U.S. Department of Energy
Office of River Protection
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

04-WED-056

NOV 03 2004

Mr. J. P. Henschel
Bechtel National, Inc.
2435 Stevens Center
Richland, Washington 99352

Dear Mr. Henschel:

CONTRACT NO. DE-AC27-01RV14136 – TRANSMITTAL OF U.S. DEPARTMENT OF ENERGY, OFFICE OF RIVER PROTECTION (ORP) DESIGN OVERSIGHT REPORT: REVIEW OF CONTRACTOR PROCESS FOR DESIGN OF THE MAIN CONTROL ROOM (MCR)

Reference: BNI letter from J. P. Henschel to R. J. Schepens, ORP, "Coordination of Design Oversight and Design Overview Reviews, Contract Deliverable 3.10," CCN: 063916, dated September 5, 2003.

ORP has conducted a Design Oversight, as agreed in the Reference letter, of the MCR and is transmitting the resulting report by attachment to this letter.

The Design Oversight concluded that the design of the MCR has considered the appropriate technical and contract requirements and followed the required processes, procedures, and guides in implementing the design. This Design Oversight identified no open items or adverse findings, but there were three recommendations provided to strengthen the design implementation and ensure that the design requirements imposed by the Waste Treatment and Immobilization Plant (WTP) contract are fully implemented. Two of the recommendations are for Bechtel National, Inc. (BNI) to better document their explanation of responses to the lines of inquiry, and the third is for ORP to follow up on commitments made by BNI. The consequence of these recommendations is that when the design is sufficiently mature, ORP should confirm that the design continues to satisfy the requirements of the WTP Control Room Requirements Specification, the Operations Requirements Document, and the Design Guide for the Human Machine Interface.

If you have any questions, please contact me, or your staff may call William F. Hamel, Jr., Director, WTP Engineering Division, (509) 373-1569.

Sincerely,

For Roy J. Schepens
Manager

WED:WFH

Attachment

cc w/attach:
S. Lynch, BNI M. Wright, BNI B. Lawrence, WGI

Attachment
04-WED-056

ORP Design Oversight Report

Review of Contractor Process for Design of the Main Control Room

WED:JEO
October 18, 2004

U.S. Department of Energy, Office of River Protection

ORP DESIGN OVERSIGHT REPORT

REVIEW OF CONTRACTOR PROCESS FOR DESIGN OF THE MAIN CONTROL ROOM

JULY 2004

Design Oversight: D-04-DESIGN-005

Team Lead: John Orchard 10/25/04

Reviewers: Randy Unger

Todd Shrader 10/25/04

Greg Gibbs

Concurrence: William F. Hamel, Director 10/25/2004
Waste Treatment and Immobilization
Plant Project Engineering Division

Approved: John R. Eschenberg, Manager
WTP Project Office 10/26/04

Executive Summary

The U.S. Department of Energy (DOE), Office of River Protection (ORP) staff and technical support contractor staff have conducted a design oversight to:

- Identify and understand the technical requirements imposed on and selected by the Contractor for designing the Main Control Room (MCR).
- Identify and understand the applicable processes, procedures, guides, etc. used by the Contractor for designing the Main Control Room.
- Evaluate a sampling of the design products to confirm the processes are effective in implementing the technical requirements, and that the principal factors affecting the Main Control Room design are being appropriately addressed.

The design process appears to be progressing satisfactorily. There are two activities under development that relate to the detailed design of the control room. These are (1) preparation of a change to the Basis of Design, Section 7, Control Philosophy to emphasize that manual administrative control of the plant will be utilized to the extent practical and (2) reconfiguration of the Pretreatment Annex into an ITS reinforced seismic concrete structure that houses the MCR and a separate Non-ITS structure for operational support areas. The Basis of Design Change has not yet been submitted to ORP for concurrence and there is considerable detail design still to be accomplished to implement the reconfiguration.

The Design Oversight concluded that the design has considered the appropriate technical and contract requirements and followed the required processes, procedures and guides in implementing the design. This Design Oversight identified no open items or adverse findings, but there were three recommendations provided to strengthen the design implementation and ensure that the design requirements imposed by the WTP contract are fully implemented. Two of the recommendations are for BNI to better document their explanation of responses to the lines of inquiry, and the third is for ORP to follow up on commitments made by BNI. The consequence of these recommendations is that when the design is sufficiently mature, ORP should confirm that the design continues to satisfy the requirements of the WTP Control Room Requirements Specification, the Operations Requirements Document, and the Design Guide for the Human Machine Interface.

Table of Contents

1.0 INTRODUCTION

A primary mission of the U.S. Department of Energy (DOE), Office of River Protection (ORP) is the construction of the Waste Treatment and Immobilization Plant (WTP) in the 200 East Area of the Hanford Site. The design and construction contractor for the WTP is Bechtel National, Inc. (BNI). As part of its oversight responsibilities, ORP performs various assessments of BNI activities during the design and construction phase. One type of assessment is the design review of various facility components and systems, called a Design Oversight, performed by the WTP Engineering Division (WED). Due to the importance to the WTP mission, WED selected the Main Control Room, annexed to the Pretreatment Facility (PT) Facility, for a Design Oversight. The purpose of the review was to confirm that the Contractor design process effectively implemented Contract and other applicable technical requirements for the Main Control Room equipment design and layout, and the facility design and layout, including habitability, human factors, control philosophy, physical design criteria, etc.

The formal phase of the Design Oversight occurred from June 15, 2004, to July 9, 2004 and consisted of BNI staff interviews, document review, and fact finding. The team pursued clarification and elaboration of the initial information through August, and prepared the Report in September. The Report has been informally reviewed by BNI, for factual accuracy. There were no open items or adverse findings, but there were three recommendations provided to strengthen the design implementation and ensure that the design requirements imposed by the WTP contract are fully implemented. Two of the recommendations are for BNI to better document their explanation of responses to the lines of inquiry, and the third is for ORP to follow up on commitments made by BNI.

2.0 BACKGROUND

The MCR provides the focus of control for plant operations. The design of the MCR has many facets and involves several disciplines, including facility engineering, Control Systems, HVAC, etc. that need to be integrated for successful operation. The Main Control Room was planned to be housed in the Pretreatment Annex which was in preliminary design and undergoing Value Engineering optimization studies. The MCR architecture was well developed but the process control philosophy, design criteria, MCR complex layout, and support system requirements were still being finalized. A BODCN was prepared to update the control philosophy, a trend was prepared to update the PT Annex layout and structural design, and the habitability ventilation design is under review.

The Design Oversight included review of design inputs of Requirements, Functions, Hazards Analyses, Control Philosophy and design products of architectural layout, structural design, support systems, normal and emergency habitability systems, Human Factors, safety features, etc. for the Main Control Room including the physical and programmatic interfaces with the satellite Facility Control Rooms, Stand-by Control Room, Emergency Command Center, and the Control Room Simulator.

3.0 OBJECTIVES, SCOPE AND APPROACH

3.1 Objectives

The following were the specific objectives of this design oversight:

1. Identify and understand the technical requirements imposed on and selected by the Contractor for designing the Main Control Room.

2. Identify and understand the applicable processes, procedures, guides, etc. used by the Contractor for designing the Main Control Room.

3. Evaluate a sampling of the design products to confirm the processes are effective in implementing the technical requirements, and that the principal factors affecting the Control Room design are being appropriately addressed.

The design oversight was conducted as part of ORP's responsibility as owner of the WTP to ensure that the design and planned operations comply with the appropriate functional and operating requirements.

3.2 Scope

This oversight included a review of the design processes and the design products produced to date in support of the Main Control Room design. This included procedures, calculations, deliverables, and other documents that describe the applicable processes and products.

This oversight also included observing the internal functioning of the BNI design process to assess its effectiveness in producing the design products under review.

3.3 Approach

The oversight was conducted within the guidelines of ORP PD 220.1-12, "Conduct of Design Oversight". Evaluated information was collected from various BNI documents, DOE documents, and interviews with BNI design staff. A full listing of reviewed documents and personnel contacted is provided in Section 6.

The review team consisted of team lead John Orchard, Todd Shrader, and Randy Unger from ORP-WED and Greg Gibbs, ORP-WTP contractor support. The approved design oversight review plan is provided in Appendix A.

Six specific areas were identified for review. Review of these areas was determined to provide the information required to meet the design review objectives.

- Habitability and HVAC
- Control Philosophy
- MCR Electrical Functionality
- MCR Structural and Architectural Functionality

- Human Factors
- Hazards Analysis

The methodology of review depended on the area. The hazards analysis and functionality reviews were performed through the review of system descriptions, calculations, regulatory guides, DOE Orders and Standards, Basis of Design, engineering specifications, other industry standards and interviews with various BNI staff. The review of the structural and architectural functionality focused mainly on review of architectural sketches of proposed layouts and discussions with BNI personnel. The human factors review consisted primarily of reviewing a table prepared by the instrumentation and control group that depicted how certain paragraphs in the IEEE 1023 standard are implemented during the routine design process. Due to limitations on the review team's time and resources, representative reviews of samples of the technical documentation were performed. Much of the design documentation was in the preliminary stage.

4.0 RESULTS

Emphasis for the review was placed on application of Contract and requirements documents to the design, hazards evaluations, application of lessons learned from commercial nuclear facilities, and functionality of the design. Vertical slices of design elements or requirements were reviewed in order to gage the overall effectiveness of the design process for the MCR. Due to the reconfiguration of the facility much of the design information was preliminary or scheduled for change. Topics reviewed were assigned a line of inquiry number (LOI) for tracking purposes. The full discussion of each LOI is provided in Appendix B.

4.1 Mitigation of Hazards Affecting MCR Habitability – (LOI-1.0)

A review of design documentation was performed to determine the consequence to Control Room Personnel resulting from introduction of radioactive and chemical plumes from postulated facility and external radiological and chemical hazard events. A review of the PSAR (Ref. 6) hazards analysis indicates that automatic isolations to prevent the introduction of postulated radioactive and chemical plumes into the MCR from external or internal sources may be prudent. It may also be desirable to automatically start the standby filtration ventilation system upon automatic isolation. For example, the Technical Basis Calculation for Control Room Habitability (Ref. 1) indicates that for some DBE's the operators could exceed the 5 rem SRD limit if standby filtration is not activated within 5-10 minutes. Rapid detection of ammonia from postulated release scenarios, isolation of MCR ventilation and start of the safety class standby filtration ventilation is also indicated as being necessary within 1-4 minutes to maintain control room habitability. Currently the only automatic isolation function for the MCR ventilation is for smoke control.

The original control philosophy was to rely on operator action to switch from the main to the standby ventilation. However, since the Rev. B calculation was issued several things have changed (different source terms, different safety classification methodology, increased chemical hazards) that require additional ISM review. The outcome of this review may be a change in the control strategy. The control strategy development phase of the review is planned for after issue of the next revision to the Technical Basis Calculation. Control strategy options that will be considered by BNI include leaving the strategy as is, installing automatic sensing and actuation equipment, or running the standby ventilation continuously. A recommendation (Recommendation 3-1) is included for ORP to confirm that the final control strategy selected is appropriate to the environmental hazards that can potentially challenge the MCR habitability.

With respect to the introduction to the MCR of radioactive plumes or chemical hazards from potential transportation or stationary facility events, a review of the hazards analysis was performed. Section 1.6.2 of the General Information of the PSAR states that "... based on historical and expected operations at the Hanford Site, neither truck nor rail guidelines [of Regulatory Guide 1.78] will be exceeded for shipments of quantities that could present a risk to the WTP facility." ORP notes that the *TWRS-P Project Hazards Analysis Report* (BNFL-5193-HAR-01, Rev 0), (Ref. 8) cited as the basis for the PSAR conclusion, is developed from a survey of truck, rail and barge traffic and stationary sources of hazardous chemicals within the vicinity of the Hanford site conducted approximately eight years ago. This eight year old survey may not be representative of the current use of the transportation infrastructure or stationary sources on or near Hanford and the included Waste Treatment Plant site.

