18.0 HUMAN FACTORS ENGINEERING

18.1 Overview (No Corresponding Section in Regulatory Guide (RG) 1.206)

Section 18.1 of the V.C. Summer Nuclear Station (VCSNS) combined license (COL) Final Safety Analysis Report (FSAR), Revision 2, incorporates by reference, with no departures or supplements, Section 18.1 of Revision 17 of the AP1000 Design Control Document (DCD). The Nuclear Regulatory Commission (NRC) staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793, "Final Safety Evaluation Report [FSER] Related to Certification of the AP1000 Standard Design," and its supplements.

18.2 Human Factors Engineering Program Management (Related to RG 1.206, Section C.I.18.1, "HFE Program Management")

18.2.1 Introduction

The Human Factors Engineering (HFE) Program Management plan describes the HFE program in sufficient detail to ensure that all aspects of the human-system interfaces (HSIs), procedures, staffing, and training are developed, designed, and evaluated on the basis of a structured top-down systems analysis using accepted HFE guidance.

18.2.2 Summary of Application

Section 18.2 of the VCSNS COL FSAR, Revision 2, incorporates by reference Section 18.2 of the AP1000 DCD, Revision 17.

In addition, in VCSNS COL FSAR Section 18.2.1.3, the applicant provided the following:

AP1000 COL Information Item

- VCS COL 18.2-2

The applicant provided additional information in VCS COL 18.2-2 to address COL Information Item 18.2-2 related to the emergency operations facility (EOF). In a letter dated September 7, 2010, the applicant proposed to revise VCS COL 18.2-2 to indicate that the EOF and technical support center (TSC) communications strategies and EOF and TSC human factors attributes are addressed in the emergency plan. In addition, the applicant proposed to delete information identifying the location of the EOF from Section 18.2 of the application.

[1] See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a design certification (DC).

License Condition

- License Condition 1, regarding the HFE inspections, tests, analyses and acceptance criteria (ITAAC).

18.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for VCS COL 18.2-2 are given in Chapter 18 of NUREG-0800, "Standard Review Plan [SRP] for the Review of Safety Analysis Reports for Nuclear Power Plants."

The applicable regulatory requirements for VCS COL 18.2-2 are as follows:

- Title 10 of the *Code of Federal Regulations* (10 CFR) 52.79(c)

The related acceptance criteria are as follows:

- NUREG-0711, "Human Factors Engineering Program Review Model," Revision 2, Section 2.4

- NUREG-0696, "Functional Criteria for Emergency Response Facilities"

18.2.4 Technical Evaluation

The NRC staff reviewed Section 18.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the HFE program management. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this safety evaluation report (SER) provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generating Plant [VEGP], Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs).

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application.

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Item

- VCS COL 18.2-2

In its July 31, 2009, response to the NRC staff's request for additional information (RAI) (RAI-SRP18-COLP-21), WEC revised COL Information Item 18.2-2. In the revised COL information item, the need to specify the location of the EOF was eliminated. The revised COL information item states:

> Specific information regarding EOF and TSC [Technical Support Center] communications, and EOF and TSC Human Factors attributes will be provided by the Combined Operating License applicant to address the Combined License information requested in this subsection.

In a letter dated September 7, 2010, the applicant proposed to revise Chapter 18 of the VCSNS COL FSAR to indicate that the EOF and TSC communications strategies and EOF and TSC human factors attributes are addressed in the emergency plan. The emergency plan indicates that the EOF and TSC is established consistent with NUREG-0696.

This is acceptable because, as discussed in the following technical evaluation adopted from the BLN SER, an EOF and TSC established consistent with NUREG-0696 would adequately address communications strategies and human factors attributes.

The applicant's commitment to incorporate the change described in the September 7 letter in a future revision of the VCSNS FSAR is being tracked as **Confirmatory Item 18.2-1**.

The applicant stated in its April 30, 2009 response to RAI 18-1 that, rather than using the existing VCSNS Unit 1 EOF, a new common EOF for Units 1, 2, and 3 will be built. The effectiveness of human factors attributes and communications must be demonstrated as part of ITAAC closure for Emergency Planning following the same protocol as applied to the referenced COL. This protocol is described below.

