13 CONDUCT OF OPERATIONS

13.1 Organizational Structure of the Applicant

In Design Control Document (DCD) Tier 2 Section 13.1, the applicant states that the organizational structure is the responsibility of the Combined License (COL) applicant. The applicant further states that the organizational structure should be consistent with the human system interface. The staff's evaluation of this matter is discussed in Sections 18.2, 18.6, and 18.10 of this report. In DCD Tier 2 Section 13.1.1, the applicant includes a statement that a COL applicant referencing the AP1000 certified design will address the adequacy of the organizational structure. Therefore, this item is acceptably addressed.

13.2 Training

In DCD Tier 2 Section 13.2, the applicant states that training programs are the responsibility of the COL applicant. Westinghouse further references WCAP-14655, which describes the input from the designer on the training of operations personnel who participate as subjects in the human factors engineering verification and validation. The staff's evaluation of this matter is discussed in Section 18.10 of this report. In DCD Tier 2 Section 13.2.1, the applicant includes a statement that a COL applicant referencing the AP1000 certified design will develop and implement training programs for plant personnel. Therefore, this item is acceptably addressed.

13.3 Emergency Planning

13.3.1 Introduction

The staff reviewed DCD Tier 2 Section 13.3, "Emergency Planning." The staff requested additional information (RAI) from the applicant (RAI 472.001, 472.002, and 472.003) in a letter dated September 19, 2002, and further additional information (RAI 472.003, Revision 1) in a letter dated April 9, 2003. The applicant responded to the initial request for additional information in a letter dated October 2, 2002, and to the subsequent RAI in an email on April 11, 2003.

The staff's review of DCD Tier 2 Section 13.3 and the applicant's response to the RAIs resulted in one COL action item and two open items for emergency planning information contained in the AP1000 DCD, Revision 3. The COL action item is associated with the programmatic responsibility of a COL applicant for emergency planning. The two open items are associated with technical support center (TSC) habitability, and relocation of TSC functions to the emergency operations facility (EOF) upon loss of TSC habitability.

The AP600 Final Safety Evaluation Report (FSER) reflected the NUREG-0737 PASS criteria as a COL action item. Subsequently, on October 31, 2000, the NRC published the Model Safety Evaluation (65 FR 65018), which eliminated the PASS criteria for emergency planning. The

Model Safety Evaluation, as it applies to the AP1000 DCD, is discussed in Section 13.3.3.4.1 of this report.

13.3.2 Emergency Planning Responsibilities

The following regulations, guidance, and standards apply to emergency planning responsibilities.

The requirements of 10 CFR 52.79(d) specify that a COL application contain emergency plans, which provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at the site. The requirements of 10 CFR 52.79(b) state that the COL application must contain the technically relevant information required of applicants for an operating license by 10 CFR 50.34. The requirements of 10 CFR 50.34(b)(6)(v) state that the COL application shall include information concerning facility operation, including plans for coping with emergencies, which shall include the items specified in Appendix E to 10 CFR Part 50. The requirements of 10 CFR 50.34(f)(2) specify that the COL applicant shall provide sufficient information to demonstrate that various required actions will be satisfactorily completed by the operating license stage. Specifically, 10 CFR 50.34(f)(2)(viii) requires a capability to promptly obtain and analyze samples from the reactor coolant system and containment that may contain accident source term radioactive materials, while ensuring that no individual receives radiation exposure in excess of 0.05 Sv (5 rem) to the whole body or 0.5 Sv (50 rem) to the extremities. In addition, 10 CFR 50.34(f)(2)(xxv) requires that the COL applicant shall provide an onsite TSC and onsite operational support center (OSC). Finally, the COL applicant must comply with the applicable requirements of 10 CFR 50.47, “Emergency Plans.” Compliance with these regulations is determined by utilizing the guidance criteria of Regulatory Guide (RG) 1.101, “Emergency Planning and Preparedness for Nuclear Power Reactors (Revision 3, August 1992), which endorses Revision 1 of NUREG-0654/FEMA-REP-1, “Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants (Revision 1, November 1980), and through it NUREG-0696, “Functional Criteria for Emergency Response Facilities-Final Report (February 1981), NUREG-0737, and Supplement 1 to NUREG-0737, “Clarification of TMI Action Plan Requirements-Requirements for Emergency Response Capability” (Generic Letter 82-33, December 17, 1982) .

DCD Tier 2 Section 13.3 indicates that emergency planning is the responsibility of the COL applicant. Additionally, it states that communication interfaces among the main control room (MCR), the TSC, and the emergency planning centers are the responsibility of the COL applicant.

The staff agrees that emergency planning (EP) will be addressed by the COL applicant referencing the AP1000 design, and EP information submitted in the application will significantly depend on plant- and site-specific characteristics. Emergency planning is basically comprised of facilities, equipment, personnel and training. The majority of EP requirements are programmatic in nature, rather than addressing physical facilities and equipment. Those aspects of physical facilities and equipment associated with emergency planning that should be

considered in the standard design are addressed below. In DCD Tier 2 Section 13.3.1, "Combined License Information Item," the following COL action item is included.

> Combined License applicants referencing the AP1000 certified design will address emergency planning including post-72 hour actions and its communication interface.

This is COL Action Item 13.3-1.

The reference to post-72 hour actions is associated with the 72-hour battery bank (i.e., second battery bank in Divisions B and C), which is used for loads requiring power for 72 hours following an event of loss of all ac power sources concurrent with a design basis accident. The staff finds that this is acceptable, in that it complies with the requirements set forth in 10 CFR 52.79(d) and the applicable portions of 10 CFR Part 50. It is consistent with the extent to which certain emergency planning design features, facilities, functions, and equipment are more appropriately addressed by the COL applicant.

13.3.3 TSC/Operational Support Center (OSC)/Decontamination Facility

Although many aspects of emergency planning will be addressed by the COL applicant, certain design features, facilities, functions, and equipment necessary for emergency planning must be considered in the standard design. Specifically, in accordance with 10 CFR 50.34(f)(2)(xxv), the standard design must address the characteristics of the onsite TSC and OSC. The design should include adequate emergency facilities and equipment to support emergency response, in accordance with 10 CFR 50.47(b)(8) and Subsection IV.E.8 of Appendix E to 10 CFR Part 50. The design should also include an onsite decontamination facility, in accordance with 10 CFR 50.47(b)(11) and Subsection IV.E.3 of Appendix E to 10 CFR Part 50, to provide the capability for controlling radiological exposures and providing decontamination facilities for onsite individuals, respectively.