BNI should perform, or obtain from others, surveys of the location, types, frequency of shipment and quantities of hazardous chemical sources as required by their commitment to Regulatory Guide 1.78 (Ref. 13) and revise the Technical Basis Calculation for Control Room Habitability (Ref. 1) and the PSAR, if necessary, based on an analysis of the potential hazards represented by the survey results. A recommendation (Recommendation 3-2) has been included in this report that ORP confirm that the hazard analyses for chemicals and toxic gases in Rev. 0 of the Technical Basis Calculation (Ref. 1) are based on current (within 3 years) information for both mobile and stationary hazardous chemical and toxic gas sources.

4.2 Methodology for Technical Basis Calculations for WTP Control Room Habitability (LOI-2.0)

This item was a review of the Technical Basis calculation for WTP Control Room Habitability (Ref. 1) to confirm that the calculation considered both "puff or instantaneous" releases as well as a longer term slower release of the hazardous chemical tanks modeled. The review confirmed that the assumed 10 minute release of the entire tank contents and the one-hour release utilized in the calculation satisfied the intent of Regulatory Guide 1.78 (Ref. 13) which addresses habitability of plant control rooms during postulated chemical releases. No open items or recommendations were identified.

4.3 Consideration of Inleakage into the Main Control Room Envelope (LOI-3.0)

The purpose of this LOI was to confirm that lessons learned from commercial nuclear plant operations with respect to maintaining control room habitability were being incorporated into the design, and being considered future planned maintenance and operations for the Main Control Room. The review found that additional efforts will be required in this area.

The technical Basis Calculation for WTP Control Room Habitability, CALC No.: 24590-WTP-HAC-C1V-00001, Rev. B, addresses the potential for infiltration of radioactive materials from the process building to threaten MCR habitability and states in part that (1) electrical and instrument cable penetrations are sealed and protected in a manner consistent with the wall's fire rating and (2) that even if the C2 corridors become contaminated, approximately 0.2 inches differential pressure (negative 0.1 inch in the corridor, positive~1/8 inch in the annex) will prevent significant infiltration of contaminants into the annex. Years of operating history in commercial nuclear power plants have demonstrated that these assumptions are not necessarily correct.

In the 1990s approximately 30 reactor control rooms were tested with the emergency makeup filtration ventilation systems running to verify that the design positive differential pressure between the control room and its environs was being maintained. While many passed the differential testing requirement, which was assumed to demonstrate integrity of the control room envelope, all but one plant exceeded the design value for inleakage assumed in its design and licensing basis.

When this experience is applied to the WTP, the tests demonstrate that calculations for control room habitability should prudently include an inleakage factor to account for gradual degradation in seals, floor drain traps, fans, ductwork and other components; other degrading factors include drift in throttled dampers, inadequate maintenance on the control room envelope, changes in differential pressures caused by ventilation system changes and inadvertent misalignments of ventilation systems. A review of the subject calculation did not identify any quantifiable value for inleakage assumed for the radiation dose and chemical hazard evaluations addressed. BNI states that a subsequent revision to the Technical Basis Calculation will provide some allowance for infiltration.

Also, to ensure that over the 40 year design life of the facility the assumed inleakage value in hazards evaluations is not exceeded, appropriate integrity surveillance testing of the control room boundary would be prudent. Regulatory Guide 1.196 provides guidance. BNI stated they will establish a maintenance program for the Control Room Habitability systems as well as a program to ensure appropriate control room envelope integrity is maintained. In developing these programs BNI should ensure that the requirements highlighted in committed Regulatory Guide 1.78 (Ref. 13), which endorses ASTM E741-95, *Standard Test Method for Determining Air Change in A Single Zone by Means of Tracer Gas Dilution,* as an effective method for determining inleakage characteristics of the MCR envelope, are fully addressed. A recommendation (Recommendation 3-3) is included in this report for ORP to confirm that the maintenance, testing and surveillance of the MCR envelope integrity, as finally implemented by BNI, incorporates the experience of the Commercial Nuclear Power Industry as reflected in Regulatory Guide 1.78, *Evaluating the Habitability of a Nuclear Power Plant Control Room during a Postulated Chemical Release,* committed to in the Safety Requirements Document for the WTP.

4.4 Implementation of Human Factors in the Main Control Room (LOI-4.0)

a. DOE documentation requires that a Human Factors (HF) process be established by the contractor to provide assurance that, "the importance of human-machine interfaces is considered in facility safety", and that consideration be given to, "ergonomics and human factors requirements for operations and maintenance." The contractor's HF Program

Implementation Plan for Design and Commissioning (HFPIP), 24590-WTP-PL-G-03-002, Rev 0, establishes a process that seems to address only safety related systems. HF assessments should not be constrained only to the review of safety related systems, but should include considerations of non-safety related activities associated with systems operability, reliability, and life-cycle costs.

HFPIP cites the contract requirement to address HF requirements to: Assess potential operator human error; provide instrument and control capabilities for ensuring safe operations; and, assure that control-room safety statusing is accomplished via effective displays and indicators. No documentation of a 'systematic inquiry' or HF methodological application to control-room operations *presently* exists, e.g., documentation relating to HF scoping, objectives, modes-of-operation, operational environment descriptions, user profiles, alternative designs, task analyses, HMI allocations/optimizations, etc.

The HFPIP states that HF-related requirements have been identified by the engineering disciplines. However, no description of the HF resources used to derive these requirements is cited. How is it determined that these are in fact, requirements derived from an "HF" process? The use of a 'checklist' is cited for development of HF requirements; an attempt to obtain this document through 'DocSearch' was unsuccessful and the contractor intimated that the document is being updated.

HFPIP states that task analyses will be performed addressing performance requirements for operator actions to mitigate accidents. It is assumed that these are control-room 'operator actions'. The HPIP implies that HF activities and task analyses are to be accomplished in support of these various operations, but it is not clear which control rooms will be affected, nor to what degree these analyses will be conducted.

b. DOE documentation requires that Human Machine Interfaces (HMIs) be identified to facilitate review of contractor efforts in assuring HF facility operability and safety.

   The Human Factors Program Implementation Plan does not contain a listing or description of HMIs, nor is reference made to a listing of HMIs.

c. DOE documentation requires, "a systematic inquiry into the optimization of human-machine interfaces" for SSCs, to enhance human performance.

The HFPIP does not address how optimization of HMIs will occur. HMI optimization is necessary to ensure that appropriate allocation of human-machine taskings has been accomplished including the following.

The present HFPIP seems to address only HF requirements related to safety systems. DOE documentation and contract requirements imply that both operability (non-safety related) and safety requirements be considered as part of the contractor's HF design process. The HFPIP emphasizes HF activities related to safety related systems of the ICN control room operations. However, the contractor has submitted a cross-reference table showing how he is implementing IEEE 1023 for the I&C design of the Control Room by routine involvement of project

Operations and HP personnel. In view of DOE documentation and contract requirements (e.g., the requirement to give consideration to ergonomics and HF for O&M) and the contractor's method of implementation of HF principles, the contractor should modify the HFPIP to clarify the consideration given to non-safety related requirements for salient activities which may significantly impact WTP operability and life-cycle costs.

Therefore, it is recommended (Recommendation #1) that BNI modify the HFPIP to better describe the consideration given to non-safety related requirements for salient activities which might significantly impact WTP operability and life-cycle costs.

4.5 Manifestation of Control Philosophy in the Main Control Room (LOI-5.0)

BNI is preparing a change to the Basis of Design, Section 7, Control Philosophy to emphasize that manual administrative control of the plant will be utilized to the extent practical. Automatic control will be used where timing requirements are too fast for manual operation. Basic controls such as interlocks and closed loop regulatory control will be automated. The purpose of this line of inquiry is to understand the effect of this changed philosophy on WTP testing and operations, commissioning, and future operations beyond the scope of the WTP contract.

Some aspects of the testing and commissioning strategy will be facilitated by the change in control philosophy from automated to manual. Where operators are in direct control of systems and processes using written procedures, changes to procedures can be completed more quickly and at less expense than equivalent changes to control system programming. Additionally, there is substantially less startup testing required in support of remote manual operation than is required for automatic sequence control. However, there might not be a savings in control system programming costs because the work avoided in not programming the Procedural Controls will be partly offset by the work incurred in additional programming of the Basic Controls. Additional interlocks will be required for increased equipment and personnel protection necessitated by the reduction of procedural automation and its inherent safety.

Physical equipment would be relatively unchanged as a result of this proposed control philosophy change. Physical components, instrumentation and protective interlocks will be designed with Basic Controls for personnel protection, regulatory compliance, and equipment protection. What would not be developed under this philosophy are the programmed sequences to coordinate the interaction of components to accomplish procedural sequences (e.g. Perform transfer of x gallons from vessel A to vessel B). These operations would be accomplished manually with the benefit of basic controls.

No specific life cycle cost estimates have been completed. The purpose of this "change in philosophy" is to describe the degree of automation required for safe and efficient operation. BNI states that unnecessary automation adds to the cost of the project in terms of design, testing, and reprogramming as operation of the plant undergoes metamorphosis.

BNI judges the level of automation being designed will support long term, safe and efficient operation of the WTP. BNI observes that as operating experience is gained, some procedures may be identified that would be beneficial to automate from a repetition, time critical, or efficiency standpoint. The software development can be performed for those operations as they are identified.

ORP notes that the Contract requires that Basis of Design changes receive DOE concurrence. To facilitate ORP's concurrence in this proposed change to the Control Philosophy, BNI has agreed to provide the rationale for the changes in degree of automation as documented in BNI meeting minutes on a system by system basis. A recommendation (Recommendation 3-4) for ORP to review and consider the rationale has been included in this report.

4.6 Control Transfer Strategy from the Facility Control Rooms to the Main Control Room (LOI-6.0)

The Main Control Room (MCR), located in the Control Building adjacent to the PTF, is the primary control and monitoring point for the Pretreatment processes, the Balance of Facilities and the LAB. The HLW and the LAW facilities may also be monitored and controlled, from the MCR, when their respective control rooms must be evacuated. The team questioned BNI regarding the Project's design plans driven by considerations such as: conditions of transfer of control between control rooms, the extent of control features that will exist in the MCR for HLW and LAW upon evacuation of these facilities, and other integrated control features.

Whenever the HLW or LAW control room becomes uninhabitable, transfer of the control will be to the PTF MCR. This includes internal events such as a Control Room Fire or external events such a chemical or radiological release.

The controls available will be dependent on the accident condition resulting in the transfer of controls. For accidents in which the normal Integrated Control System is available, as would be expected for an offsite radiological release (non-seismic), all normal controls would be expected to be available.

Evaluations are currently being performed by BNI to identify post accident monitoring and control requirements consistent with IEEE Standard 497-2002, *Standard Criteria for Accident Monitoring Instrumentation for Nuclear Power Generating Stations* as identified in the Safety Requirements Document SRD Criteria 4.3-4. Currently the LAW offgas fans and UPS are designed to fail to a safe condition and do not require external Control.

There are currently no engineered interlocks planned for transfer of control from the Facility Control Rooms (FCR(s)) to the MCR. BNI states that this will be handled administratively by procedure and software password priority. To ensure these transfers are accomplished with the necessary discipline and control rigor, a recommendation (Recommendation #2) has been identified for BNI to provide ORP a detailed explanation (addressing both PCJ and PPJ systems) of the controls established for affecting transfer of control to and from the MCR for the HLW and LAW FCRs.

4.7 Soil-Structural analysis of vibration induced load on the Main Control Room by the adjacent PJM air compressors (LOI-7.0)

Trend, TN-24590-03-01094, proposed a change in the design of the PT Annex that was to house the MCR. The proposed Annex design has a separate ITS building of reinforced concrete (the Control Building) and non-ITS annex for operational support areas. The Pretreatment Annex Architectural Floor Plan Sketches Proposed Layout – G (Ref. 17) shows an appended structure to the ITS portion of the building planned to house the Pulse Jet Mixer (PJM) air compressors. This LOI was written to identify and understand the potential effects (induced vibration and noise) the compressors could have on the MCR. As the design detail is still maturing information available is very preliminary.

The critical SC/SS control system electronics are rated for 2g @ 10 to 500 Hz (Sinusoidal Vibrations per axis) and the normal control system electronics are rated for 0.25g at 3 to 200 Hz. The estimated ambient noise should be less that 50 dB(A) total which allows normal communication at a distance of 10 feet.