The following portion of this technical evaluation section is reproduced from Section 18.2.4 of the VEGP SER:

> *The following portion of this technical evaluation section is reproduced from Section 18.2.4 of the BLN SER.*
>
> *In its September 2, 2008, response to RAI 18-3, the applicant stated that the scope of the HFE design includes implementation and verification of applicable EOF/Technical Support Center (TSC) displays consistent with the AP1000 HFE program. TR-136* [Technical Report] *(APP-GW-GLR-136, Revision 1, "AP1000 Human Factors Program Implementation for the Emergency Operations Facility and Technical Support Center") indicates that the Westinghouse DCD does not cover all aspects of the HSI design (such as panel layouts, room configuration, and indications/controls) for the EOF/TSC. The applicant states that the EOF/TSC functions and tasks that are not within the scope of the AP1000 HFE Program will be subject to HFE principles and practices as described in NUREG-0737, "Clarification of TMI [Three Mile Island] Action Plan Requirements."*
>
> *The staff was concerned that, since NUREG-0737 does not have HFE guidance comparable to that of NUREG-0711, EOF/TSC design elements would fall outside the scope of the HFE program. The applicant addressed this concern in its RAI 18-4 response dated February 23, 2009, stating that the HSI design will meet the data and availability criteria in NUREG-0654, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, Section II.H, 'Emergency Facilities and Equipment,'" which states that the TSC and the EOF will be established in accordance with NUREG-0696.*
>
> *The staff agrees that NUREG-0696 describes an acceptable method for meeting EOF/TSC requirements and contains guidance for managing the EOF/TSC HFE design based on the following:*
>
> - *NUREG-0696, Section 2.8, states, "The design of the TSC data system equipment shall incorporate human factors engineering with consideration for both operating and maintenance personnel."*
> - *NUREG-0696, Section 4.7, states, "The design of the EOF data system equipment shall incorporate human-factors engineering with consideration for both operating and maintenance personnel."*
> - *NUREG-0696, Section 4.8, states, "Human-factors engineering shall be incorporated in the design of the EOF." This section of the NUREG also addresses data availability and human factors design criteria.*
> - *The AP1000 DCD includes a structured approach for identifying data needed to support the EOF/TSC functions.*

- *The guidance in NUREG-0696 addresses information usability. While some guidance is generic, the staff concludes APP-OCS-J1-002, "AP1000 HSI Design Guidelines," which is included by reference in Chapter 18 of the AP1000 DCD, is applicable to the definition of more explicit, measurable design acceptance criteria. Use of these guidelines will ensure that general design principles, such as "callup, manipulation, and presentation of data can be easily performed," and, "display formats shall present information so that it can be easily understood," will be subject to more explicit design acceptance criteria.*

Emergency planning drills and inspections provide repeated opportunities to identify improvements to HSIs. In the case of BLN, for which a common EOF will be used, EOF design improvements have already been implemented based on operating experience.

HFE design verification and validation (V&V) is a second area of NUREG-0711 guidance that is not being directly applied by the applicant. As an alternative, the applicant states in their RAI 18-4 response dated February 23, 2009, that V&V of the EOF HFE design is achieved by the evaluation of equipment and personnel performance during drills and exercises. The staff concludes that although the specific guidance in NUREG- 0711 for V&V is not being applied, the alternative V&V approach provides reasonable assurance that the HFE aspects of the EOF and TSC will be acceptably designed based on the following:

- *NUREG-0696 contains guidance on V&V. Section 9 states, "The design, development, qualification, and installation of the SPDS [safety parameter display system], TSC, EOF, and NDL [nuclear data link] facilities and systems shall be independently verified and validated by qualified personnel other than the original designers and developers."*

  The RAI 18-4 response indicates both equipment and personnel performance will be evaluated during drills and exercises.

- *Exercises and drills are conducted on a periodic basis, and therefore, provide repeated opportunities to test and improve the HSIs.*

- *The first exercise is included as an inspection, test, analysis and acceptance criterion (ITAAC) that ensures EOF/TSC functionality prior to fuel load. The BLN COL application Part 10, "Proposed License Conditions," Revision 1, Table 3.8-1, ITAAC contain the following inspections, tests and analyses:*

  > *ITAAC 1.1: An inspection of the control room, TSC, and CECC [Central Emergency Control Center] will be performed to verify that they have displays for retrieving facility system and effluent parameters in specific emergency action levels (EALs).*

ITAAC 8.1: A full-participation exercise (test) will be conducted within the specified time periods of Appendix E to 10 CFR Part 50.

- *Exercises and drills are conducted in the actual facilities, (vice a simulator), allowing direct observation of the HSI.*

Evaluation of Site-Specific Information Related to Standard Content

Part 10, "Proposed License Conditions," License Condition 1, Table 3.8-1 of the VCSNS COL FSAR includes the following relevant site-specific ITAAC for VCSNS Units 2 and 3 that addresses a verification inspection to ensure functionality of the control room, EOF, and TSC prior to fuel load:

> ITAAC 1.1: An inspection of the Control Rooms, Technical Support Center (TSC), and Emergency Operations Facility (EOF) will be performed to verify that they have displays for retrieving facility system and effluent parameters that are specified in the Emergency Classification and EAL scheme and the displays are functional.
>
> ITAAC 8.1: A full-participation exercise (test) will be conducted within the specified time periods of Appendix E, ["Emergency Planning and Preparedness for Production and Utilization Facilities"] to 10 CFR Part 50.