In addition, 10 CFR 50.47(b)(9) requires adequate methods, systems, and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency condition; 10 CFR 50.47(b)(11) requires the establishment of the means for controlling radiological exposures to emergency workers; and 10 CFR 50.34(f)(2)(viii) requires that the standard design must provide the capability to promptly obtain and analyze samples from the reactor coolant system and containment, which may contain accident source term radioactive materials, without radiation exposure to any individual exceeding 0.05 Sv (5 rem) to the whole body or 0.5 Sv (50 rem) to the extremities.

Compliance with these regulations is determined utilizing the guidance criteria in RG 1.101, which endorses Revision 1 of NUREG-0654/FEMA-REP-1, and through it NUREG-0696, NUREG-0737, and Supplement 1 to NUREG-0737.

13.3.3.1 General Description of Facilities

The mission and major tasks of the TSC and OSC for the AP1000 standard design are provided in DCD Tier 2 Section 18.8.3.5, “Technical Support Center Mission and Major Tasks,” and Section 18.8.3.6, “Operational Support Center Mission and Major Tasks,” respectively. The TSC and OSC are in different locations in the annex building. The TSC is located in the annex building at Elevation 117'6", adjacent to the passage from the annex building to the nuclear island control room, as shown in DCD Tier 2 Figure 1.2-19, “Annex Building General Arrangement Plan at Elevation 117'6" & 126'-3".” The TSC is identified as the Main TSC Operations Area (Room 40403). The OSC location is identified as the ALARA [as low as is reasonably achievable] Briefing Room & Operational Support Center (Room 40318), and is shown as such in the DCD Tier 2 Figure 1.2-18, “Annex Building General Arrangement Plan at Elevation 100'-0" & 107'-2".”

In RAI 472.002, the applicant was asked to explain why no decontamination facilities were depicted in Figure 1.2-18, which showed the hot machine shop, while DCD Tier 2 Section 1.2.5, “Annex Building,” indicated that the hot machine shop includes decontamination facilities. In its response the applicant stated that the hot machine shop (Room 40358) will include a variety of equipment for servicing radiologically controlled area equipment, including a lathe, a power hacksaw and power band saw. Also included will be a permanent diked decontamination basin with a grating support floor, connected to the radioactive waste drain system for cleaning contaminated components. The hot machine shop will also contain a “portable decontamination system,” which will be purchased by the COL holder to specifications of their choosing. Personnel decontamination will be performed in a separate decontamination room (Room 40355), which will include two personnel showers and two sinks connected to the radioactive liquid waste system.

The staff concludes that the information provided in the DCD pertaining to the TSC, OSC and decontamination room, is consistent with the guidance criteria in RG 1.101, which endorses Revision 1 of NUREG-0654/FEMA-REP-1, and through it NUREG-0696, NUREG-0737, and Supplement 1 to NUREG-0737. As such, the staff finds this meets the requirements of 10 CFR 50.34(f)(2)(xxv), 10 CFR 50.47(b)(8), 10 CFR 50.47(b)(11), and Subsections IV.E.3 and IV.E.8 of Appendix E to 10 CFR Part 50.

13.3.3.2 Technical Support Center Size

The guidance of section H.1 of NUREG-0654/FEMA-REP-1, Revision 1, calls for the establishment of a TSC in accordance with NUREG-0696, “Functional Criteria for Emergency Response Facilities.” NUREG-0696 states that the TSC shall be large enough to provide working space, without crowding, for the personnel assigned to the TSC at the maximum level of occupancy. Specifically, the TSC working space shall be sized for a minimum of 25 persons, with a minimum working space of approximately 7 square meters (75 square feet) per person. Sufficient space for equipment and storage, and to perform certain repair and other TSC-related activities, is also called for. In addition, Paragraph 8.2.1.c of Supplement 1 to NUREG-0737, which is consistent with NUREG-0696, states that the TSC will be sufficient to

accommodate and support NRC and licensee predesignated personnel, equipment and documentation in the center.

The design considerations for the TSC are described in DCD Tier 2 Section 18.8.3.5, where the applicant states that the size of the TSC complies with the size criteria of NUREG-0696. DCD Tier 2 Section 9.4.1.2.1.1, "Main Control Room/Technical Support Center HVAC [heating, ventilation and air conditioning] Subsystem," further states that the TSC areas consist of the main technical support center operations area, conference rooms, NRC room, computer rooms, shift turnover room, kitchen/rest area, and restrooms.

The staff concludes that this information is consistent with guidance criteria in RG 1.101, which endorses Revision 1 of NUREG-0654/FEMA-REP-1, and through it NUREG-0696, NUREG-0737, and Supplement 1 to NUREG-0737. Specifically, it conforms with the size specifications of NUREG-0696, and is sufficient to accommodate and support NRC and licensee predesignated personnel, equipment and documentation, in conformance with Supplement 1 to NUREG-0737. As such, the staff finds that this information meets the requirements of 10 CFR 50.47(b)(8) and Subsection IV.E.8 of Appendix E to 10 CFR Part 50, and is, therefore, acceptable.

13.3.3.3 Technical Support Center Habitability

In DCD Tier 2 Section 18.8.3.5, the applicant states that, consistent with NUREG-0737, the TSC has no emergency habitability requirements. In addition, it states that the TSC complies with the habitability requirements of Supplement 1 to NUREG-0737, "Clarification of Three Mile Island (TMI) Action Plan Requirements–Requirements for Emergency Response Capability," when electrical power is available. Paragraph 8.2.1.f of Supplement 1 to NUREG-0737 calls for the TSC to be provided with:

> . . . radiological protection and monitoring equipment necessary to assure that radiation exposure to any person working in the TSC would not exceed 5 rem [0.05 Sv] whole body, or its equivalent to any part of the body, for the duration of the accident.

