.6-22

15.6.5.3.5 Main Control Room Dose Model

The main control room is accessed by a vestibule entrance, which restricts the volume of contaminated air that can enter the main control room from ingress and egress. The design of the emergency habitability system (VES) provides 65 cfm ±5 cfm to the control room and maintains it in a pressurized state. The path for the purge flow out of the main control room is through the vestibule entrance and this results in a dilution of the activity in the vestibule and a reduction in the amount of activity that might enter the main control room. Without this purge through the vestibule, the projected unfiltered inleakage into the main control room is 5 cfm. ~~However, t~~The impact of the purge flow is to reduce the effective unfiltered inleakage rate to 2.654 cfm. ~~Additionally, during the first 24 hours following the LOCA, personnel entering the control room will be required to wait inside the vestibule for a short period of time until the activity concentration is reduced by a factor of five or more. This reduces the effective unfiltered inleakage rate to 0.531 cfm. Conservatively, assuming a purge flow of only 55 cfm through the vestibule, the factor of five reduction in activity concentration would be achieved in less than 11 minutes.~~

19. Tier 2, DCD Table 15.6.5-2 (Sheet 2 of 3), pg 15.6-64

Table 15.6.5-2

• Effective unfiltered inleakage via ingress/egress (cfm)	~~5.0~~2.654
~~• 0 - 24 hr~~	~~0.531~~
~~• > 24 hr~~	~~2.654~~

20. Tier 2, DCD Table 15.6.5-3, pg 15.6-66

Table 15.6.5-3

Main control room dose (emergency habitability system in operation)	
– Airborne activity entering the main control room	3.30~~2.8~~ rem
– Direct radiation from adjacent structures	0.15 rem
– Sky-shine	0.01 rem
– Total	3.46~~2.96~~ rem