The staff found that VCSNS ITAAC 1.1 and VCSNS ITAAC 8.1 were comparable to those proposed by VEGP and concluded that the site-specific ITAAC provided an acceptable V&V approach to ensure functionality of the control room, EOF, and TSC from an HFE perspective. Therefore, the conclusions reached by the NRC staff related to VEGP COL 18.2-2 are directly applicable to the VCSNS COL application. These ITAAC will be included in the COL.

The evaluation of these ITAAC from an emergency planning perspective is addressed in SER Section 13.3. License Condition 1 is evaluated in Chapter 1 of this SER.

18.2.5 Post Combined License Activities

For the reason discussed in the technical evaluation section above, the staff proposes to include the following ITAAC proposed by the applicant to ensure functionality of the control room, EOF, and TSC from an HFE perspective.

- The Licensee shall perform the following ITAAC:
  - ITAAC 1.1: An inspection of the Control Rooms, Technical Support Center (TSC), and Emergency Operations Facility (EOF) will be performed to verify that they have displays for retrieving facility system and effluent parameters that are specified in the Emergency Classification and EAL scheme and the displays are functional.
  - ITAAC 8.1: A full-participation exercise (test) will be conducted within the specified time periods of Appendix E to 10 CFR Part 50.

18.2.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to HFE program management, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that, pending closure of **Confirmatory Item 18.2-1**, the relevant information presented in the VCSNS COL FSAR is acceptable and meets the requirements of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," and 10 CFR 52.79, "Contents of applications; technical information in final safety analysis report," and meets the guidance in Chapter 18 of NUREG-0800. The staff based its conclusion on the following:

- VCS COL 18.2-2 is acceptable because the applicant will design the EOF/TSC in accordance with appropriate elements of the AP1000 HFE program and NUREG-0696.

18.3 Operating Experience Review (Related to RG 1.206, Section C.I.18.2, "Operating Experience Review")

Operating experience review (OER) identifies and analyzes HFE-related problems and issues in previous designs. In this way, negative features associated with predecessor designs may be avoided in the current one, while retaining positive features. This section describes the applicant's OER and how it was used to identify HFE-related safety issues. OER includes a summary discussion of the source materials, such as documents, event reports, and personnel interviews. OER-identified issues are included along with their resolution.

Section 18.3 of the VCSNS COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 18.3 of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.4 Functional Requirements Analysis and Allocation (Related to RG 1.206, Section C.I.18.3, "Functional Requirements Analysis and Function Allocation")

Functional requirements analysis and function allocation demonstrate that functions are allocated to human and system resources in a manner that takes advantage of human strengths and avoids human limitations. The scope includes identification and analysis of those functions that must be performed to satisfy the plant's safety objectives that is, to prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public.

Section 18.4 of the VCSNS COL FSAR, Revision 2-, incorporates by reference, with no departures or supplements, Section 18.4 of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.5 AP1000 Task Analysis Implementation Plan (Related to RG 1.206, Section C.I.18.4, "Task Analysis")

Task analyses identify the specific tasks that are needed for function accomplishment and their information, control, and task support requirements. The analyses address how representative and important operations, maintenance, test, inspection, and surveillance tasks are selected, as well as the range of operating modes included in the analyses. This includes the use of probabilistic risk assessment (PRA)/human reliability analysis (HRA) for the identification of the risk-important human actions, including the monitoring and backup of automatic actions. The task analysis results are used as input to the design of HSIs, procedures, and training programs.

Section 18.5 of the VCSNS COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 18.5 of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.6 Staffing (Related to RG 1.206, Section C.I.18.5, "Staffing and Qualifications")

18.6.1 Introduction

Staffing and qualification analyzes the requirements for the number and qualifications of personnel in a systematic manner that includes a thorough understanding of task requirements and applicable regulatory requirements.

This section is coordinated with Section 13.1 of this SER, which also relates to organization and staffing. The staffing analysis is iterative in nature and discusses how the initial staffing goals have been reviewed and modified as the analyses associated with other HFE elements are complete. Staffing and qualifications are also shown to be in compliance with 10 CFR 50.54(m).

18.6.2 Summary of Application

Section 18.6 of the VCSNS COL FSAR, Revision 2, incorporates by reference Section 18.6 of the AP1000 DCD, Revision 17.

In addition, in VCSNS COL FSAR Section 18.6, the applicant provided the following:

AP1000 COL Information Item

- STD COL 18.6-1

The applicant provided additional information in Standard (STD) COL 18.6-1 to resolve COL Information Item 18.6-1, addressing staffing level and qualification of plant personnel.