Item II.B.2 of NUREG-0737 states that the TSC is considered vital after an accident, and that the design dose rate for personnel in a vital area should be such that the guidelines of General Design Criteria (GDC) 19 will not be exceeded during the course of an accident. In addition, GDC 19 requires that adequate radiation protection be provided, such that the dose to personnel should not be in excess of 0.05 Sv (5 rem) whole body, or its equivalent to any part of the body for the duration of the accident. More detailed criteria for emergency plans, design, and functional criteria for emergency response facilities are provided in NUREG-0696, including the following habitability criteria for the TSC in Section 2.6 of NUREG-0696.

> Since the TSC is to provide direct management and technical support to the control room during an accident, it shall have the same radiological habitability as the control room under accident conditions. TSC personnel shall be protected from radiological hazards, including direct radiation and airborne radioactivity from inplant sources under accident conditions, to the same degree as control room personnel. Applicable criteria

> are specified in General Design Criterion 19; Standard Review Plan 6.4; and NUREG-0737, "Clarification of TMI Action Plan Requirements," Item II.B.2. The TSC ventilation system shall function in a manner comparable to the control room ventilation system. . .. A TSC ventilation system that includes high-efficiency particulate air (HEPA) and charcoal filters is needed, as a minimum. . . . If the TSC becomes uninhabitable, the TSC plant management function shall be transferred to the control room.

13.3.3.3.1 TSC Ventilation System

In DCD Tier 2 Section 18.8.3.5, the applicant states the following in regard to habitability related systems, and their operation under various conditions.

> When a source of ac power is available, the nuclear island nonradioactive ventilation system (VBS) provides HVAC service to the main control room and the TSC during normal and abnormal conditions. The VBS and its support systems provide these functions in a reliable and failure tolerant fashion. If offsite power is not available, backup power is automatically provided by either of the two nonsafety-related diesels within the onsite standby power system. Subsection [DCD Tier 2 Section] 9.4.1 provides additional design details of the VBS.
>
> The VBS system provides for cooling, heating, humidity control, filtration, (HEPA and charcoal), and pressurization following design basis accidents except for a station blackout (loss of nonsafety-related ac power, including the nonsafety-related diesels). If nonsafety-related ac power is not available, including the diesels, the habitability of the main control [room] is provided by the main control room emergency habitability system (VES) as discussed in Section 6.4. Although the TSC is not supplied by either the VBS or the VES during a station blackout, it still remains habitable. The doors to the TSC can be opened to aid with ventilation and control of room temperature for the two hours that the workstations continue to operate. The TSC workstations are powered from the non-Class 1E uninterruptable [sic] power supplies, therefore plant monitoring capability from the TSC exists for two hours following a station blackout.
>
> Should habitability be challenged within the TSC due to lack of cooling or a high radiation level resulting from a beyond-design-basis accident, the TSC personnel and the functions of the TSC are transferred to the emergency operations facility (EOF) where habitability is not dependent on plant systems and with communication and data transfer links to the main control room to provide essential exchange of information.

In DCD Tier 2 Section 6.4, "Habitability Systems," the applicant states the following, in part:

> The habitability systems are a set of individual systems that collectively provide the habitability functions for the plant. The systems that make up the habitability systems are the:
>
> - Nuclear island nonradioactive ventilation system (VBS)
> - Main control room emergency habitability system (VES)

> When a source of ac power is available, the nuclear island nonradioactive ventilation system (VBS) provides normal and abnormal HVAC service to the main control room (MCR), technical support center (TSC), instrumentation and control rooms, dc equipment rooms, battery rooms, and the nuclear island nonradioactive ventilation system equipment room as described in subsection [DCD Tier 2 Section] 9.4.1.
>
> When a source of ac power is not available to operate the nuclear island nonradioactive ventilation system or radioactivity is detected in the MCR air supply, which could lead to exceeding General Design Criterion 19 operator dose limits, the main control room emergency habitability system (VES) is capable of providing emergency ventilation and pressurization for the main control room.

Further, DCD Tier 2 Section 6.4.3.2, "Emergency Mode," provides, in part:

> Automatic transfer of habitability system functions from the nuclear island nonradioactive ventilation system to the main control room emergency habitability system is accomplished by the receipt of one of two signals:
>
> - "High-high" particulate or iodine radioactivity in MCR air supply
> - Loss of ac power sources

The VBS serves the TSC. DCD Tier 2 Section 9.4.1.1.2, "Power Generation Design Basis," states that the VBS provides the following functions:

- Controls the MCR and TSC relative humidity between 25 to 60 percent;
- Maintains the MCR and TSC at a slightly positive pressure during normal operations;
- Isolates the MCR and/or TSC from normal outdoor air intake, and provides filtered outdoor air to pressurize the MCR and TSC when a high gaseous radioactive concentration is detected in the MCR supply air duct;
- Isolates the MCR and/or TSC when a high concentration of smoke is detected in the outside air intake; and
- Provides smoke removal capability for the MCR and TSC.

DCD Tier 2 Section 9.4.1.2.2, "Component Description," indicates that the VBS components include low efficiency filters, high efficiency filters, and postfilters; HEPA filters; charcoal adsorbers; and isolation dampers. DCD Tier 2 Section 9.4.1.2.3.1, "Main Control Room/Technical Support Center HVAC Subsystem," under the section entitled "Abnormal Plant Operations," states that when a "high" gaseous radioactivity is detected and the HVAC subsystem is operable, both supplemental air filtration units automatically start to pressurize the MCR and TSC to at least 1/8 inch wg. The normal outside air makeup duct and the MCR and TSC toilet exhaust isolation dampers close. In addition, if ac power is unavailable for more than 10 minutes or if "high-high" particulate or iodine radioactivity is detected in the MCR supply air duct, which would lead to exceeding GDC 19 operator dose limits, the plant safety and monitoring system automatically isolates the MCR from the normal MCR/TSC HVAC

subsystem. In the event of a loss of the normal plant ac electrical system, the MCR/TSC ventilation subsystem is automatically transferred to the onsite standby diesel generators.