The vibration isolation mechanisms will consist of providing a separate foundation pad for each compressor which will be installed separate from the main base mat. A compressible material will be provided in the joint between the compressor pad and the main base mat. In addition, vibration isolators will be provided between the compressor mounts and the concrete pad. The vibration spectrum induced on the MCR by the compressors will be evaluated when the vibration characteristics are received from the vendor and will be analyzed using applicable soil characteristics.

While vibration isolation, induced vibration spectrum and noise levels as they could affect the control room are being considered in the design, DOE should confirm that the cumulative noise levels (equipment and personnel) and any induced vibration levels are acceptable as specified in section 3.3 and 3.9.6.2 of the WTP Control Room Requirements specification (Ref. 10). A recommendation (Recommendation 3-5) in this regard has been included in this report.

4.8 Control room equipment, layout, and architectural features (LOI-8.0)

WTP Control Room Requirements Specification, Rev. 1 (Ref. 10) identifies the main control room and control room support locations. The main control room (MCR) is the primary control and monitoring point for the Pretreatment processes, the Balance of Facilities and the LAB. Additionally the HLW and LAW facilities may also be monitored and controlled from the MCR when their respective control rooms must be evacuated.

Trend, TN-24590-03-01094, invoked a change in the design of the PT Annex that was to house the MCR. The new Annex design has a separate ITS building of reinforced concrete and Non-ITS annex for operational support areas. This will minimize the costs of construction, since the size of the ITS portion that requires seismic qualification is smaller and has been separated from facilities not required to be seismically qualified. The reconfiguration has the potential to affect current plans for the MCR layout. ORP reviewed these changes with BNI to understand what consequential changes, if any, are anticipated and the effect of those changes on the functionality and habitability of the MCR with respect to the requirements specified in the WTP Control Room Requirements Specification (Ref. 10).

The primary effects anticipated as a result of the trend are minor increases in some room sizes, a change in configuration of the emergency exit egress directly to the building exterior, the mirror imaging of the groupings of the MCR, Crane Control Room and Engineering Support Room and relocation of the air intakes to for the MCR HVAC to the south wall of the proposed layout. The latter will require a change to Technical Basis Calculation for Control Room Habitability (Ref. 1), since originally the air intakes were on the west wall. Also, no changes to the Operations Requirements Document are anticipated as a result of the configuration changes proposed by the subject Trend. Minor modifications to the room layouts resulting from maturation of the detailed design are expected to continue.

When the design is sufficiently mature, ORP should confirm that the architectural layout, as revised, continues to satisfy the requirements of the WTP Control Room Requirements Specification (Ref. 10), the Operations Requirements Document (Ref. 12), and the Design Guide for the Human Machine Interface (Ref. 28). This recommendation (Recommendation 3-6) has been included in the report.

4.9 Electrical Systems for Main Control Room Complex (LOI-9.0)

The following functions need to be performed or supported in the MCR and the Control Building under normal and upset conditions include:

- Operator supervision and operation of all Pre-Treatment Facility operations under normal operating conditions.
- Under accident conditions, the MCB provides for operator oversight/status of Safety Systems as well as identified operator initiated actions (e.g. initiate shutting of seismic isolation valves) for the Pre-Treatment Facility.
- Under specific accident conditions when one or more of the HLW, LAW local control rooms need to be abandoned, the MCB provides for operator oversight/status of Safety Systems as well as identified operator initiated actions for those facilities.
- The MCB also houses Important to Safety Electrical Control Centers including the Uninterruptible Power Supply (UPS), and Control and Instrumentation (Plant Protection Systems) Computers.
- Further, the MCB provides facilities for emergency response/notification activities (Incident Command Post).

The facility must meet the ability of operators to complete their process and emergency related actions. In addition to the process controls needed to perform safety related activities, the general control room environment must be supportive as well. This includes a stable structure, clean air, water, lighting, and restrooms. During upset conditions, there are generally three time frames to consider; immediately following an accident, a lockdown period when conditions outside the control room do not allow operators to exit or others to enter, and an occupation period for longer-term monitoring. The actual time frames for the lockdown period and occupation period have not been established but can be initially estimated to be 4 to 8 hours and >8 hours respectively. Standards for these times do not exist, as they are completely dependent on site-specific conditions and accident scenarios. Support during these periods should include the following:

Time Frame	MCB Structure	Filtered HVAC	Lighting	Potable Water	Restrooms
Immediate	X	X	X		
Lockdown Period	X	X	X		
Occupation Period	X	X	X	X	X

The structure will be available since it is a SC-I facility. Habitability is assured by providing control room air that is treated for the expected accident conditions. In addition to the analysis provided by 24590-WTP-HAC-C1V-00001, Rev B, *Technical Basis Calculation for WTP Control Room Habitability*, the NRC provides additional guidance in Regulatory Guide 1.196, *Control Room Habitability At Light-Water Nuclear Power Reactors* and Regulatory Guide 1.197, *Demonstrating Control Room Envelope Integrity At Nuclear Power Reactors.*

For the MCR, the HVAC system will either provide 100% redundant ventilation trains each providing makeup air that is HEPA and carbon-bed filtered on a full-time basis, or automatic switchover controls will be provided. Emergency lighting and HVAC is supplied by both normal and emergency (diesel generator) power. ANS Standard 3.8.2 *Criteria for Functional and Physical Characteristics of Radiological Emergency Response Facilities* provides guidance on what equipment and supplies to consider for nuclear power plant operators to independently man the control room in accident conditions for a 24 hour period without external support.

The Design Basis Accident conditions and required redundancy are included within the Safety Analysis Reports.

When the electrical design is sufficiently mature, ORP should confirm that the appropriate functions in the MCR are adequately provided with back-up power for the applicable conditions. This recommendation (Recommendation 3-7) has been included in the report.

5.0 OPEN ITEMS AND RECOMMENDATIONS

Recommendations will be tracked by the team leader through the closure memorandum. The recommendations presented include actions to be performed by BNI and actions to be performed by ORP. In general, the recommendations for BNI can be addressed immediately. The recommendations for ORP will be performed after further maturing of the design.

Recommendation #1:

It is recommended that BNI modify the HF Plan to better describe the consideration given to non-safety related requirements for salient activities which might significantly impact WTP operability and life-cycle costs. (From LOI-4.0)

Recommendation #2:

It is recommended that when the design has sufficiently progressed, BNI provide ORP a detailed explanation (addressing both PCJ and PPJ systems) of the controls established for affecting transfer of control to and from the MCR for the HLW and LAW FCRs. (From LOI-6.0)

Recommendation #3:

It is recommended that ORP confirm the design continues to satisfy the requirements of the WTP Control Room Requirements Specification, the Operations Requirements Document, and the Design Guide for the Human Machine Interface in the following areas.

1. Based on the revised 24590-WTP-HAC-C1C-00001, Technical Basis Calculations for Control Room Habitability, ORP should confirm that the final control strategy selected (leaving the strategy as is, installing automatic sensing and actuation equipment, or running the standby ventilation continuously) is appropriate to the environmental hazards that can potentially challenge the MCR habitability. (From LOI-1.0)

2. ORP should review Rev. 0 to the Technical Basis Calculation for Control Room Habitability to confirm that the hazard analyses for chemicals and toxic gases are based on current information (within 3 years) for both mobile and stationary hazardous chemical and toxic gas sources. (From LOI-1.0)

3. ORP should confirm that the maintenance, testing and surveillance of the Main Control Room Envelope integrity, as finally implemented by BNI, incorporates the experience of the Commercial Nuclear Power Industry as reflected in Regulatory Guide 1.78, *Evaluating the Habitability of a Nuclear Power Plant Control Room during a Postulated Chemical Release,* committed to in the Safety Requirements Document for the WTP. (From LOI-3.0)

4. When the proposed BODCN for the new control philosophy is submitted for concurrence, ORP should review and consider the rationale for the changes in degree of automation as documented in BNI meeting minutes on a system by system basis. (From LOI-5.0)

5. DOE should confirm that the cumulative noise levels and any induced vibration levels are acceptable as specified in section 3.3 and 3.9.6.2 of the WTP Control Room Requirements Specification. (From LOI-7.0)

6. When the design is sufficiently mature, ORP should confirm that the architectural layout, as revised, continues to satisfy the requirements of the WTP Control Room Requirements

Specification (Ref. 10), the Operations Requirements Document (Ref. 12), and the Design Guide for the Human Machine Interface (Ref. 28). (From LOI-8.0)

7. When the electrical design is sufficiently mature, ORP should confirm that the appropriate functions in the MCR are adequately provided with back-up power for the applicable conditions. (From LOI-9.0)

6.0 REFERENCES AND PERSONNEL CONTACTED

6.1 References

1. 24590-WTP-HAC-C1C-00001, Rev B, Technical Basis Calculation for Control Room Habitability

2. 24590-PTF-3YD-C1V-00001, Rev A, System Description for PTF C1 Ventilation System, C1V

3. 24590-PTF-MAC-C1V-00001, Rev A, PTF C1v Main Control Room HVAC Load Calculation

4. 24590-PTF-MAC-C1V-00002, Rev A, PTF C1V Main Control Room HVAC Equipment Sizing and Selection

5. 24590-WTP-PSAR-ESH-01-002-01, Rev 1b, Preliminary Safety Analysis Report to Support Construction Authorization; General Information

6. 24590-WTP-PSAR-ESH-01-002-02, Rev 1a, Preliminary Safety Analysis Report to Support Construction Authorization; PT Facility Specific Information

7. 24590-WTP-SED-ENS-03-002-02, Rev 0d, Safety Envelope Document; PT Facility Specific Information

8. BNFL-5193-HAR-01, Rev 0, TWRS-P Project Hazard Analysis Report

9. 24590-WTP-SRD-ESH-01-001-02, Rev 3, Safety Requirements Document Volume II

10. 24590-WTP-3PS-JQ00-T0001, Rev 1, WTP Control Room Requirements

11. 24590-WTP-3PS-JQ00-Too3, Rev A, Engineering Specification for Plant Wide Systems Components for Simulator Facility

12. 24590-WTP-RPT-OP-01-001, Rev 2, Operations Requirements Document

13. Regulatory Guide 1.78, Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release

14. Regulatory Guide 1.196, Control Room Habitability at Light-Water Nuclear Power Reactors

15. Regulatory Guide 1.197, Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors

16. TN-24590-03-01094, Redesign of PTF Annex Building

17. 24590-PTF-Annex Floor Plan, Pretreatment Annex Architectural Floor Plan Sketches Proposed Layout – G

18. 24590-WTP-DC-ST-01-001, Rev 2, Structural Design Criteria

19. 24590-WTP-DB-ENG-01-001, Rev 1 Draft Change, Basis of Design, Section 7 – Control Philosophy

20. 24590-LAW-M6C-AMR-00004, Rev A, Anhydrous Ammonia Supply Line Sizing

21. 24590-LAW-DCA-PR-03-004, Rev 0, Addition of Two Anhydrous Ammonia Tanks

22. 24590-WTP-GPG-J-014, Rev B, Control Systems Design Process Guide

23. DE-AC27-01RV14136, Waste Treatment Plant Contract

24. ANSI/ANS-58.8-1994, American National Standard Time Response Design Criteria for Safety-Related Operator Actions

25. 24590-WTP-SE-ENS-04-003, Rev 0, Safety Evaluation for Issue of Drawing 24590-LAW-M5-V17T-00010, Rev 4

26. BNI Management Power Point Presentation, Introduction to Control Systems Automation for the WTP Project

27. 24590-WTP-PL-G-03-002, Rev 0, Human Factors Program Implementation Plan for Design and Commissioning

28. 24590-WTP-GPG-J-002, Rev 0, Design Guide for the Human Machine Interface (HMI)

6.2 Personnel Contacted

Steve Anderson
Peter Douglass
LeRoy Geoff
John Hinckley
Greg Jager
Marlene Kingman
Pete Lowry

Peter Shea
Julia Hamrick
Marla Wright
Caleb Sarka
Steve Lynch
Val McAdams
Bob Voke

APPENDIX A
OVERSIGHT PLAN

U.S. Department of Energy, Office of River Protection

DESIGN PRODUCT OVERSIGHT PLAN

REVIEW OF CONTRACTOR PROCESS FOR DESIGN OF THE MAIN CONTOL ROOM

June 14, 2004

Design Oversight: D-04-DESIGN-005

Team Lead: John Orchard

Reviewer(s): John Orchard

Todd Shrader

Randy Unger

Greg Gibbs

Submitted by

Team Lead: ______________________ Date ______________

Concurrence:

WTP Engineering
Division Director: ______________________ Date ______________

Project Manager
Waste Treatment Plant: ______________________ Date ______________

1.0 Background, Purpose and Objectives

1.1 Background

The Control Room provides the main interface between the ORP and the plant operation. The design of the Control Room addresses many facets and involves several disciplines, including facility engineering, Control Systems, HVAC, etc. that need to be integrated for successful operation. The Main Control Room will be housed in Pretreatment Annex which is currently in preliminary design and undergoing Value Engineering optimization studies. The control system architecture is well developed but the process control philosophy, Control Room design criteria, Control Room complex layout, and support system requirements are still being finalized. A BODCN is in preparation to update the control philosophy, a trend is in preparation to update the PT Annex layout and structural design, and the habitability ventilation design is under review. Thus it appears this is an opportune time for the owner to review the technical status and safety design. The Technical Oversight will look at design inputs of Requirements, Functions, Hazards Analyses, Control Philosophy, etc. and design products of architectural layout, structural design, support systems, normal and emergency habitability systems, Human Factors, safety features, etc. for the Main Control Room including the physical and programmatic interfaces with the satellite Facility Control Rooms, Stand-by Control Room, Emergency Command Center, and the Control Room Simulator.