18.6.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for STD COL 18.6-1 are given in Chapter 18 of NUREG-0800.

The applicable regulatory requirements for STD COL 18-1 are as follows:

- 10 CFR 52.79(c)
- 10 CFR 50.54(m)

The related acceptance criterion is as follows:

- NUREG-0711, Section 6.4

18.6.4 Technical Evaluation

The NRC staff reviewed Section 18.6 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to staffing and qualification. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

Although the staff concluded that the evaluation performed for the standard content is directly applicable to the VCSNS COL application, there was a difference in the information provided by the VCSNS applicant from that provided by the VEGP applicant regarding the plant operating experience. This difference is evaluated by the staff below, following the standard content material.

The following portion of this technical evaluation section is reproduced from Section 18.6.4 of the VEGP SER:

<u>AP1000 COL Information Item</u>

The following portion of this technical evaluation section is reproduced from Section 18.6.4 of the BLN SER:

- *STD COL 18.6-1, addressing staffing level and qualification of plant personnel*.

The applicant provided additional information in STD COL 18.6-1 to resolve COL Information Item 18.6-1. COL Information Item 18.6-1 states:

> *Combined License applicants referencing the AP1000 design will address the staffing levels and qualifications of plant personnel including operations, maintenance, engineering, instrumentation and control technicians, radiological protection technicians, security, and chemists. The number of operators needed to directly monitor and control the plant from the main control room, including the staffing requirements of 10 CFR 50.54(m), will be addressed.*

The commitment was also captured as COL Action Item 18.6.3-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will address the staffing level and qualifications of plant personnel including operations, maintenance and control technicians, radiological protection technicians, security, and chemists. Specifically, the COL applicant will (1) address the*

> *staffing considerations in NUREG-0711, and (2) identify the minimum documentation that is necessary for the staff to complete the review.*

Information pertaining to the staffing level and qualifications is contained in BLN COL FSAR Chapter 13 and is summarized here. The applicant provided the estimated staffing levels for different categories of personnel that are addressed by the HFE program in accordance with NUREG-0711. The minimum staffing level for control room personnel is also stated. Information about the staffing level of security personnel is contained in the separately submitted physical security plan. Qualification requirements of Technical Support Personnel, Nuclear Plant Personnel, and Security Personnel are also included.

The baseline level of staffing is derived from experience from current operating nuclear power plants. Iterative adjustments are implemented with input from other elements of the HFE program.

The NRC staff reviewed the resolution to COL Information Item 18.6-1 related to staffing and qualifications included under Section 18.6 of the BLN COL FSAR, Revision 1.

NUREG-0711 states that satisfying criterion 4 for the staffing and qualifications should be in part based on an operating experience review. The applicant addresses this in Chapter 13, Conduct of Operations, by stating:

> *The Tennessee Valley Authority (TVA) has over 30 years of experience in the design, construction and operation of nuclear generating stations. TVA has designed, constructed, and operates six nuclear units at three sites: Browns Ferry Nuclear Plant Units 1, 2, and 3; Watts Bar Nuclear Plant Unit 1; and Sequoyah Nuclear Plant Units 1 and 2.*

NUREG-0711, Criterion 1 states that the staffing and qualifications should address applicable guidance in NUREG-0800, Section 13.1 and 10 CFR 50.54.

Section 18.6 references BLN COL FSAR Section 13, which discusses staffing levels that meet the requirements in 10 CFR 50.54.

NUREG-0711, Criterion 2 states that the staffing analysis should determine the number and background of personnel for the full range of plant conditions including operational tasks, plant maintenance, and plant surveillance and testing.

Section 18.6 of the COL states that Table 13.1-201 of the COL application contains the estimated staffing levels for those categories of personnel that are addressed in NUREG-0711, as follows:

> *1) licensed operators, 2) shift supervisors, 3) non-licensed operators, 4) shift technical advisors, 5) instrumentation and control technicians, 6) mechanical maintenance technicians, 7) electrical maintenance technicians, 8) radiation protection technicians, 9) chemistry technicians, and 10) engineering support.*

The applicant states that the minimum level of control room staffing is also stated in Table 13.1-201 and meets the requirements of 10 CFR 50.54(m).

The staff reviewed the requirements of 10 CFR 50.54, which state:

> *A senior operator licensed pursuant to Part 55 shall be present at the facility or readily available on call at all times during its operations, and shall be present at the facility during initial start-up and approach to power, recovery from an unplanned or unscheduled shut-down or significant reduction in power, and refueling.*

This section of 10 CFR contains a table that describes the minimum staffing requirements in the control room for one, two and three unit sites. For example, a one unit site with one control room is required to maintain two Senior Operators, and two Operators at all times. Table 13.1-201 describes numbers for control room operators that meet these limits and, therefore, meet the requirements for operator staffing in 10 CFR 50.54.