13.3.3.3.2 TSC Evacuation

Because of the unique design of the AP1000, the habitability system for the TSC is not the same as for the MCR. At currently operating reactors, the TSC habitability system is either the same as for the MCR, or the TSC has been provided a separate habitability system. At these sites, should the TSC become uninhabitable, it is usually evacuated to either the MCR or another location onsite where habitability can be established. Not having the TSC in the same habitability envelope as the MCR, as discussed above, increases the likelihood that the TSC will have to be evacuated due to either loss of ac power sources, or high-high particulate or iodine radioactivity in the MCR air supply. In addition, the applicant has indicated that, should the TSC become uninhabitable, the functions and staff will be relocated to the EOF, and not the MCR or another facility onsite where habitability can be established. Consequently, the EOF will have to be activated and staffed early, in order to ensure that the functions and support provided to the MCR by the TSC are not impeded. DCD Tier 2 Section 13.3.1 provides the following COL information item (i.e., COL Action Item).

> Combined License applicants referencing the AP1000 certified design will address the activation of the emergency operations facility consistent with current operating practice and NUREG-0654/FEMA-REP-1 except for a loss of offsite power and loss of all onsite AC power. For this initiating condition, the Combined License applicant shall immediately activate the emergency operations facility rather than bringing it to a standby status.

13.3.3.3.3 Requests for Additional Information

In RAI 472.003 the applicant was asked the following:

> [DCD Tier 2] Section 9.4.1.2.1.1 indicates that radiation monitors are located inside the main control room upstream of the supply air isolation valves and that these monitors isolate the main control room form [sic] the nuclear island non-radioactive ventilation system on high-high particulate or iodine radioactivity concentrations. Does this include isolating the technical support center as well?

In its response to RAI 472.003, the applicant stated the following.

> No, only the main control room is isolated on a high-high signal. At that time, the main control room emergency habitability system is placed into operation to protect the main control room operators. Please refer to “Abnormal Plant Operation” portion of DCD subsection [Tier 2 Section] 9.4.1.2.3.1, which provides details as to the operation of the main control room and technical support center HVAC subsystem during abnormal events involving high and high-high signals.

Also see DCD subsection [Tier 2 Section] 18.8.3.5 “Technical Support Center Mission and Major Tasks” for discussions of the technical support center (TSC) including habitability and evacuation during emergencies.

The staff conducted a telephone conference with the applicant to discuss issues associated with TSC habitability and relocation of TSC functions to the EOF under emergency conditions; followed-up by supplemental comments to RAI 472.003.

The staff has reviewed Westinghouse’s response to RAI 472.003 dealing with technical support center (TSC) ventilation (i.e., habitability). The response referred to the Design Control Document (DCD) sections that covered TSC ventilation and habitability. While this answered the specific RAI question, it did not address apparent incorrect statements and inconsistencies in the system design, or the justification for relocation of TSC function to the emergency offsite [sic] facility (EOF) rather than to the main control room (MCR). Below are two questions pertaining to DCD Section 18.8.3.5, and an additional question pertaining to use of the EOF when the TSC becomes uninhabitable:

1. DCD Section [Tier 2] 18.8.3.5 states that “Consistent with NUREG 0737 . . . the technical support center has no emergency habitability requirements.” In accordance with NUREG-0737, the TSC is a “vital area” and should comply with radiological habitability requirements of General Design Criteria (GDC) 19 for the duration of an accident. Please provide justification for why the TSC has no emergency habitability requirements.

2. DCD Section [Tier 2] 18.8.3.5 states (in italics) that “The TSC complies with the habitability requirements of Reference 27 [i.e., Supplement 1 to NUREG-0737] when electrical power is available.” First, Supplement 1 requires the same radiological habitability requirements as GDC 19, and thus, this statement contradicts (1), above; and second, the reference to “when electrical power is available” is but one, of two, triggering events that would automatically isolate the Main Control Room from the TSC. The second trigger is “High-high” particulate or iodine radioactivity in MCR air supply” (see DCD [Tier 2] Section 6.4.4, page 6.4-9). Please provide justification for the inconsistencies.

3. In the event a relocation of the TSC to the EOF is allowed, rather than to the MCR (as required by NUREG-0696 guidance), how will the physical location of the EOF be addressed, as it relates to TSC support functions? There is currently a trend of utilities attempting to consolidate their EOFs for multiple plants. The physical location aspect is not addressed in the DCD, including whether the NRC would allow it. The implication is that the EOF could be anywhere, and as such, the transferred TSC functions could be anywhere.

The applicant responded with Revision 1 to RAI 472.003

1&2 The nuclear island nonradioactive ventilation system (VBS) maintains habitability in the TSC to the requirements of GDC 19 for normal and accident scenarios as long as

electrical power is available and radiation levels do not exceed a predetermined, "high-high" threshold. The VBS has two safety-related functions. The first is to monitor the air coming into the MCR and the second is to isolate the MCR envelope during a loss of electrical power of more than 10 minutes or upon a "high-high" radiation signal. As this system has no safety-related AC electrical system, it is not credited as meeting GDC 19 for the protection of the MCR operators. The safety-related main control room emergency habitability system (VES) is credited as meeting GDC 19 for the protection of the MCR operators. Thus, Westinghouse agrees that the statement, "Consistent with NUREG-0737 . . . the technical support center has no emergency habitability requirements," is confusing. The statement will be removed from DCD section 18.8.3.5 in the next revision of the DCD. See the DCD Revision: section below for detail changes.

Revise the fourth paragraph of DCD [Tier 2] 18.8.3 as indicated below:

> Consistent with NUREG 0737, the technical support center is nonsafety-related and is not required to be available after a safe shutdown earthquake.

In the event of high radiation, the VBS operates in a recirculation mode filtering the air in the MCR and the TSC. In this mode, the VBS is designed to provide a capability similar to that of the engineered safety features (ESF) systems in operating plants with respect to air filtration and adsorption. Should a "high-high" radiation signal or if a station blackout of more than 10 minutes occur, the VBS stops, isolates the MCR envelop and the VES begins operation to protect the MCR operators. If the system has power and is operating, it will prevent a "high-high" radiation signal. This is the reason DCD 18.8.3.5 states, "The TSC complies with the habitability requirements of Reference 27 [i.e., Supplement 1 to NUREG-0737] when electrical power is available."

In practical terms, the TSC does have emergency habitability capabilities comparable to those of operating plants as long as electrical power is available either from offsite power or from the onsite diesel generators. See the response to item 3 below, for a discussion on the probability of losing both offsite power and the onsite diesel generators.