1.2 Purpose

The purposes of this review is to confirm that the Contractor design process effectively implements all Contract and other applicable technical requirements for the Control Room equipment design and layout and the facility design and layout, including Requirements, Functions, Hazards Analyses, Control Philosophy, etc. to ensure long-term operability and optimal life cycle cost of the WTP.

1.3 Specific Objectives

The following are the specific objectives of this oversight:

1. Identify and understand the technical requirements imposed on and selected by the Contractor for designing the system under review.

2. Identify and understand the applicable processes, procedures, guides, etc. used by the Contractor for designing the system under review.

3. Evaluate a sampling of the design products to confirm the processes are effective in implementing the technical requirements, and that the principal factors affecting the Control Room design are being appropriately addressed.

2.0 Process

This oversight shall be conducted within the guidelines of ORP PD 220.12, issued 2/12/03, "Conduct of Design Oversight".

2.1 Scope

This oversight will include review of the design processes and the design products produced to date in support of the topic under review. This will include procedures, calculations, deliverables, and other documents that describe the applicable processes and products.

This oversight will also include monitoring the internal functioning of the BNI design process to assess its effectiveness in producing the design products under review.

2.2 Preparation

1. Identify the Contractor Point of Contact for the Review.

2. Establish the scope and elements of the design processes and deliverables under review.

3. Identify and review the applicable Contract and requirements source documents.

4. Review background information as provided by Contractor and identified through review of available databases.

5. Review previously performed Contractor design review reports, documentation, open issues, and the plans for and status of their resolution.

6. Review the applicable design processes and a sample of the resulting design deliverables.

7. Table 1 lists information requested from the Contractor to initiate this oversight.

2.3 Review and identify, resolve or document issues

Evaluate the selected attributes and develop lines of inquiry and specific questions that are then explored with cognizant Contractor personnel to meet the oversight objectives. This phase will be documented in summary tables as shown in ORP PD 220.12, issued 2/12/03, "Conduct of Design Oversight," Attachment 9.4, Appendix A. This effort will include participating in any applicable internal Contractor reviews and discussions. The output from this phase of the oversight will be a completed summary table with Contractor responses to the questions and lines of inquiry and a list of remaining open issues that need further evaluation by Contractor for resolution.

2.4 Reporting

De-brief ORP and Contractor management periodically as required. Prepare a draft report that summarizes the activities, the results, conclusions and recommendations of the review. Issue the Draft Design Oversight Report for review and comment of ORP management and cognizant Contractor personnel. The final report will resolve comments received on the draft report.

3.0 Schedule of Activities

Table 2 summarizes the schedule for completion of this oversight.

4.0 Documentation

The final report of this task shall contain the sections and content as summarized in ORP PD 220.12, issued 2/12/03, "Conduct of Design Oversight," Attachment 9.4, "Design Oversight Report Outline."

The open issues identified in this oversight shall be listed in the final report. Each open issue shall be assigned an item number and shall be tracked to resolution through CARS. These shall also be tracked to resolution by Contractor through the CCN that will be assigned to the transmittal of the report from ORP to Contractor.

5.0 Closure

The Team Leader with concurrence of the Director shall confirm that the open items from this oversight are adequately resolved.

Table 1
Initial Information Requirements

1.	Points of contact, lines of authority, and divisions of responsibility for design groups involved in the Control Room design.
2.	Procedures, guides, instructions, templates, etc. used in the design process.
3.	Applicable technical evaluations, reports, calculations, system descriptions, specifications, and drawings, including schematics, P&IDs, V&IDs, layouts, arrangements, etc.

Table 2
Schedule

Activity Description	Responsibility	Complete By
Develop Design Product Oversight Plan.	Orchard/Gibbs	6/14/04
Identify Team members.	Hamel/Orchard	6/14/04
Advise Contractor of planned oversight and provide Design Product Oversight Plan to identify needed Contractor support	Eschenberg/Hamel	6/14/04
Kick-off meeting with Contractor Discipline Engineering Managers to outline objectives, scope, schedule, and establish points of contact.	Team	6/15/04
Obtain documents from Contractor.	Team	6/25/04
Review Contractor documents, participate in relevant Contractor internal meetings and meet with Contractor as required.	Team	6/25/04
Prepare Draft Design Oversight Report.	Team	7/9/04
ORP and Contractor review of Report.	ORP and Contractor	7/16/04
Resolve comments and issue Final Report including close out with Contractor.	Team	7/30/04

APPENDIX B
LINES OF INQUIRY

Line of Inquiry:

1.0 Mitigation of Hazards Affecting MCR Habitability

a. Please describe the control philosophy and design features being considered for the MCR, specifically addressing any plans for detection of hazards at the ventilation intakes or source, the method of isolation of the MCR ventilation system (manual or automatic) with attendant startup (manual or automatic) of the filtered safety class ventilation system for both radiation dose and chemical hazard events.
b. Describe the decision criteria that will be used to determine whether actions will be taken manually by the operators for these events or whether automatic actions are necessary.
c. Describe the basis for the determination stated in section 1.6.2 of the General Information of the PSAR that "... based on historical and expected operations at the Hanford Site, neither truck nor rail guidelines [of Regulatory Guide 1.78] will be exceeded for shipments of quantities that could present a risk to the WTP facility."

Discussion of Review:

<u>LOI-1.a:</u>

Current documentation for the Main Control Room (MCR), such as the PTF C1V System Description, PSAR, the Technical Basis Calculation for WTP Control Room Habitability, indicate that the only automatic isolation function for the MCR ventilation is for smoke control. A review of the PSAR hazards analysis would indicate that other automatic isolations to prevent introduction of postulated radioactive plumes from various DBE's into the MCR and prevent introduction of chemicals from external or internal sources may be prudent. While review of ISM meeting minutes indicate that some other MCR automatic isolations are potentially being considered, the control philosophy and design features for maintaining habitability in the control room could not be discerned.

BNI stated that the original control philosophy underpinned by the Revision B Technical Basis Calculation was to rely on operator action to switch from the main to the standby ventilation. However, BNI acknowledges that since the Rev. B calc was issued several things have changed (different source terms, different safety classification methodology, increased chemical hazards) that require additional ISM review. The outcome of this review may be a change in the control strategy. The control strategy development phase of the review is planned for late July 2004, after issue of Revision C to the Technical Basis Calculation. Control strategy options that will be considered include, for example, leaving the strategy as is, installing automatic sensing and actuation equipment, or running the standby ventilation continuously.

<u>LOI-1.b:</u>
The Technical Basis Calculation indicates that for some DBE's the operators could exceed the 5 rem SRD limit if standby filtration is not activated within 5-10 minutes. Rapid detection of ammonia from postulated release scenarios, isolation of MCR ventilation and start of the safety class standby filtration ventilation is also indicated as being necessary to maintain control room habitability.

The principal criteria for determining whether actions can be taken manually by operators or need to be automatic actions is the elapsed time from the start of the accidental release until air contamination limits would be exceeded in the control room. Acceptable time limits for operator actions will be based on the standard ANSI/ANS 58.8-1994, *Time Response Design Criteria for Safety-Related Operator Actions*. Additional guidance is also found in the procedure *Hazard Analysis, Development of Hazard Control Strategies, and Identification of Standards*, 24590-WTP-GPP-SANA-002, Appendix G.

LOI-1.c:

Section 1.6.2 of the General Information of the PSAR states that "... based on historical and expected operations at the Hanford Site, neither truck nor rail guidelines [of Regulatory Guide 1.78] will be exceeded for shipments of quantities that could present a risk to the WTP facility."

BNI indicates that: (1) the above statement was taken from the *TWRS-P Project Hazards Analysis Report* (BNFL-5193-HAR-01, Rev 0); (2) the effect of potential transportation accidents on control room habitability has been discussed extensively with the (then) Office of Safety Regulation in response to their PSAR review question PT-PSAR-204.

Observations:

The current design and technical documentation for the MCR is subject to revision because of the anticipated reconfiguration of the PT Main Control Room annex as described in Trend Notice TN-24590-03-01094, the addition of two large ammonia tanks (24590-LAW-DCA-PR-03-004, Rev. 0) in the BOF for delivery of ammonia to HLW and LAW facilities and different safety classification methodology. Discussions with E&HS personnel indicate that a revision to the Technical Basis Calculation for Control Room Habitability that will address these design inputs will be completed.

ORP notes that the *TWRS-P Project Hazards Analysis Report* (BNFL-5193-HAR-01, Rev 0) cited as the basis for the PSAR conclusion that "based on historical and expected operations at the Hanford Site, neither truck nor rail guidelines [of Regulatory Guide 1.78] will be exceeded for shipments of quantities that could present a risk to the WTP facility" is based on a survey of truck, rail and barge traffic and stationary sources of hazardous chemicals within the vicinity of the Hanford site conducted approximately eight years ago. This eight year old survey may not be representative of the current use of the transportation infrastructure or stationary sources on or near Hanford and the included Waste Treatment Plant site.

BNI committed to following Regulatory Guide 1.78, *Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release,* which provides for performing surveys of the location, types, and quantities of the mobile and stationary hazardous chemical sources at least once every 3 years, or more frequently as applicable. The commitment to implement these requirements is in Appendix C of the Safety Requirements Document (24590-WTP-SRD-ESH-01-001-02).

BNI intends to perform, or obtain from others, surveys (current within 3 years) of the location, types, and quantities of the mobile and stationary hazardous chemical sources as required by their commitment to Regulatory Guide 1.78 and revise the Technical Basis Calculation for Control Room Habitability (Ref. 1) and the PSAR if necessary based on the survey results.

Recommendations:

1. Based on the revised Technical Basis Calculation for Control Room Habitability, ORP should confirm that the final control strategy selected (leaving the strategy as is, installing automatic sensing and actuation equipment, or running the standby ventilation continuously) is appropriate to the environmental hazards that can potentially challenge the MCR habitability.

2. ORP should review Rev. 0 to the Technical Basis Calculation for Control Room Habitability (Ref. 1) to confirm that the hazard analyses for chemicals and toxic gases are based on current information (within 3 years) for both mobile and stationary hazardous chemical and toxic gas sources.

Line of Inquiry:

2.0 Methodology for Technical Basis Calculations for WTP Control Room Habitability

a. Will the technical basis calculation for main control room habitability, which is currently under revision and scheduled for completion by June 30, 2004, address the maximum concentration-duration type of industrial accident for hazardous chemicals being considered? If not please, please describe the rationale for not considering the maximum concentration-duration accident.
b. For transportation accidents, describe how the types and quantities of hazardous chemicals will be identified if you find that the transportation frequencies are different than currently stated in the existing calculation. (See LOI-1.0 question "c"). Also identify the criteria that will be used for determining the hazardous chemical quantities of concern for any shipments that exceed the frequency by traffic type.