NUREG-0711 states that the applicant should have systematically analyzed the need for the number and qualifications of personnel and have demonstrated a thorough understanding of task requirements and regulatory requirements. NUREG-0711 also references NUREG-0800, Section 13.1 that describes the roles and responsibilities for design and construction activities and pre-operational activities. NUREG-0711 also spells out specific acceptance criteria for providing the NRC with specific information about qualification levels of the staff. In Section 13.1 of the BLN COL FSAR, the applicant describes in detail the organizational structure of the AP1000 plant. The roles and qualifications described include: Management and Technical Support Organization; Engineering; Quality Assurance; Chemistry; Radiation Protection; Fueling and Refueling Support; Training and Development; Maintenance Support; Operations Support; and Fire Protection. Each of these sections describes the applicant's commitment for maintaining qualified staff to carry out the responsibilities of each position. For example, in Section 13.1.1.2.1, "Engineering," the applicant states:

> *The engineering department consists of system engineering, design engineering, engineering programs, and safety and engineering analysis. These groups are responsible for performing the classical design activities as well as providing engineering expertise in other areas. Each of the engineering*

> *groups has a functional manager who reports to the manager in charge of engineering and site support.*

The applicant then describes the overall roles that the engineering department is responsible for, such as:

> *Support of plant operations in the engineering areas of mechanical, structural, electrical, thermal-hydraulic, metallurgy and materials, electronic, instrument and control and fire protection. Priorities for support activities are established based on input from the plant manager with emphasis on issues affecting safe operation of the plant.*

Review Criterion 3 in NUREG-0711 states that the staffing analysis should be iterative, meaning that staffing goals should be reviewed and modified as the analyses associated with other elements are completed. The applicant addresses this criterion by stating:

> *Iterative adjustments are implemented to the staffing, as necessary, based on findings and input from periodic reviews and staffing analysis. Input to this analysis includes information derived from the other elements of the human factors engineering program, particularly operating experience reviews, functional requirements analysis and function allocation, task analysis, human reliability analysis, human-system interface design, procedure development, and training program development.*

The staff finds this information sufficient for meeting the criteria for the level and qualification of staffing contained in NUREG-0711, NUREG-0800, and 10 CFR 50.54.

<u>Evaluation of Site-Specific Information Related to Standard Content</u>

In Section 13.1.1 of the VEGP COL FSAR, the applicant provided site-specific information regarding its operating experience that the staff considered to address the staffing and qualifications basis for NUREG-0711 Criterion 4. The applicant stated:

> *Southern Nuclear Operating Company, Inc. (SNC) has over 30 years of experience in the design, construction, and operation of nuclear generating plants. SNC, with its architectural engineering predecessor Southern Company Services, Inc., has designed, constructed, and currently operates six nuclear units at three sites: Edwin I. Hatch Nuclear Plant Units 1 and 2, Joseph M. Farley Nuclear Plant Units 1 and 2, and Vogtle Electric Generating Plant Units 1 and 2.*

> *The staff found the VEGP operating experience to be comparable to that described by BLN. Therefore, the Staff finds this information sufficient for meeting the criteria for the level and qualification of staffing described in NUREG-0711, NUREG-0800, and 10 CFR 50.54.*

Evaluation of Site-Specific Information Related to Standard Content

In Section 13.1.1 of the VCSNS COL FSAR, the applicant provided site-specific information regarding its operating experience that the staff considered to address the staffing and qualifications basis for NUREG-0711 Criterion 4. The applicant stated:

> South Carolina Electric and Gas (SCE&G) has over 35 years of experience in the design, construction, and operation of nuclear generating stations. SCE&G has designed, constructed, and operates VCSNS Unit 1.

Although the VCSNS operating experience is less than that described by VEGP, the staff finds that the VCSNS operating experience is sufficient for meeting the criteria for the level and qualification of staffing described in NUREG-0711, NUREG-0800, and 10 CFR 50.54.

18.6.5 Post Combined License Activities

There are no post-COL activities related to this section.

18.6.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to staffing and qualification, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the acceptance criteria defined in NUREG-0711, Section 6.4. The staff based its conclusion on the following:

- STD COL 18.6-1 is acceptable because it meets the acceptance criteria described in NUREG-0711, NUREG-0800, and 10 CFR 50.54.

18.7 Integration of Human Reliability Analysis with Human Factors Engineering (Related to RG 1.206, Section C.I.18.6, "Human Reliability Analysis")

HRA is an integral activity of a complete PRA. HRA seeks to evaluate the potential for, and mechanisms of, human error that may affect plant safety. Thus, it is an essential element in achieving the HFE design goal of providing a design that will minimize personnel errors, allow their detection, and provide recovery capability.