3. The AP1000 design philosophy for the MCR and TSC habitability is the same as for the AP600. Discussions of this design were provided in AP600 RAIs 100.10 and 100.33. In a very limited number of instances, the TSC may become uninhabitable. As stated in the DCD 18.8.3.5, even in the low probability case of a station blackout, the TSC will still most likely remain habitable. The doors to the TSC can be opened to aid with ventilation and control of room temperature for the two hours that the workstations continue to operate. The TSC workstations are powered from the non-Class 1E uninterruptable [sic] power supplies, therefore plant monitoring capability from the TSC exists for two hours following a station blackout. (The probability of a station blackout is discussed in the AP1000 Probability Risk Assessment. The probability of a station blackout occurring is 8.57×10^{-4}. The probability of non-recovery within 2 hours is specified in the EPRI ALWR Utility Document as 0.37.)

To assure that the functions of the TSC are not impeded, Westinghouse states in DCD 13.3 that staffing of the EOF for the AP1000 will occur consistent with current operating practice and revision 1 of NUREG-0654/FEMA-REP-1. In the unlikely event of a loss of offsite power and loss of all onsite AC power, the Combined License applicant shall immediately activate the EOF rather [than] bringing it to standby status. As stated in DCD [Tier 2] 18.8.3.5 a communicator is assigned to the MCR as part of the emergency staffing. The communicator is responsible for providing direct interface between the TSC and the MCR operators. If the TSC function has been transferred to the EOF, then the communicator provides the direct interface between the EOF and the MCR operators. The Combined License applicant is responsible for the EOF design, including the specification of its location(s) (DCD subsection 18.2.6), emergency planning, and associated communication interfaces among the MCR, the TSC, and the EOF (DCD [Tier 2] subsection 13.3). Westinghouse has committed to providing a TSC communicator in the MCR for the unlikely event that the TSC becomes uninhabitable. When the Combined License applicant establishes the emergency plan, and associated communication interfaces among the MCR, the TSC, and the EOF; the NRC will have an opportunity to review the plan including the total number of TSC support personnel that will be sent to the MCR in the event that the TSC becomes uninhabitable as well as the location of the EOF.

13.3.3.3.4 TSC as a Vital Area

According to Section 2.6 of NUREG-0696, the intent of the TSC is to provide direct management and technical support to the control room during an accident. Section II.B.2 of NUREG-0737 states that any area which will or may require occupancy to permit an operator to aid in the mitigation of, or recovery from, an accident is designated as a “vital area;” and that the control room and TSC must be included among those areas where access is considered vital after an accident. Further, the design dose rate for personnel in a vital area should be such that the guidelines of GDC 19 will not be exceeded during the course of the accident. GDC 19 requires that adequate radiation protection be provided, such that dose to personnel should not be in excess of 0.05 Sv (5 rem) whole body, or its equivalent to any part of the body, for the duration of the accident. In addition, Subsection 8.2.1.f of Supplement 1 to NUREG-0737 states that the TSC will be provided with radiological protection and monitoring equipment necessary to assure that radiation exposure to any person working in the TSC would not exceed 0.05 Sv (5 rem) whole body, or its equivalent to any part of the body, for the duration of the accident. These guidelines form the basic radiological habitability criteria for the TSC.

Section H.1 of NUREG-0654/FEMA-REP-1, Rev. 1, calls for establishment of a TSC in accordance with NUREG-0696. Section 2.6 of NUREG-0696 states that since the TSC is to provide direct management and technical support to the control room during an accident, it shall have the same radiological habitability as the control room under accident conditions, and the TSC ventilation system shall function in a manner comparable to the control room ventilation system. If the TSC becomes uninhabitable, the TSC plant management function shall be transferred to the control room.

As discussed above, the applicant states in DCD Tier 2 Section 18.8.3.5 that the TSC has no emergency habitability requirements, and that this is consistent with NUREG-0737. Given NUREG-0737's designation of the TSC in Section II.B.2 as a vital area, having related radiation protection criteria of GDC 19 during the course of an accident, the statement that the TSC "has no emergency habitability requirements" is not consistent with NUREG-0737. In the applicant's additional response to RAI 472.003, the apparent inconsistency is acknowledged as "confusing." The statement was removed from DCD Tier 2 Section 18.8.3.5.

Despite the removal of the statement that the TSC has no emergency habitability requirements in DCD Tier 2 Section 18.8.3.5, the design of the ventilation systems for the TSC and MCR does not provide the TSC with the same radiological habitability as the MCR under all accident conditions. Section 2.1 of NUREG-0696 provides that "[l]icensees who cannot meet the criteria for location, size, and habitability for the TSC must submit to NRC a request for an exception. This request must include justification for the exception and an alternate proposal. The NRC will review requests for exceptions on a case-by-case basis." The AP1000 DCD does not request an exception to the habitability criteria for the TSC. In addition, the use of criteria different from those set forth in NUREG-0696, NUREG-0737, and Supplement 1 of NUREG-0737, will be accepted only if the substitute criteria provides a basis for determining that the applicable regulatory requirements are met.

The applicant further states in its additional response to RAI 472.003, that "[i]n practical terms, the TSC does have emergency habitability capabilities comparable to those of operating plants as long as electrical power is available either from offsite power or from the onsite diesel generators." This does not comport with the TSC emergency habitability criteria of NUREG-0696, NUREG-0737, and Supplement 1 to NUREG-0737. The staff has identified the inability of the TSC to provide emergency habitability under accident conditions as Open Item 13.3-1.a.

13.3.3.3.5 Isolation of MCR from TSC

DCD Tier 2 Section 18.8.3.5 further states that "[t]he TSC complies with the habitability requirements of Reference 27 [i.e., Supplement 1 to NUREG-0737] when electrical power is available." The reference to "when electrical power is available" is but one, of two, triggering events that would automatically isolate the MCR from the TSC. The second triggering event is "High-high particulate or iodine radioactivity in MCR air supply" (see DCD Section 6.4.4). In addition, the second triggering event is not reflected in DCD Tier 2 Section 3.1.2, "Protection by Multiple Fission Product Barriers," which states under Criterion 19, "Control Room," that "[i]f the normal main control room ventilation system is inoperable or if no ac power sources are available, the emergency control room habitability system automatically isolates the main control room and provides operator habitability requirements." If, for example, electrical power was available, while at the same time there was high-high particulate or iodine radioactivity in the MCR air supply, the MCR would automatically isolate from the TSC. As such, the TSC would no longer be able to ensure compliance with the radiological protection requirements of GDC 19, and therefore, the TSC would be unable to comply with the radiological habitability criteria of Supplement 1 to NUREG-0737 (i.e., Reference 27). Hence, the statement that the TSC complies with the habitability requirements of Supplement 1 to NUREG-0737 when electrical power is available, is incomplete.