Discussion of Review:

LOI-2.0.a

Calculation No.: 24590-WTP-HAC-C1V-00001, Rev B section 6.6.2.3 indicates that the ammonia tank release source terms (release rates) are based on an assumed 10 minute release of the entire contents and a one-hour release for each tank modeled. In addition to ammonia, the other source terms originating from spills, process upsets or mixing of incompatible chemicals are assumed to persist for one hour. Accepted practice for evaluating chemical hazards from industrial accidents includes performing two types of calculations (e.g., see USNRC Regulatory Guide 1.78). One of these accidents is a maximum concentration accident resulting in a short-term puff or "instantaneous" release of a large quantity of hazardous chemical. The other type is a maximum concentration-duration accident that results in a long-term, low-leakage release.

The subject calculation addresses a ten-minute or short term puff release consistent with the practice cited above. Additionally the calculation considers a one-hour release because the 10 minute release may not give the most adverse conditions within the main control room. Provisions that are adequate for the large instantaneous release will provide protection against the low-leakage rate release.

LOI-2.0.b

This item has been addressed under LOI-1.0.

Recommendations:

None

Line of Inquiry:

3.0 Consideration of Inleakage into the Main Control Room Envelope

a. Will the revision (due June 30, 2004) to the Technical Basis Calculation for Main Control Room Habitability include an assumed value for Control Room Envelope inleakage (infiltration) as part of the methodology?
b. Will appropriate surveillance testing to periodically verify integrity of the Main Control Room boundary be scheduled?
c. If the methodology will not include these considerations, please provide a technical basis and rationale.

Discussion of Review:

The technical Basis Calculation for WTP Control Room Habitability, CALC No.: 24590-WTP-HAC-C1V-00001, Rev. B, addresses the potential for infiltration of radioactive materials from the process building to threaten MCR habitability and states in part that (1) electrical and instrument cable penetrations are sealed and protected in a manner consistent with the wall's fire rating and (2) that even if the C2 corridors become contaminated, approximately 0.2 inches differential pressure (negative 0.1 inch in the corridor, positive~1/8 inch in the annex) will prevent significant infiltration of contaminants into the annex. Years of operating history in commercial nuclear power plants have demonstrated that these assumptions are not necessarily correct.

In the 1990s approximately 30 reactor control rooms were tested with the emergency makeup filtration ventilation systems running to verify that the design positive differential pressure between the control room and its environs was being maintained. While many passed the differential testing requirement, which was assumed to demonstrate integrity of the control boundary, all but one plant failed to meet the design value for inleakage assumed in its design and licensing basis.

When this experience is applied to the WTP, the tests demonstrate that calculations for control room habitability should prudently include an inleakage factor to account for gradual degradation in seals, floor drain traps, fans, ductwork and other components; other degrading factors include drift in throttled dampers, inadequate maintenance on the control room envelope, changes in differential pressures caused by ventilation system changes and inadvertent misalignments of ventilation systems. To ensure that over the 40 year design life of the facility the assumed inleakage value in hazards evaluations is not exceeded, appropriate integrity surveillance testing of the control room boundary would be prudent. Regulatory Guide 1.196 provides guidance.

A review of the subject calculation did not identify any quantifiable value for inleakage assumed for the radiation dose and chemical hazard evaluations addressed. BNI states the Revision C Technical Basis Calculation will not include an assumed value for control room infiltrations. However, the calculation is expected to be revised again when the final control strategy has been determined. BNI states the purpose of that calculation will be to verify the strategy will be effective. Some allowances for infiltration will be included in that revision.

BNI will establish a maintenance program for the Control Room Habitability systems. They envision that ASHRAE Guideline 1-1996 in conjunction with design development and review activities involving Operations, E&HS, HVAC and the Client representative will be used to establish the program for these systems.

Observations:

BNI committed to NUREG 0800, *Standard Review Plan*, as being applicable to the WTP. Sections III.3.d (2) & (3) of the NUREG provide criteria for determining approaches to infiltration assumptions for the MCR envelope. While the basis is related to controlling iodine for commercial nuclear reactors, the concepts are appropriate for determining infiltration rates that will be applied in the evaluation of radiological consequences of postulated accidents and should be considered by BNI during the revisions of the Technical Basis Calculations for Control Room Habitability (Ref. 1).

ORP notes that Regulatory Guide 1.78, *Evaluating the Habitability of a Nuclear Power Plant Control Room during a Postulated Chemical Release,* committed to in the Safety Requirements Document (Ref. 9), requires that inleakage characteristics of the control room envelope during a hazardous chemical challenge be determined by testing. The testing is to be conducted to a recognized industry standard to demonstrate control room inleakage with systems and components configured and operating as they would in the event of a hazardous chemical challenge, e.g., ammonia infiltration. The regulatory guide endorses ASTM E741-95, *Standard Test Method for Determining Air Change in A Single Zone by Means of Tracer Gas Dilution as an effective method.* BNI stated a program will be developed to ensure appropriate integrity is maintained. In developing this program BNI should ensure that the requirements highlighted above for determining inleakage characteristics of the MCR envelope are fully addressed.

Recommendations:

ORP should confirm that the maintenance, testing and surveillance of the Main Control Room Envelope integrity, as finally implemented by BNI, incorporates the experience of the Commercial Nuclear Power Industry as reflected in Regulatory Guide 1.78, *Evaluating the Habitability of a Nuclear Power Plant Control Room during a Postulated Chemical Release,* committed to in the Safety Requirements Document for the WTP.

Line of Inquiry:

4.0 Implementation of Human Factors in the Main Control Room

a. Has the contractor implemented an HF process for systematically inquiring into the importance of human factors in control-room operations?
b. Does the contractor's HF Program identify and describe human-machine interfaces (HMIs) that are important to control-room operability and safety operations?
c. Does the contractor's HF Program require optimization of HMIs for control room operability and safety operations?

Discussion of Review:

LOI – 4.a

Requirement: DOE Order 1009, the Contract, the ORD, the SRD Safety Criterion 4.3-6, and IEEE Standard 1023 require that an HF process be established to provide assurance that the importance of human-machine interfaces is considered in facility safety, and that consideration be given to ergonomics and human factors requirements for operations and maintenance.

The Contract states that operations requirements shall be developed to address WTP commissioning and life-cycle operations, e.g., those requirements that will "influence WTP design features to ensure cost efficient operations and provide for accurate life-cycle cost estimates, planning, and informed decision-making." The contract further states that these requirements, "shall include at a minimum: … Ergonomics and human factors requirements for operations and maintenance." Safety is one of the elements of consideration in developing HF requirements, but operability and life-cycle operations constitute the major reasons for instituting the HF program.

The Contract requires that ergonomics and human factors be applied to all aspects of operations and maintenance, and that these requirements be included in the Operations Requirements Document (ORD). The ORD commits to implementing the HF requirements through IEEE 1023 and reiterates some of the concepts. The ORD further indicates that implementation of IEEE 1023 will be tailored in the Safety Requirements Document (SRD). Section 2.6 in SRD Appendix B on Defense in Depth (DID) indicates IEEE 1023 will be applied as a formal structured program to DID situations for hazards with severity levels SL-1 and SL-2 but not for SL-3 and SL-4 hazards. For SL-3 and SL-4 hazards, and non-ITS applications, IEEE 1023 is implemented as a routine part of the design process. An example of how IEEE 1023 is implemented in these situations is provided by the table included in Appendix C, "Application of IEEE 1023 Human Factors Engineering Fundamental Considerations to C&I Discipline Activities." This table is limited to I&C Engineering design of the Control Room, so it does not address architectural and ventilation considerations, but it is indicative of the HF approach to the Control Room design.

The contractor's HF Program Implementation Plan for Design and Commissioning (HFPIP, 24590-WTP-PL-G-03-002, Rev 0) establishes a process that addresses both safety and non-safety related systems in Chapter 4, and the application of the ISM process to safety related systems in Chapter 5.

HFPIP para 4.2.1 cites the contract requirement to address HF requirements to: Assess potential operator human error; provide instrument and control capabilities for ensuring safe operations; and, assure that control-room safety statusing is accomplished via effective displays and indicators. The last sentence of para 4.2.2, states that HF requirements are applied to appropriate performance requirements to minimize human error and improve plant performance. HFPIP para 4.2.3, second subpara, second sentence, states that HF-related requirements have been identified by the engineering disciplines.

Objective evidence of implementing these requirements was not immediately available, e.g., documentation relating to HF scoping, objectives, modes-of-operation, operational environment descriptions, user profiles, alternative designs, task analyses, HMI allocations/optimizations, etc. Subsequently, the contractor submitted a table (Attachment C) cross-referencing how he is implementing IEEE 1023 for the I&C design of the Control Room by routine involvement of project Operations and HP personnel.

The last subpara of para 4.3 cites use of a 'checklist' used for development of HF requirements; an attempt to procure this document through 'DocSearch' was unsuccessful and the contractor intimated that the document is being updated.

HFPIP para 5.1, second-to-last subpara on p.7, states that task analyses will be performed on operator actions to mitigate accidents. It is assumed that these are control-room 'operator actions'. The last sentence of para 5.3 addresses development of performance requirements affecting HF operator actions. Para 5.5 identifies requirements for human responses to ICN safety alarms. These statements imply that HF activities and task analyses are to be accomplished in support of these various operations, but it is not clear which control rooms will be affected, nor to what degree these analyses will be conducted.

<u>LOI – 4.b</u>

<u>Requirement:</u> The reviewers interpret DOE documentation to require that HMIs be identified to facilitate review of contractor efforts in assuring HF facility operability and safety.

The Human Factors Program Implementation Plan does not contain a listing or description of HMIs, nor is reference made to a listing of HMIs. However, the operator interfaces in the control room primarily relate to computer displays that are under development; the contractor provided copies of the design guidance for development of the associated software. The design of the physical features of the control room, including human factors considerations, is addressed in LOI number 8.

<u>LOI – 4.c</u>

<u>Requirement</u>: The reviewers interpret DOE documentation to require, "a systematic inquiry into the optimization of human-machine interfaces" for SSCs, to enhance human performance.

The Human Factors Program Implementation Plan does not address how optimization of HMIs will occur. However, the contractor has issued design guidance that reflects optimization considerations, and the ISM process for safety related systems specifically considers the allocation of hazard controls between machines and humans. HMI optimization is necessary to ensure that appropriate allocation of human-machine taskings has been accomplished including:

- Identification of those information requirements that humans need to perform taskings;
- Determination of what human-resource expenditures occur in operational task accomplishment;
- Assurance that effective allocation of taskings has been made to respective human and machine operations;
- And, assurance that human-informational needs are met and that humans are not overloaded in accomplishing their operational taskings

Observations:

Chapter 4 of the contractor's Human Factors Program Implementation Plan provides an overview of the major source documents that address some of the HF activities that apply to both safety and non-safety related systems. Chapter 5 of the HFPIP emphasizes HF activities specifically related to safety related systems. The contractor has submitted a cross-reference table (Appendix C) showing how he is implementing IEEE 1023 for the safety and non-safety related I&C design of the Control Room by routine involvement of project Operations and HP personnel. In view of DOE documentation and contract requirements (e.g., the requirement to give consideration to ergonomics and HF for O&M) and the contractor's method of implementation of HF principles, the contractor should modify the HFPIP to clarify the consideration given to non-safety related requirements for salient activities which may significantly impact WTP operability and life-cycle costs.

Recommendations:

It is recommended that BNI modify the HF Plan to better describe the consideration given to non-safety related requirements for salient activities which might significantly impact WTP operability and life-cycle costs.

Line of Inquiry:

5.0 Manifestation of Control Philosophy in the Main Control Room

a. What aspects of the commissioning strategy will be facilitated by the change in control philosophy from automated to manual?
b. What are the other physical impacts of the change in philosophy (e.g. design, equipment, construction, operations, etc.)?
c. What is the capital and life-cycle cost impact of the change in philosophy?
d. What steps will ensure inexpensive change to automated control after commissioning?

Discussion of Review:

BNI is preparing a change to the Basis of Design, Section 7, Control Philosophy to emphasize that manual administrative control of the plant will be utilized to the extent practical. Automatic control will be used where timing requirements are too fast for manual operation. Basic controls such as interlocks and closed loop regulatory control will be automated. The purpose of this line of inquiry is to understand the effect of this changed philosophy on WTP testing and operations, commissioning and future operations beyond the scope of the WTP contract.