Section 18.7 of the VCSNS COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 18.7 of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.8 Human-System Interface Design (Related to RG 1.206, Section C.I.18.7, "Human System Interface Design")

18.8.1 Introduction

HSI design describes the design process and scope, including the translation of function and task requirements into the detailed design of alarms, displays, controls, and other aspects of the HSI through the systematic application of HFE principles and criteria. It also describes the process by which HSI design requirements are developed and HSI designs are identified and refined.

18.8.2 Summary of Application

Section 18.8 of the VCSNS COL FSAR, Revision 2, incorporates by reference Section 18.8 of the AP1000 DCD, Revision 17.

In addition, in VCSNS COL FSAR Section 18.8, the applicant provided the following:

Tier 2 Departure

- VCS DEP 18.8 1

The applicant proposed a Tier 2 departure (DEP) from the AP1000 DCD related to the location of the TSC and Operational Support Center (OSC).

18.8.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for VCS DEP 18.8-1 are given in Chapter 18 of NUREG-0800.

The applicable regulatory requirements for VCS DEP 18.8-1 are as follows:

- 10 CFR Part 52, Appendix D, Section VIII, "Processes for changes and departures"
- 10 CFR 52.79(c)

18.8.4 Technical Evaluation

The NRC staff reviewed Section 18.8 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the HSI design. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Tier 2 Departure

- VCS DEP 18.8-1

HFE design implementation in the TSC is not location-dependent. Therefore, the proposed location of the TSC between the protected areas of Unit 1 and Units 2 and 3 is acceptable from an HFE program perspective. HFE design elements applicable to the TSC are identified and implemented in accordance with AP1000 DCD, Chapter 18, which is addressed in Section 18.2.4 of this SER.

The TSC location has the potential to affect technical data availability, communications, power supply reliability, security, and habitability. The acceptability of this location relative to these attributes is addressed in Section 13.3 of this SER.

The OSC is not in the HFE program scope. Therefore, the OSC location change is not evaluated from an HFE program perspective. The OSC location, as it relates to emergency preparedness, is evaluated in Section 13.3 of this SER.

18.8.5 Post Combined License Activities

There are no post-COL activities related to this section.

18.8.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to HSI design, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the acceptance criteria defined in NUREG-0711, Section 8.4. The staff based its conclusion on the following:

- Implementation of HFE design in the TSC is not location-dependent and the HFE design elements applicable to the TSC are in accordance with AP1000 DCD, Chapter 18.

18.9 Procedure Development (Related to RG 1.206, Section C.I.18.8, "Procedure Development")

Procedure development documents, in coordination with VCSNS COL FSAR Section 13.5, ensure that the HFE principles and criteria, along with other design requirements, are incorporated in developing procedures that are technically accurate, comprehensive, explicit, easy to use, and validated. The procedure development program addresses the requirements specified in 10 CFR 50.34(f)(2)(ii) and describes the procedure writer's guide that establishes the process for developing technical procedures. The writer's guide ensures that procedures are consistent in organization, style, and content, and it also specifies which procedures fall within the purview of the guide.

Section 18.9 of the VCSNS COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 18.9 of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding information related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.10 Training Program Development (Related to RG 1.206, Section C.I.18.9, "Training Program Development")

18.10.1 Introduction

Training programs help to provide reasonable assurance that plant personnel have the knowledge, skills, and abilities to properly perform their roles and responsibilities. The training program, as discussed in this section, is coordinated with the training discussions in VCSNS COL FSAR Section 13.2, and describes how the training program follows a systems approach to training, and how it addresses the requirements of 10 CFR 50.120, "Training and qualification of nuclear power plant personnel," 10 CFR 52.79(a)(33), and 10 CFR Part 55, "Operators' Licenses."

18.10.2 Summary of Application

Section 18.10 of the VCSNS COL FSAR, Revision 2, incorporates by reference Section 18.10 of the AP1000 DCD, Revision 17.

In addition, in VCSNS COL FSAR Section 18.10, the applicant provided the following:

AP1000 COL Information Item

- STD COL 18.10-1

The applicant provided additional information in STD COL 18.10-1 to resolve COL Information Item 18.10-1, addressing the execution of a training plan.

18.10.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for STD COL 18.10-1 are given in Chapter 18, Section II.A.9 of NUREG-0800.