Addressing this concern, the applicant stated the following in their additional response to RAI 472.003.

> Should a "high-high" radiation signal or if a station blackout of more than 10 minutes occur, the VBS stops, isolates the MCR envelop and the VES begins operation to protect the MCR operators. If the system has power and is operating, it will prevent a "high-high" radiation signal. This is the reason DCD [Tier 2 Section] 18.8.3.5 states, "The TSC complies with the habitability requirements of Reference 27 [i.e., Supplement 1 to NUREG-0737] when electrical power is available."

This response is somewhat confusing. The isolation of the MCR envelop can occur with either a high-high radiation signal or loss of power. That means that isolation can occur on a high-high radiation signal only, without loss of power. The statement that "[i]f the system has power and is operating, it will prevent a "high-high" radiation signal" implies that a high-high radiation signal will never occur, except upon loss of power. The need for the high-high radiation signal as a trigger to automatically isolate the MCR is, therefore, not needed, since the isolation already occurs upon loss of power. Subsequent high-high radioactivity would be inconsequential, as the MCR would have already been isolated from the TSC upon loss of power, with potential loss of TSC habitability. These habitability concerns should be resolved. This is identified as Open Item 13.3-1.b.

13.3.3.3.6 EOF as Alternate TSC

Because of the unique design of the AP1000, the habitability system for the TSC is not the same as for the MCR. As such, the applicant states in DCD Tier 2 Section 18.8.3.5 that should habitability be challenged within the TSC, TSC personnel and functions are transferred to the EOF. This proposed arrangement is supported in DCD Tier 2 Section 13.3.1 with the COL information item proposing activation of the EOF when both onsite and offsite ac power is lost. In regard to TSC communications, DCD Tier 2 Section 1.8 states that communications systems and equipment outside the annex building (which includes the TSC) are site-specific elements and are outside the scope of the AP1000 standard plant, and that the DCD is based upon the COL applicant providing adequate external communications. The staff disagrees with this approach, in that the physical location of the EOF is not addressed, as it relates to the EOF serving as an alternate TSC. The distinction between transferring the TSC plant management function to the EOF upon loss of TSC habitability, rather than to the MCR (per section 2.6 of NUREG-0696), is also not discussed. Further, as addressed above, the condition of loss of both offsite power and onsite ac power to initiate EOF activation does not account for the second triggering event, in which high-high particulate or iodine radioactivity in the MCR air supply would also isolate the MCR from the TSC.

In the applicant's additional response to RAI 472.003, the use of the EOF as an alternate TSC is justified by the capabilities of the EOF, as well as when it is activated. In addition, the applicant states that the EOF design, including location, emergency planning and communications is the COL applicant's responsibility. TSC design requirements cannot be ignored based on unknown compensatory measures. If the EOF is the alternate TSC, its

location will need to be evaluated against the following guidance criteria from Section 2.2 of NUREG-0696.

> The onsite TSC is to provide facilities near the control room for detailed analyses of plant conditions during abnormal conditions or emergencies by trained and competent technical staff. During recent events at nuclear power plants, telephone communications between the facilities were ineffective in providing all of the necessary management interaction and technical information exchange. This demonstrates the need for face-to-face communications between TSC and control room personnel. To accomplish this, the TSC shall be as close as possible to the control room, preferably located within the same building. The walking time from the TSC to the control room shall not exceed 2 minutes. This close location will facilitate face-to-face interaction between control room personnel and the senior plant manager working in the TSC. This proximity also will provide access to information in the control room that is not available in the TSC data system.

The above discussion pertain to the TSC habitability and utilization of the EOF as an alternate TSC should be resolved. This is Open Item 13.3-2.

13.3.3.3.7 Summary of TSC Habitability Issues

The staff concludes that the information provided in the DCD, as detailed above, pertaining to habitability of the TSC is not consistent with the guidance criteria in RG 1.101, which endorses Revision 1 of NUREG-0654/FEMA-REP-1, and through it NUREG-0696, NUREG-0737, and Supplement 1 to NUREG-0737; and the applicant does not provide an acceptable alternative for meeting the regulations. As such, the staff finds that the DCD fails to meet the requirements of 10 CFR 50.34(f)(2)(xxv), 10 CFR 50.47(b)(8) and (b)(11), and Subsection IV.E.8 of Appendix E to 10 CFR Part 50.

13.3.3.4 Postaccident Sampling and Analysis

In accordance with 10 CFR 50.47(b)(9), the COL applicant must employ adequate methods, systems, and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency condition. To address this regulation, the NRC has concluded that source term information should be obtained and analyzed promptly to continuously assess and refine dose assessments, and confirm or modify initial protective action recommendations.

The requirements of 10 CFR 52.79(b) state that a COL application must contain the technically relevant information required of applicants for an operating license under 10 CFR 50.34. The requirements of 10 CFR 50.34(f)(2)(viii) state that the COL applicant must provide a capability to promptly obtain and analyze samples from the reactor coolant system and containment that may contain accident source term radioactive materials, without radiation exposures to any individual exceeding 0.05 Sv (5 rem) to the whole body or 0.5 Sv (50 rem) to the extremities. Materials to be analyzed and quantified include certain radionuclides that are indicators of the degree of core damage (e.g., noble gases, radioiodines and cesiums, and nonvolatile isotopes), hydrogen in the containment atmosphere, dissolved gases, chloride, and boron concentrations.