LOI-5.a

Some aspects of the testing and commissioning strategy will be facilitated by the change in control philosophy from automated to manual. Where operators are in direct control of systems and processes using written procedures, changes to procedures can be completed more quickly and at less expense than equivalent changes to control system programming. Additionally, there is substantially less control system programming and startup testing required in support of remote manual operation than is required for automatic sequence control.

Automated control will be used where appropriate, but manual controls should be used wherever possible for normal plant operation. Control system alarms and interlocks will be provided to warn the operator of adverse conditions and protect equipment from inadvertent operations as appropriate.

LOI-5.b

Physical equipment is relatively unchanged. Physical components, instrumentation and protective interlocks must be designed with Basic Controls for personnel protection, regulatory compliance, and equipment protection. What is not being developed for manual operations are the programmed sequences to coordinate the interaction of components to accomplish procedural sequences (e.g. Perform transfer of x gallons from vessel A to vessel B).

LOI-5.c

No specific life cycle cost estimates have been completed. However, experience in previous facility startups is that this will result in significant cost avoidance. This "change in philosophy" is quite simply an agreement between Engineering and Operations relative to what level of automation is required for safe and efficient operation. Automated systems add to the cost of the project in terms of design, testing, and reprogramming as operation of the plant undergoes metamorphosis.

The sequence of operation for equipment controlled by automatic sequences may change up to and during commissioning as system designs evolve and operating strategies are improved. For example, the PTF Feed Receipt (FRP) System Software Functional Specification (SFS) was recently reviewed at Rev. A, and changes in operating strategy related to line flushing have already arisen which will require significant rework of FRP automatic sequences. This is a relatively minor issue to correct at this stage of the project. However, changes to automatic sequences later in the project will result in changes to the control system programming and possibly re-performance of any completed testing. The unnecessary use of automatic sequences potentially adds cost and includes some risk of rework to control system software that could occur late in the project schedule.

LOI-5.d

It is unclear that automated control beyond that being identified will ever be necessary. The level of automation being designed is judged to support long term, safe and efficient operation of the WTP. As operating experience is gained, some procedures may be identified that would be beneficial to automate from a repetition, time critical, or efficiency standpoint. The software development can be performed for those operations as they are identified.

Observation:

ORP notes that the Contract requires that Basis of Design changes receive DOE concurrence. To facilitate ORP's concurrence in this proposed change to the Control Philosophy, BNI has agreed to provide the rationale for the changes in degree of automation as documented in BNI meeting minutes on a system by system basis.

Recommendations:

When the proposed BODCN for the new control philosophy is submitted for concurrence, ORP should review and consider the rationale for the changes in degree of automation as documented in BNI meeting minutes on a system by system basis.

Line of Inquiry:

6.0 Control Transfer Strategy from the Facility Control Rooms to the Main Control Room

a. Under what conditions will either or both the FCRs be transferred to the MCR?
b. What control features for each facility will be transferred under these various conditions? (e.g., will the MCR have any controls for LAW off-gas?)
c. Are interlocks planned with respect to which FCR has control for features which may be controlled in multiple control rooms?
d. If interlocks are not planned, what administrative controls are being considered?
e. What are the criteria that are being considered to return control to the respective FCR(s) upon mitigation of the event that required the initial evacuation and transfer of control.
f. To the extent that answers to items "a" through "e" above are not known, what is the schedule for determination of the design or administrative approach to these Control Room transfer considerations?

Discussion of Review:

The Main Control Room (MCR), located in the recently proposed ITS building adjacent to the PTF, is the primary control and monitoring point for the Pretreatment processes, the Balance of Facilities and the LAB. The HLW and the LAW facilities may also be monitored and controlled, from the MCR, when their respective control rooms must be evacuated. The team questioned BNI regarding the Project's design plans driven by considerations such as: conditions of transfer of control between control rooms, the extent of control features that will exist in the MCR for HLW and LAW upon evacuation of these facilities, and other integrated control features.

Whenever the HLW or LAW control room becomes uninhabitable, transfer of the control will be to the PT MCR. This includes internal events such as a Control Room Fire or external events such a chemical or radiological release.

The controls available will be dependent on the accident condition resulting in the transfer of controls. For accidents in which the normal Integrated Control System is available (as would be expected for an offsite radiological release (non-seismic), all normal controls would be expected to be available.

Evaluations are currently being performed to identify post accident monitoring and control requirements consistent with IEEE Standard 497-2002, *Standard Criteria for Accident Monitoring Instrumentation for Nuclear Power Generating Stations* as identified in the Safety Requirements Document SRD Criteria 4.3-4. Currently the LAW offgas fans and UPS are designed to fail to a safe condition and do not require external Control.

There are currently no engineered interlocks planned for transfer of control from the Facility Control Rooms (FCR(s)) to the MCR. BNI states that this will be handled administratively by procedure and software password priority. To ensure these transfers are accomplished with the necessary discipline and control rigor, a recommendation has been identified for BNI to provide

ORP a detailed explanation (addressing both PCJ and PPJ systems) of the controls established for affecting transfer of control to and from the MCR for the HLW and LAW FCRs. ORP should confirm that BNI's evaluation of the post accident monitoring and control requirements are consistent with IEEE Standard 497-2002, *Standard Criteria for Accident Monitoring Instrumentation for Nuclear Power Generating Stations* and that the requirements and procedures for transfer of control from the LAW and HLW FCR(s) to the MCR on uninhabitability of these facilities will invoke the appropriate discipline and control rigor.

Recommendations:

BNI should provide ORP a detailed explanation (addressing both PCJ and PPJ systems) of the controls established for affecting transfer of control to and from the MCR for the HLW and LAW FCRs.

Line of Inquiry:

7.0 Soil-Structural analysis of vibration induced load on the Main Control Room by the adjacent PJM air compressors

a. What are the vibration and noise limits on the equipment, electronics, and personnel in the MCR?
b. What are the vibration acceleration and magnitude spectra for the compressors, with and without isolation?
c. What are the proposed vibration isolation mechanisms?
d. What is the vibration spectrum induced on the MCR by the compressors?

Discussion of Review:

Trend, TN-24590-03-01094, proposed a change in the design of the PT Annex that was to house the MCR. The proposed Annex design has a separate ITS building of reinforced concrete and Non-ITS annex for operational support areas. The Pretreatment Annex Architectural Floor Plan Sketches Proposed Layout – G (Ref. 17) shows an appended structure to the ITS portion of the building planned to house the Pulse Jet Mixer (PJM) air compressors. This LOI was written to identify and understand the potential effects (induced vibration and noise) the compressors could have on the MCR. As the design detail is still maturing information available is very preliminary.

A sampling of environmental specifications indicates that the critical SC/SS control system electronics are rated for 2 G @ 10 to 500 Hz (Sinusoidal Vibrations per axis) and the normal control system electronics are rated for 0.25 G at 3 to 200 Hz (Note: manufacturer qualifies this with a limited duration of 15 minutes). The estimated ambient noise should be less that 50 dB(A) total which allows normal communication at a distance of 10 feet.

Vibration spectra for the compressors can be obtained from test data provided by the manufacturer and available from vendor submittals. As this time and the data is not available because the equipment has not been awarded

The vibration isolation mechanisms will consist of providing a separate foundation pad for each compressor which will be installed separate from the main base mat. A compressible material will be provided in the joint between the compressor pad and the main base mat. In addition, vibration isolators will be provided between the compressor mounts and the concrete pad. The type will depend on the manufacturer.

The vibration spectrum induced on the MCR by the compressors will be evaluated when the vibration characteristics are received from the vendor and will be analyzed using applicable soil characteristics.

While vibration isolation, induced vibration spectrum and noise levels as they could affect the control room are being considered in the design, DOE should confirm that the cumulative noise levels (equipment and personnel) and any induced vibration levels are acceptable as specified in section 3.3 and 3.9.6.2 of the WTP Control Room Requirements specification.

Recommendations:

DOE should confirm that the cumulative noise levels and any induced vibration levels are acceptable as specified in section 3.3 and 3.9.6.2 of the WTP Control Room Requirements specification, 24590-WTP-3PS-JQ00-T0001, Rev 1.

Line of Inquiry:

8.0 Control room equipment, layout and architectural features

a. What are the sizes, relative locations, and architectural considerations (life safety, habitability, human factors, traffic, etc.) of the spaces needed to perform or support functions performed in the MCR?

b. Is there a calculation or other document existing or planned to establish the size and layout of the MCR Complex, considering the architectural considerations above?

c. What architectural and layout changes to Figure 1, PTF MCR, CCR and ESR Layouts, of the Engineering Specification for Control Room Requirements are anticipated as a result of this reconfiguration of the PT annex into two buildings?

d. What changes to section 11 of the Operations Requirements Document, 24590-WTP-RPT-OP-01-001 are anticipated as a result of the configuration changes proposed by the trend?

e. Will ventilation duct intakes and discharges have the same directional layout as the original building with respect to prevailing winds and orientations to other WTP and Hanford structures? If the orientation of ductwork and other features is changing, what are the affects on the hazards analyses and when will these analyses be revised to reflect any such changes.

f. What bases did Operations use to develop the original and/or revised MCR layout requirements?

Discussion of Review:

Engineering Specification for Control Room Requirements, Rev. 1 identifies the main control room and control room support locations. The main control room (MCR) is the primary control and monitoring point for the Pretreatment processes, the Balance of Facilities and the LAB. Additionally the HLW and LAW facilities may also be monitored and controlled, from the MCR when their respective control rooms must be evacuated.

Trend, TN-24590-03-01094, proposed a change in the design of the PT Annex that was to house the MCR. The proposed Annex design has a separate ITS building of reinforced concrete and Non-ITS annex for operational support areas. This will minimize the costs of construction, since the size of the ITS portion that requires seismic qualification is smaller and has been separated from facilities not required to seismically qualified. The reconfiguration has the potential to affect current plans for the MCR layout. ORP desires to know to what consequential changes, if any, are anticipated and the effect those changes have on the functionality and habitability of the MCR.

LOI-8.0.a

CCN 033910 provides the most comprehensive description and bases for architecturally scoping the Main Control Room. This memo in conjunction with the Operations Requirement Document (24590-WTP-RPT-OP-01-001), WTP Control Room Requirements Engineering Specifications (24590-WTP-3PS-JQ00-T0001), and their referenced documents were instrumental in establishing the size, locations, and architectural considerations for the Main Control Room. The following synopsis is provided.

During the proposal stages, a concurrent evaluation was performed for preliminary building code issues, life safety code issues, which includes habitability, human factors, traffic and egress. In addition, a study was performed of the areas uses and the relationship to adjoining spaces. The proposed control room building design is a replica of the original plan with minor modifications as noted below. The reason for this approach was to minimize engineering costs for edification of the Engineering Specification for WTP Control Room Requirements, 24590-WTP-3PS-JQ00-T0001, Rev 1. In addition, the modifications to layouts were minimized, avoiding costs associated with modification of procured equipment resulting from changes in design layouts. The following provides a description of the spaces as originally designed and as proposed.

- The original Main Control Room (MCR), PA0220, was 1,890 net sf with a 6 ft egress path on the west end of the room. The proposed is 1,950 gross sf. The dimensions of the rooms remained the same to follow the WTP Control Room Requirements, Figures 15 and 16.
- The Computer Room (ESR), PA0221 was 1,328 net sf and the proposed is 1,415 gross sf. There is no change to the configuration of this room as it replicates the layout identified in WTP Control Room Requirements, Figure 1. The emergency exit that was originally provided egress to the stairway will be a direct emergency exit to the exterior of the building.
- The Crane Control Room, PA0202, was originally 331 net sf, proposed is 355 gross sf. The configuration of this room replicates the WTP Control Room Requirements, Figure 1. This will have a direct access off the corridor for equipment installation and egress. It will also have visual contact with the MCR and access into the Computer Room.
- The Command Post, PA0217 was originally 898 net sf., the proposed is 1,007 gross sf. This configuration matches the WTP Control Room Requirement, Figure 9.
- There will be access to the MCR and Corridor for egress, in addition to the Kitchen, Restroom and Storage Areas.
- The Unit Kitchen Area, PA0218, was 69 net sf, proposed is 73 gross sf.
- The Storage Room, PA0218A, was 39 net sf, proposed is 47 gross sf.
- The Unisex Rest Room was 71 net sf, proposed is 63 gross sf.