The applicable regulatory requirements for STD COL 18.10-1 are as follows:

- 10 CFR 52.79(c)

The related acceptance criteria are as follows:

- NUREG-0711, Section 10.4
- Nuclear Energy Institute (NEI) 06-13A, "Template for an Industry Training Program Description," Revision 1

18.10.4 Technical Evaluation

The NRC staff reviewed Section 18.10 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to training program development. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 18.10.4 of the VEGP SER:

> *The following portion of this technical evaluation section is reproduced from Section 18.10.4 of the BLN SER:*
>
> *<u>AP1000 COL Information Item</u>*
>
> - *STD COL 18.10-1, addressing execution of a training plan*
>
> *The applicant provided additional information in STD COL 18.10-1 to resolve COL Information Item 18.10-1. COL Information Item 18.10-1 refers to Section 13.2, where the COL information item in Section 13.2.1 states:*
>
>> *Combined License applicants referencing the AP1000 certified design will develop and implement training programs for plant personnel. This includes the training program for the operations personnel who participate as subjects in the human factors engineering verification and validation. These Combined License applicant training programs will address the scope of licensing examinations as well as new training requirements.*
>
> *The commitment was also captured as COL Action Item 18.10.3-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:*
>
>> *With regard to the training program development, the COL applicant will: (1) address the training program development in NUREG-0711; (2) address relevant concerns identified in NUREG-1793; and (3) identify the minimum documentation that the COL applicant will provide to enable the staff to complete its review.*
>
> *The NRC staff reviewed the resolution to COL Information Item 18.10-1 related to staffing and qualifications included under Section 18.10 of the BLN COL FSAR, Revision 1. Section 18.10 in the BLN COL FSAR refers to Section 13.1,*

"Organizational Structure of Applicant," and Section 13.2, "Training," regarding the training program development. In Section 13.2 of the BLN COL FSAR, the applicant provided the referenced, NRC approved, NEI 06-13A [Revision 1], "Template for an Industry Training Program Description" to address COL Information Item 18.10-1. The applicant also noted that a systematic approach to training development will be conducted in accordance with the referenced staff approved WCAP-14655, "Designer's Input for the Training of the Human Factors Engineering Verification and Validation Personnel."

The applicant provided information for the operational programs relating to non-licensed plant staff training, reactor operator training, and reactor operator re-qualification, by referencing NEI 06-13A [Revision 1], "Template for an Industry Training Program Description."

NEI 06-13A was created to provide applicants with a generic program description for use with COL application submittals. In a letter dated March 7, 2007, the staff stated that the template was an acceptable means for describing reactor operator and non-licensed plant staff training programs. The staff finds this approach to be acceptable because NEI 06-13A addresses non-licensed plant staff training, reactor operator training, and reactor operator re-qualification.

18.10.5 Post Combined License Activities

There are no post-COL activities related to this section.

18.10.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to training program development, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and is sufficient to resolve COL Action Item 18.10.3-1. The staff based its conclusion on the following:

- COL Information Item 18.10-1, relating to training, appropriately references Section 13.2 "Training." In Section 13.2, the applicant has committed to using WCAP-14655 to ensure a systematic approach to training development, and the applicant has referenced the staff-endorsed NEI 06-13A, Revision 1.

- Information involving nonlicensed plant staff training, reactor operator training, and reactor operator requalification are acceptably addressed because the applicant referenced NEI 06-13A, Revision 1.

- The staff's review of the VCSNS training program is found in Sections 13.2 and 13.4 of this SER.

18.11 Human Factors Engineering Verification and Validation (Related to RG 1.206, Section C.I.18.10, "Verification and Validation")

Human factors V&V documents the V&V activities confirming that the HSI design conforms to HFE design principles and that it enables plant personnel to successfully perform their tasks to achieve plant safety and other operational goals.

Section 18.11 of the VCSNS COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 18.11 of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.12 Inventory (No Corresponding Section in RG 1.206)

The specific sensors, instrumentation, controls, and alarms that are needed to operate the various plant systems constitute the inventory. The instruments, alarms, and controls for each system are documented in the piping and instrumentation diagrams. The minimum inventory required to safely shutdown the reactor and maintain it shutdown is also identified.

Section 18.12 of the VCSNS COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 18.12 of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.13 Design Implementation (Related to RG 1.206, Section C.I.18.11, "Design Implementation")

Design implementation verifies that the as-built design conforms to the verified and validated design that resulted from the HFE design process. The scope of the design implementation includes the following considerations:

- V&V of design aspects that cannot be completed as part of the HSI V&V program
- confirmation that the as-built HSI, procedures, and training conform to the approved design
- confirmation that all HFE issues in the tracking system are appropriately addressed

Section 18.13 of the VCSNS COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 18.13 of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.14 Human Performance Monitoring (Related to RG 1.206, Section C.I.18.12, "Human Performance Monitoring")

18.14.1 Introduction

Human performance monitoring is used to assure that no significant safety degradation occurs because of any changes that are made in the plant and to confirm that the conclusions that have been drawn from the integrated system validation remain valid over time. Human performance monitoring is a program that begins after plant operation commences. Therefore, the applicant describes the documentation to be maintained after the program is implemented. The objective of this review is to verify that the applicant has prepared a human performance monitoring strategy for ensuring that no significant safety degradation occurs because of any changes that are made in the plant.