13.3.3.4.1 Model Safety Evaluation

On October 31, 2000, the NRC published a Federal Register notice (65 FR 65018), entitled "Notice of Availability for Referencing in License Amendment Applications--Model Safety Evaluation on Technical Specification Improvement to Eliminate Requirements on Post Accident Sampling Systems Using the Consolidated Line Item Improvement Process." The model safety evaluation states that the information provided by the PASS, described in NUREG-0737, "Clarification of TMI Action Plan Requirements," is either unnecessary or is effectively provided by other indicators of process parameters or measurement of radiation levels. Sampling of various radionuclides is not required to support emergency response decision making during the initial phases of an accident because the information provided by PASS is either unnecessary or is effectively provided by other indications of process parameters or measurement of radiation levels. Therefore, it is not necessary to have dedicated equipment to obtain in a prompt manner the various samples identified in the model safety evaluation.

However, there could be significant benefits to having information about the radionuclides existing post-accident, in order to address public concerns and plan for long-term recovery operations. In addition, radionuclide sampling information could also be useful in classifying certain types of events that could cause fuel damage without having an indication of overheating on core exit thermocouples. Licensees could satisfy this function by developing "contingency plans" to describe existing sampling capabilities and what action (e.g., assembling temporary shielding) may be necessary to obtain and analyze highly radioactive samples from the reactor coolant system, containment sump, and containment atmosphere. These contingency plans must be available to be used by a licensee during an accident. Finally, the model safety evaluation states that each licensee should verify that it has, and will make a regulatory commitment to maintain (or make a regulatory commitment to develop and maintain), contingency plans for obtaining and analyzing highly radioactive samples of reactor coolant, containment sump, and containment atmosphere.

DCD Tier 2 Section 1.9.5.2.9, "Post-Accident Sampling System," states that the post-accident sampling system is a subsystem of the primary sampling system, and that the primary sampling system is designed to conform to the guidelines of the model safety evaluation report on eliminating post-accident sampling system requirements from technical specifications for operating plants. DCD Tier 2 Section 1.9.3, "Three Mile Island Issues," under (2)(viii), "Post-Accident Sampling (NUREG-0737 Item II.B.3)," states that the AP1000 sampling design is consistent with the approach in the model safety evaluation report and not the guidance outlined in NUREG-0737 and Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants To Assess Plant and Environs Conditions During and Following an Accident" (Revision 3, May 1983). The primary sampling system design is consistent with contingency plans to obtain and analyze highly radioactive post-accident samples from the reactor coolant system, the containment sump, and the containment atmosphere.

DCD Tier 2 Section 9.3.3.1.2.2, "Post-Accident Sampling," states that the primary sampling system does not include specific post-accident sampling capability. However, there are contingency plans for obtaining and analyzing highly radioactive samples of reactor coolant,

containment sump, and containment atmosphere. These plans include the procedures to analyze, during the later stages of accident response, reactor coolant for boron, containment atmosphere for hydrogen and fission products, and containment sump water for pH. The primary means of containment atmosphere hydrogen analysis is the hydrogen analyzer, which is not part of the post-accident sampling capabilities.

DCD Tier 2 Section 13.3.1 provides the following COL Information Item (i.e., COL action item).

> To initially and continuously assess the course of an accident for emergency response purposes, Combined License applicants referencing the AP1000 certified design will address the capability for promptly obtaining and analyzing grab samples of reactor coolant and containment atmosphere and sump in accordance with the guidance of Item II.B.3 of NUREG 0737.

This COL action item is the same as that provided in Section 13.1 of the standard safety analysis report (SSAR) for the Westinghouse AP600 standard design, and was reflected as COL Action Item 13.3-3 in the NRC's AP600 FSER in September 1998. Appendix C to 10 CFR Part 52, entitled "Design Certification Rule for the AP600 Design," was published in the Federal Register on December 23, 1999 (64 FR 72002, 72015). The NRC staff issued the FSER related to certification of the AP600 standard plant design in September 1998 (NUREG-1512, 63 FR 48772). At that time, the PASS guidance in NUREG-0737 (Section II.B.3) was applicable for post-accident sampling. As discussed above, the model safety evaluation was published on October 31, 2000, at which time it eliminated various emergency response of the PASS sampling requirements in Section II.B.3 of NUREG-0737. As such, this COL action item in DCD Section 13.3.1, does not reflect the model safety evaluation, and is inconsistent with the other DCD sections that refer to the model safety evaluation and its acceptance of the use of "contingency plans."

The applicant acknowledged that the subject COL information item (i.e., COL action item) was, indeed, in error, and it was removed from the DCD.

13.3.3.4.2 Radiation Exposure

DCD Tier 2 Section 9.3.3, "Primary Sampling System," states that the primary sampling system "includes equipment to collect representative samples of the various process fluids, including reactor coolant system and containment air, in a manner that adheres to as-low-as-reasonably-achievable (ALARA) principles during normal and post-accident conditions." In addition, DCD Tier 2 Section 12.4.1.8, "Post-Accident Actions," states the following.

> Requirements of 10 CFR 52.79(b) relative to plant area access and post-accident sampling (10 CFR 50.34(f)(2)(viii)) are included in Section 1.9.3. If procedures are followed, the design prevents radiation exposures to any individual from exceeding 5 rem [0.05 Sv] to the whole body or 50 rem [0.5 Sv] to the extremities.

The staff concludes that the information pertaining to controlling radiation exposures to individuals involved in post-accident sampling is acceptable, and meets the requirements of 10 CFR 50.34(f)(2)(viii), 10 CFR 50.47(b)(8), 10 CFR 50.47(b)(9), and 10 CFR 50.47(b)(11).

13.3.4 Overall Emergency Planning Findings

The following is a summary of the emergency planning (EP) findings, as presented in sec. 13.3, "Emergency Planning," of the AP1000 DSER.

13.3.4.1 Emergency Planning Responsibilities (See Section 13.3.2 of this report)

The staff concludes that emergency planning (EP) will be primarily addressed by the COL applicant referencing the AP1000 design, and that EP information submitted in the application will significantly depend on plant- and sit-specific characteristics. As such, the staff finds that COL Action Item 13.3-1 is acceptable, in that it complies with the requirements set forth in 10 CFR 52.79(d) and the applicable portions of 10 CFR Part 50.