There will continue to be minor modifications to the layouts, resulting from the detailed design process.

LOI-8.0.b

WTP Control Room Requirements Engineering Specifications (24590-WTP-3PS-JQ00-T0001) provides details relative to size, locations and architectural considerations for the MCR Complex. This physical information remains unchanged by the proposed trend other than the mirror image, and elevation description in table 1. Meeting Minutes, CCN: 077462, finalize C&T/Operations Control Room Requirements.

LOI-8.0.c

The Pretreatment Facility Main Control Room, Crane Control Room and Engineering Support Room are unchanged in physical layout other than the grouping of these three room are being mirror imaged in the new Main Control Building. Details of whether equipment will be mirror imaged are yet to be determined and will be worked out in detail design with consideration for simulator building compatibility.

LOI-8.0.d

No changes to the Operations Requirements Document are anticipated as a result of the configuration changes proposed by the trend. Section 11 of the Operations Requirements Document describes the operational requirements that were developed through discussions with DOE and Operations personnel with experience from DWPF, West Valley, and numerous other DOE and commercial nuclear operating facilities very early in the project. No change to this strategy has occurred, only clarification.

LOI-8.0.e

The air intakes for the MCR HVAC system are more likely to be located on the south wall of the new proposed layout. Technical Basis Calculations for WTP Control Room Habitability (24590-WTP-HAC-C1V-00001, Rev. C, 6/30/04), sheet 12, assumption No. 9, are based on the original building with the MCR HVAC system outside air intake located on the west wall. Therefore, the calculation must be revised once the GA and Architectural details have matured sufficiently.

LOI-8.0.f

The bases Operations used to develop the original and/or revised MCR layout requirements are as follows:

- Significant input from DOE and Operations personnel with experience from DWPF, West Valley and numerous other operating facilities

- Section 2 of WTP Control Room Requirements, 24590-WTP-3PS-JQ00-T00001, lists the applicable documents.

Recommendations:

When the design is sufficiently mature, ORP should confirm that the architectural layout, as revised, continues to satisfy the requirements of the WTP Control Room Requirements Specification (Ref. 10), the Operations Requirements Document (Ref. 12), and the Design Guide for the Human Machine Interface (Ref. 28).

Line of Inquiry:

9.0 Electrical Systems for Main Control Room Complex

a. What functions need to be performed or supported in the MCR and MCR Complex under normal and upset conditions?
b. What are the various design basis upset conditions and what level of back-up needs to be provided under the various upset scenarios (e.g. fire separation, UPS back-up for non-ITS and ITS electronics, Emergency Diesel Generator backup for ITS systems, Standby Diesel Generator for non-ITS systems, etc.)?

Discussion of Review:

The following functions need to be performed or supported in the MCR and MCR Complex under normal and upset conditions:

- The functions performed in the Main Control Building (MCB) include Operator supervision and operations of all Pre-Treatment Facility operations under normal operating conditions.

- Under accident conditions, the MCB provides for operator oversight/status of Safety Systems as well as identified operator initiated actions (e.g. initiate shutting of seismic isolation valves). The MCB also houses Important to Safety Electrical Control Centers including the Uninterruptible Power Supply (UPS), and Control and Instrumentation (Plant Protection Systems) Computers.

- Further, the MCB provides facilities for emergency response/notification activities (Incident Command Post).

The facility must meet the ability of operators to complete their process and emergency related actions. In addition to the process controls needed to perform safety related activities, the general control room environment must be supportive as well. This includes a stable structure, clean air, water, lighting, and restrooms. During upset conditions, there are generally three time frames to consider; immediately following an accident, a lockdown period when conditions outside the control room do not allow operators to exit or others to enter, and an occupation period for longer-term monitoring. The actual time frames for the lockdown period and occupation period have not been established but can be initially estimated to be 4 to 8 hours and >8 hours respectively. Standards for these times do not exist, as they are completely dependent on site-specific conditions and accident scenarios. Support during these periods should include the following:

Time Frame	MCB Structure	Filtered HVAC	Lighting	Potable Water	Restrooms
Immediate	X	X	X		
Lockdown Period	X	X	X		
Occupation Period	X	X	X	X	X

The structure will be available since it is a SC-I facility. Habitability is assured by providing control room air that is treated for the expected accident conditions. In addition to the analysis provided by 24590-WTP-HAC-C1V-00001, Rev C, *Technical Basis Calculation for WTP Control Room Habitability*, the NRC provides additional guidance in Regulatory Guide 1.196, *Control Room Habitability At Light-Water Nuclear Power Reactors* and Regulatory Guide 1.197, *Demonstrating Control Room Envelope Integrity At Nuclear Power Reactors*.

For the MCR, the HVAC system will either provide 100% redundant ventilation trains each providing makeup air that is HEPA and carbon-bed filtered on a full-time basis, or automatic switchover controls will be provided. Emergency lighting and HVAC is supplied by both normal and emergency (diesel generator) power. ANS Standard 3.8.2 *Criteria for Functional and Physical Characteristics of Radiological Emergency Response Facilities* provides guidance on what equipment and supplies to consider for nuclear power plant operators to independently man the control room in accident conditions for a 24 hour period without external support.

The Design Basis Accident conditions and required redundancy are included within the Safety Analysis Reports.

Recommendations:

When the electrical design is sufficiently mature, ORP should confirm that the appropriate functions in the MCB are adequately provided with back-up power for the applicable conditions.

APPENDIX C
TABLE: APPLICATION OF IEEE 1023 HUMAN FACTORS ENGINEERING FUNDAMENTAL CONSIDERATIONS TO C&I DISCIPLINE ACTIVITIES

IEEE 1023 – 1988 (Rev. E)

IEEE Guide for the Application of Human Factors Engineering to Systems, Equipment, and Facilities of Nuclear Power Generating Stations

APPLICATION OF IEEE 1023 HUMAN FACTORS ENGINEERING FUNDAMENTAL CONSIDERATIONS TO C&I DISCIPLINE ACTIVITIES

Item	Section	Section 4 Fundamental Consideration (paraphrased criterion from IEEE 1023)	Design Application of Fundamental Consideration
	4.1	**Task Considerations**	
1	4.1.1	Function Allocation – Automate job/task or assign job/task to plant operators.	C&I- In a combined effort, the C&I engineering, operations, and Human Factors representatives review the general functions and tasks on a equipment by equipment basis. Relying on experience and lessons learned, the level of automation is determined and documented. The agreed level of automation is reflected on the project P&IDs, V&IDs, MHDs, and in the Software Requirements Specifications (SRSs) and Software Functional Specifications (SFSs).
2	4.1.2	Task Loading – Do not overload (in terms of the number of indications/alarms presented and controls required to be manipulated and the rate at which indications/alarms are presented and controls are required to be manipulated) or underload a plant operator.	C&I- Engineering does not formally perform task loading analysis from the perspective of an individual operator. Note: In respect to control room operators, C&I engineering utilizes industry best practices and standards as well as experience (both C&I/ Ops/ HF personnel and control system vendor) in the development of HMI display and alarm management philosophies. These philosophies will be documented in project design guides. Application of these design guides will minimize the negative impacts of overloading. Underloading is not formally considered in C&I design.

Item	Section	Section 4 Fundamental Consideration (paraphrased criterion from IEEE 1023)	Design Application of Fundamental Consideration
3	4.1.3	Precision Requirements – Incorporate the accuracy and precision with which operators can manipulate plant controls and the accuracy and precision with which operators can visually and audibly discriminate between indications and alarms into the design.	C&I- Engineering relies on C&I/ Ops/ HF experience, lessons learned, and standard industry practices when ensuring that the precision of tasks assigned to the operators are within their ability. For remote operations where high precision movements are required, there is a heavy reliance on vendor experience to supply "fit for purpose" equipment (e.g., master/slave and power manipulators).
4	4.1.3.1	Task Feedback – Provide immediate, direct, variable feedback measurements to improve operator performance and therefore plant performance.	C&I- Engineering relies on C&I/ Ops/ HF experience, lessons learned, and standard industry practices when ensuring suitable feedback is included in process and mechanical handling design. Feedback is reflected on the project P&IDs, V&IDs, MHDs, SRSs and SFSs.
5	4.1.3.2	Error Tolerance – Design systems to permit recovery from human errors or minimize human errors by including interlocks in the design.	C&I- The ISM process included evaluation of operator actions to determine the applicability of automatic interlocks on equipment. C&I engineering relies on C&I/ Ops/ HF experience, lessons learned and standard industry practices to develop design guides to minimize human error in HMI designs and to develop consistency across the WTP.
6	4.1.4	Training – Train operators in design conventions such as equipment/component/pipe color coding, equipment/component configuration coding, standardized directions of motion for plant controls, etc.	C&I- Engineering is not directly involved in the training of operations and maintenance personnel. C&I will support the Commissioning & Training team by supplying source design documents to be used for the development of training programs and operational procedures.
	4.2	**Environmental Considerations**	

Item	Section	Section 4 Fundamental Consideration (paraphrased criterion from IEEE 1023)	Design Application of Fundamental Consideration
7	4.2.1	Temperature, Airflow, and Humidity – Set temperature/airflow/humidity conditions in operational areas to accommodate the operators while meeting the environmental conditions for plant equipment.	C&I- C&I engineering is not directly involved in the environmental control of operational areas. C&I engineering has supplied HVAC engineering with heat loads for equipment to be installed at each location and passed on the NUREG-0700 requirements via the Control Room Requirements specification.
8	4.2.2	Illumination and Acoustics – Set lighting and background noise (ambient sound) conditions in operational areas to accommodate the operators.	C&I – C&I engineering is relying on the appropriate sections of NUREG-0700, revision 2, for the lighting and acoustical requirements for the control rooms. C&I states their expectations of lighting levels in the Control Room Requirements specification and it is up to Electrical to provide the proper lighting levels. Acousitic paneling will be applied to the control room walls in order to meet the NUREG-0700 requirements.
9	4.2.3	Workplace Size, Geometry, and Layout – Set size, geometry, and layout conditions in operational areas after considering number of tasks to be performed, number of operators performing the tasks, the ease of communication, and the ease of operation of the plant controls.	C&I – Engineering is responsible for the layout of equipment within the control rooms as well as at local control points. C&I engineering has utilized NUREG-0700, Section 12, as guide for the application of opeator and manintenance access to the control room equipment. Other industry best practices and standards, as well as, experience (via project personnel and control system vendors) has also contributed to the current control room layouts. Project drawing review procedures ensure that all identified requirements are accommodated.
10	4.2.4	Nuclear Radiation and Other Environmental Hazards – Design the workplace to minimize the exposure to radiation and other health-threatening agents.	C&I – The WTP ALARA program and its reviews deal directly with these issues. C&I engineering is a contributor to the ALARA reviews.
	4.3	**Equipment Considerations**	

Item	Section	Section 4 Fundamental Consideration (paraphrased criterion from IEEE 1023)	Design Application of Fundamental Consideration
11	4.3.1	User Operability – Display design should consider visibility, readability, attention attracting capability of the indication, understandability of the indication, and the precision to which the output can be read. Plant control design should consider how much force is required for operation, the required precision of the control, the required response time for the control, and the accessibility of the control.	C&I – Design guideline documents are developed to establish suitable and consistent displays and controls for the HMIs. C&I engineers utilize industry best practices and standards as well as experience (via project personnel and control system vendors) in the development of these guidelines. Project review procedures ensure that identified requirements from other disciplines (operations, etc.) are accommodated. Specific HMI displays and controls will be created based on the design guidelines and subject to review by experienced C&I/Ops/HF personnel for both the static environmental conditions and simulated dynamic environmental conditions. In the WTP control rooms, large screen displays under the control of the shift supervisor will allow a group-view display system as discussed in NUREG-0700, section 6: "Group-view displays have traditionally been implemented in conventional control rooms using large screen displays that enable multiple individuals to refer to the same information and allow individuals to move about the CR while still viewing the information. They can also reduce distractions that might otherwise occur if the information is needed by multiple personnel is located at the workstation of one individual." For physical plant control aspects (hand valve operations, local control stations, etc.) C&I/Ops/HF experience is relied upon during model reviews to ensure the human operator is adequately accommodated.