The program describes: (1) a human performance monitoring strategy; (2) how it trends human performance relative to changes implemented in the plant after startup; and (3) how it demonstrates that performance is consistent with that assumed in the various analyses conducted to justify the changes.

The program provides for specific cause determination, trending of performance degradation and failures, and determination of appropriate corrective actions. Detailed implementation plans and procedures for human performance monitoring remain available for NRC review.

18.14.2 Summary of Application

Section 18.14 of the VCSNS COL FSAR, Revision 2, incorporates by reference Section 18.14 of the AP1000 DCD, Revision 17.

In addition, in VCSNS COL FSAR Section 18.14, the applicant provided the following:

AP1000 COL Information Item

- STD COL 18.14-1

The applicant provided additional information in STD COL 18.14-1 to resolve COL Information Item 18.14-1, addressing human performance monitoring after the plant is placed in operation.

18.14.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for STD COL 18.14-1 are given in Chapter 18, Section II A.12 of NUREG-0800.

The applicable regulatory requirements for STD COL 18.14-1 are as follows:

- 10 CFR 52.79(c)

The related acceptance criteria are as follows:

- NUREG-0711, Section 13.4

18.14.4 Technical Evaluation

The NRC staff reviewed Section 18.14 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to human performance monitoring. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 18.14.4 of the VEGP SER:

> *The following portion of this technical evaluation section is reproduced from Section 18.14.4 of the BLN SER:*
>
> *<u>AP1000 COL Information Item</u>*
>
> - *STD COL 18.14-1 (COL Action Item 18.13-1)*
>
> *The applicant provided additional information in STD COL 18.14-1 to resolve COL Information Item 18.14-1. COL Information Item 18.14-1 states:*
>
>> *Human performance monitoring applies after the plant is placed in operation, and is a Combined License Applicant responsibility.*
>
> *The commitment was also captured as COL Action Item 18.13-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:*
>
>> *The COL applicant is responsible for human performance monitoring after the plant is placed into operation. The human performance monitoring process implements the guidance and methods as described in DCD Section 18.14 Reference 1 (NUREG-0711).*
>
> *The applicant noted that the human performance monitoring process implements the guidance and methods as described in DCD Section 18.14. The applicant defines a broad outline of the structure of the human performance monitoring process and the assurances that can be obtained through implementation of the process. The human performance monitoring process for risk-informed changes is integrated into the corrective action program, training program, and other programs as appropriate. The cause determination process is also defined. It states that monitoring strategies for human performance trending after the implementation of the design changes are capable of demonstrating that performance is consistent with that assumed in various analyses conducted to justify the changes. Risk-informed changes are screened commensurate with their safety importance to determine if the changes require monitoring.*
>
> *The NRC staff reviewed the resolution of COL Information Item 18.14-1 relating to human performance monitoring included under Section 18.14 of the BLN COL FSAR, Revision 1.*
>
> *The BLN COL FSAR describes the human performance monitoring program found in NUREG-0711. It also states:*
>
>> *The human performance monitoring process for risk-informed changes is integrated into the corrective action program, training*

> *program and other programs as appropriate. Identified human performance conditions/issues are evaluated for human factors engineering applicability.*

Criterion 5 of NUREG-0711 states:

> *As part of the monitoring program, it is important that provisions for specific cause determinations, trending of performance degradation and failures, and corrective actions be included. The cause determination should identify the cause of the failure or degraded performance to the extent that corrective action can be identified that would preclude the problem or provide adequate assurance that it is anticipated prior to becoming a safety concern.*

The applicant's use of cause investigation:

- *Identifies the cause of the failure or degraded performance to the extent that corrective action can be taken consistent with the corrective action program requirements.*
- *Addresses failure significance, which includes the circumstances surrounding the failure or degraded performance, the characteristics of the failure, and whether the failure is isolated or has generic or common cause implications.*
- *Identifies and establishes corrective actions necessary to preclude the recurrence of unacceptable failures or degraded performance in the case of a significant condition adverse to quality.*

The staff has determined that the information included in Section 18.14 of the BLN COL FSAR is consistent with criteria found in NUREG-0711 and is sufficient for the staff to consider COL Information Item 18.14-1 closed.

18.14.5 Post Combined License Activities

There are no post-COL activities related to this section.

18.14.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to human performance monitoring, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the acceptance criteria defined in NUREG-0711. The staff based its conclusion on the following:

- STD COL 18.14-1, addressing human performance monitoring after the plant is placed in operation, outlines a structured approach for accomplishing this monitoring.