13.3.4.2 General Description of Facilities (See Section 13.3.3.1 of this report)

The staff concludes that the information provided in the DCD pertaining to the TSC, OSC and decontamination room, is consistent with the guidance criteria in RG 1.101, which endorses Revision 1 of NUREG-0654/FEMA-REP-1, and through it NUREG-0696, NUREG-0737, and Supplement 1 to NUREG-0737. As such, the staff finds this meets the requirements of 10 CFR 50.34(f)(2)(xxv), 10 CFR 50.47(b)(8), 10 CFR 50.47(b)(11), and Subsections IV.E.3 and IV.E.8 of Appendix E to 10 CFR Part 50.

13.3.4.3 Technical Support Center Size (See Section 13.3.3.2 of this report)

The staff concludes that this information is consistent with guidance criteria in RG 1.101, which endorses Revision 1 of NUREG-0654/FEMA-REP-1, and through it NUREG-0696, NUREG-0737, and Supplement 1 to NUREG-0737. Specifically, it conforms with the size specifications of NUREG-0696, and is sufficient to accommodate and support NRC and licensee predesignated personnel, equipment and documentation, in conformance with Supplement 1 to NUREG-0737. As such, the staff finds that this information meets the requirements of 10 CFR 50.47(b)(8) and Subsection IV.E.8 of Appendix E to 10 CFR Part 50, and is, therefore, acceptable.

13.3.4.4 Technical Support Center Habitability (See Section 13.3.3.3 of this report)

The staff concludes that the information provided in the DCD, pertaining to habitability of the TSC, is not consistent with the guidance criteria in RG 1.101, which endorses Revision 1 of NUREG-0654/FEMA-REP-1, and through it NUREG-0696, NUREG-0737, and Supplement 1 to NUREG-0737; and the applicant does not provide an acceptable alternative for meeting the regulations. As such, the staff finds that the DCD fails to meet the requirements of 10 CFR 50.34(f)(2)(xxv), 10 CFR 50.47(b)(8) and (b)(11), and Subsection IV.E.8 of Appendix E to 10 CFR Part 50.

13.3.4.5 Post-Accident Sampling and Analysis (See Section 13.3.3.4 of this report)

The staff concludes that the information pertaining to controlling radiation exposures to individuals involved in post-accident sampling is acceptable, and meets the requirements of 10 CFR 50.34(f)(2)viii), 10 CFR 50.47(b)(8), 10 CFR 50.47(b)(9), and 10 CFR 50.47(b)(11).

13.4 Operational Review

In DCD Tier 2 Section 13.4 the applicant states that the operational review is the responsibility of the COL applicant. In Section 13.4.1, the applicant includes a statement that a COL applicant referencing the AP1000 certified design will address each operational review. Therefore, this item is acceptably addressed.

13.5 Plant Procedures

In DCD Tier 2 Section 13.5, the applicant states that the plant procedures are the responsibility of the COL applicant. The applicant further references WCAP-14690, which provides input to the COL applicant for developing plant procedure, including information on the development and design of the AP1000 emergency response guidelines and emergency operating procedures. In DCD Tier 2 Section 13.5.1, the applicant includes a statement that a COL applicant referencing the AP1000 certified design will address plant procedures for the following areas:

- normal operation
- abnormal operation
- emergency operation
- refueling and outage planning
- alarm response
- maintenance, inspection, test, and surveillance
- administrative
- operation of post-72 hour equipment

Therefore, this item is acceptably addressed.

13.6 Security

The applicant states the following in DCD Tier 2 Section 13.6.1:

> Objectives and functional requirements of the AP1000 physical protection system and description of security features are provided in the AP600 Security Design Report, submitted under separate cover in accordance with 10 CFR 790(d), Rules of Practice. The use of this AP600 report is justified because the AP1000 plant footprint and access controls is [sic] similar to that for AP600. The additional height of the AP1000 containment and shield building and the additional length of its turbine building does [sic] not require change from the information provided in the report for AP600. The report also includes the security boundary drawings and the listing of the vital equipment and components. A

> vulnerability analysis, which demonstrates that the AP600 certified security design is adequate to protect the AP600 from radiological sabotage, is also submitted under separate cover. This vulnerability report for AP600 is applicable to AP1000.
>
> As demonstrated by the AP600 Security Design Vulnerability Analysis Report, reducing the protected area and eliminating the isolation zones results in a reduced requirement for security staffing for AP1000 when compared to current plants. Personnel screening, selection, performance evaluations, and training aspects of the physical security program will be addressed by the Combined License Applicant.

DCD Tier 2 Section 13.6.1, was changed in Revision 5 of the DCD to state, in part, the following:

> Subsequent to the issuance of AP600 Design Certification, and as a result of the events of September 11, 2001, the NRC issued orders to power reactor licensees titled "Interim Compensatory Measures for High Threat Environment" (Reference 4) . On April 29, 2003, the NRC also issued a revised "Design Basis Threat for Radiological Sabotage for Operating Reactors" (Reference 5). An assessment of the impact of References 4 and 5 is provided in the AP1000 Security Assessment (Reference 6) that has been submitted under separate cover in accordance with 10 CFR 2.790(d), Rules of Practice. The AP1000 Security Assessment describes how References 4 and 5 are addressed in the AP1000 design, and identifies the applicable requirements in References 4 and 5 that are addressed by the Combined License applicant for an AP1000.
>
> The use of the AP600 security reports (References 2 and 3) as a foundation for the AP1000 approach to the security design is acceptable because the AP1000 plant footprint and access controls are similar to that for AP600. The design changes incorporated in the AP600, such as the additional height of the AP1000 containment and shield building and the additional length of the turbine building does not affect the approach to security design that is described in these references.

The applicant has only recently been authorized, by the Commission, access to the Interim Compensatory Measures for High Threat Environment (power reactor ICMs) and the revised "Design Basis Threat for Radiological Sabotage for Operating Reactors" (DBT). On May 9, 2003, the NRC met with the applicant to discuss the AP1000 security plan as proposed and in consideration of the power reactor ICMs and the revised DBT. Subsequent to the meeting, the applicant provided the staff with Revision 5 to DCD Tier 2 Section 13.6. In this revision, the applicant defers the development of the security plan to the COL applicant. The information contained in the Security Design Report and Security Design Vulnerability Analysis Report are now considered to be a foundation for the AP1000 approach to the security design.

The staff has not completed the review the applicant's change to the security plan. At this time, the staff plans to issue a supplemental DSER that will address the AP1000 security plan, including the COL action items and any additional ITAAC. This is Open Item 13.6-1.