Item	Section	Section 4 Fundamental Consideration (paraphrased criterion from IEEE 1023)	Design Application of Fundamental Consideration
12	4.3.2	Application – Select display type based on the type of information needed from the display (e.g., digital readout vs. strip chart recorder vs. simple on/off status). Select controls based on expected use, considering such aspects as limb used, continuous vs. discrete outputs, strength needed, etc.	C&I – Specific HMI displays and controls are being created based on the design guidelines and subject to review by experienced C&I/Ops/HF personnel in both the static and simulated dynamic environments. These reviews rely heavily on Ops personnel experience and vision on how each piece of information will be utilized. Each type of HMI screen and color scheme has been reviewed by Human Factors Engineering using NUREG-0700 guidelines.
13	4.3.3	Maintenance – Consider the ease with which equipment can be assembled or disassembled, the tools required, interchangeability of parts, features necessary to prevent incorrect assembly, and the level of training and skill required to maintain the equipment.	C&I – An evaluation of C&I equipment (enclosures, panels, cabinets, racks and control room operator consoles) in regards to maintenance is performed. Maintenance considerations such as interchangeability of parts, ease of assembly, periodic maintenance requirements, etc. are included in the technical requirements of the procurement specifications and are evaluated against vendor bid packages prior to award. A formal evaluation of instrumentation in regards to maintenance is not performed. Instead, instrument-related maintenance considerations are addressed during the technical evaluation of equipment prior to purchase.
14	4.3.4	Accessibility – Locate equipment such that it is readily accessible for operation or maintenance. Conversely, it may be prudent to deliberately impair the accessibility/usability of a control when inadvertent actuation could produce a major plant transient (e.g., use of cover plates, two-hand operation, etc.).	C&I – C&I engineering is not directly responsible for location and accessibility of any equipment. Equipment is located by Plant Design and C&I/Ops/HF experience is relied upon during model reviews to ensure accessibility requirements are met. C&I engineering has worked closely with Plant Design in the layout of the control rooms. NUREG-0700 accessibility and maintenance guidelines have been followed to the maxiimum extent possible in the control rooms and their supporting computer rooms.

Item	Section	Section 4 Fundamental Consideration (paraphrased criterion from IEEE 1023)	Design Application of Fundamental Consideration
15	4.3.5	Testability – Ensure design supports equipment and component test results that are unambiguous. Allow adequate space for test personnel to perform their tests.	C&I – C&I engineering is not responsible for the development of testing procedures and schedules. C&I engineering will develop project standard instrument installations and include isolation components (both physical and software) to allow for component testing. During the design of Safety Instrumented Systems, C&I will follow guidelines from tailored project standard IEEE 338-1987 for Period Testing of Nuclear Power Generating Station Safety Systems.
16	4.3.6	Dependability – Design into equipment obvious indicators of an equipment malfunction. Design into equipment understandable and easy-to-apply recovery methods.	C&I – For safety applications, C&I engineering will perform formal calculations, to ensure equipment design meets the dependability/reliability requirements as determined by the ISM process. Safety systems design requires positive feedback, to confirm that corrective actions have been taken. For non-safety equipment, faults can generally be confirmed through secondary indications (i.e., pump failed = low flow) or through the use of intelligent devices. This practice of confirming faults through secondary indications relies on the C&I and Ops experience during review of project documents (P&ID, V&IDs, MSDs) to ensure secondary indications are allowed for.

Item	Section	Section 4 Fundamental Consideration (paraphrased criterion from IEEE 1023)	Design Application of Fundamental Consideration
17	4.3.7	Standardized Conventions and Nomenclature – Establish design conventions and consistently follow. Examples include: Relative location of components (e.g., display above control); direction of motion of control (e.g., valves turned clockwise are being shut); direction of motion of display pointer (arrow deflecting right means reading is increasing); standardized abbreviations for systems, equipment, and components in all text, labels, and drawings; color coding of pipes and process equipment, etc.	C&I- Control panel layouts rely on C&I/Ops/HF experience during the development of General Arrangement Drawings. Industry standards (such as MIL-STD-1472F and NUREG-0700) are used as design inputs. To ensure standardization a project specification for C&I enclosures, panels, cabinets, and racks has been issued. For Human Machine Interfaces, C&I engineering relies on project experience, vendor experience, lessons learned and standard industry practices to develop design guides to minimize human error in HMI designs and to develop consistency throughout the WTP. NUREG-0700 is an input to the HMI Design Guide.
	4.4	**Personnel Considerations**	
18	4.4.1	Physiological Limitations – Factor into the design the limits on the human body in terms of strength, range of motion, tolerance to temperature, etc.	C&I – Experience of Ops, HF, and project design personnel on similar plants, adherence to project design guides and specifications, as well as utilizing standard vendor products will minimize the impacts of physiological limitations. Range of motion for the 5%-tile female to the 95%-tile male per NUREG-0700 are being followed in the design of the operator consoles for the control rooms.
19	4.4.2	Anthropometry – Ensure workplace layout is consistent with the body dimensions of the operator group interfacing with it – specifically, consider reach distances, seating height, lines of sight, physical clearances, etc.	C&I - Experience of Ops, HF, and project design personnel on similar plants, adherence to project design guides and specifications, as well as utilizing standard vendor products will address the anthropometry concerns. Reach distances, seating height, etc., of the 5%-tile female to the 95%-tile male per NUREG-0700 are being followed in the design of the operator consoles for the control rooms, as well as, in the layout of the consoles in the control rooms.

Item	Section	Section 4 Fundamental Consideration (paraphrased criterion from IEEE 1023)	Design Application of Fundamental Consideration
20	4.4.3	Sensory Limitations – Display signals must exceed the minimum threshold levels in order to be perceived. Ensure indications are loud enough, audibly different, and visibly different (in terms of color, size, shape) to attract attention.	C&I –Experience of Ops, HF, and project design personnel on similar plants, adherence to project design guides and specifications, as well as utilizing standard vendor products will minimize the impacts of sensory limitations.
21	4.4.4	Memory – Allow for short-term and long-term human memory limitations by designing display/control formats that allow memory aids to be utilized.	C&I - C&I engineering utilizes descriptive text, symbols, and graphical representations of data to aid in operator memory. A Control Systems Design Document will be prepared that provides logic guidance, nameplate data structure guidance, control library guidance, alarm prioritization logic, and alarm suppression logic. This structured approach allows operators to take advantage of memory aids.
22	4.4.5	Decision Making – Displays and controls shall be as simple and straight forward as the design allows to minimize situations where human decisions are made under uncertainty.	C&I - C&I engineering utilizes industry best practices and standards as well as experience (via project personnel and control system vendors) in the development of HMI display and alarm management philosophies. These philosophies will be documented in the project design guide. Application of this design guide will minimize the negative impacts of speed and load stress on the operator.
23	4.4.6	Experience and Education Level – Ensure the design reflects the competence, level of technical expertise, and training of the work force.	C&I – Modern control systems require a higher level of training which must be provided to ensure proper and effective utilization. Operations and maintenance personnel are included in the review of all design guides and application documentation to ensure that the level of complexity is acceptable. C&I is not responsible for operator training & qualification or operating procedures. C&I, however, is working closely with Training and Process Operations to ensure that the various systems emulating the control system, safety system and CCTV system provide a high degree of physical and functional fidelity.

Item	Section	Section 4 Fundamental Consideration (paraphrased criterion from IEEE 1023)	Design Application of Fundamental Consideration
24	4.4.7	Human Adaptability – Ensure there are no underlying design deficiencies which can be masked by adaptable human performance under normal conditions.	C&I - C&I engineering does not formally consider human adaptability.
25	4.4.8	User Acceptance – Ensure operators endorse the system design.	C&I – C&I engineering recognizes the final owners of the control systems are the WTP operations and maintenance teams. To ensure user acceptance, C&I will directly involve commissioning, operations, and maintenance personnel, where appropriate, throughout the design life cycle.
	4.5	**Nuclear Operations Considerations**	
26	4.5.1	Operational Safety – Implement man-machine interfaces that enhance operational safety.	C&I – C&I engineering will implement HMIs in accordance with developed project design guides. C&I relies on "Others" for any structured analysis of operational modes and activities.
27	4.5.2	Long Continuous Operation – Design the work space to accommodate periods of resting and mobility during shift operation.	This is not a direct C&I engineering consideration. Personnel areas for rest and shift turnover are designed by the Architectural Group.
28	4.5.3	Shift Rotation – Design the work space to accommodate a work group's change from day to night operations and back again.	This is not a direct C&I engineering consideration. Personnel areas for rest and shift turnover are designed by the Architectural Group.
29	4.5.4	Shift Turnover – Design the work space to accommodate two shifts during turnover. Incorporate operator aids into the design to facilitate an efficient turnover.	This is not a direct C&I engineering consideration. Personnel areas for rest and shift turnover are designed by the Architectural Group.
30	4.5.5	Normal Startup, Shutdown, and Emergency Operation – Make human task loading during design basis events manageable.	C&I Engineering does not see this requirement as a direct C&I responsibility. This is a follow-on requirement from 4.1.2. Note: At a minimum, C&I is indirectly responsible for ensuring a manageable degree of human task loading. C&I will work with Operations and MH (where appropriate) to ensure human task loading is appropriate for the bounding design basis events. Operational procedures will further ensure the task loading is manageable.

Item	Section	Section 4 Fundamental Consideration (paraphrased criterion from IEEE 1023)	Design Application of Fundamental Consideration
31	4.5.6	Total Plant Operation – Standardize man-machine interfaces (i.e., indications & controls) for all plant equipment.	C&I - To the extent possible, C&I has retained responsibility for implementation of the indications and controls (the HMIs) for all applications to ensure that project standards can be applied throughout the facility, allowing for a common "look and feel" from both an operations perspective as well as maintenance perspective. The C&I HMI Design Guide provides direction to reach this standardization goal.
32	4.5.7	Remote Operation – Design multiple feedback features for equipment and systems that are operated remotely.	C&I - Engineering relies on C&I/ Ops / HF experience, lessons learned, and standard industry practices to ensure adequate feedback of operational data is available and organized to allow safe, effective remote operation.
	4.6	**Documentation Considerations**	
33	4.6.1	Plant Procedures – Make plant procedures technically correct and easy to read and comprehend. Utilize task analysis to establish the procedural steps necessary to accomplish an activity.	Plant procedures are not a C&I engineering deliverable. C&I will assist Operations and MH to ensure the plant procedures are technically correct. Operations is the lead group. These procedures should be reviewed by the HF specialist before they are approved.
34	4.6.2	Equipment Manuals – Ensure information is technically accurate, the format is user-friendly, the text is presented at the correct reading level, and the illustrations are of high quality.	C&I does not impose any specific HFE requirements on the equipment suppliers for the quality of the equipment manuals. C&I equipment is an off-the-shelf item and manuals that come with this equipment adequately cover these standardized components. Note: This is a Maintenance Department initiative; however, C&I will assist Maintenance in the review and acceptance of the equipment manuals. These manuals shall be reviewed by the HF specialist before they are approved.
35	4.6.3	Computer Software – Utilize HFE lessons learned to help guide software development, use, and maintenance.	C&I - C&I engineering utilizes industry best practices and standards as well as experience (via project personnel and control system vendors) in the development of HMI displays and control software. Software will be developed under a quality program to ensure consistency and to ensure software requirements are achieved and properly documented.

Item	Section	Section 4 Fundamental Consideration (paraphrased criterion from IEEE 1023)	Design Application of Fundamental Consideration
36	4.6.4	Specifications – Include HFE requirements in the functional requirements for equipment and component specifications.	C&I – Where required, HF considerations are stated directly in specifications, including the specifications for "Instrumentation for Packaged Equipment" and "C&I enclosures, panels, cabinets, and racks". HFE considerations are also addressed during Vendor submittals reviews to ensure project requirements are satisfied.
37	4.6.5	Engineering Drawings – Utilize HFE lessons learned for the development of engineering drawings.	C&I- Engineering drawings are subject to project review procedures which allow users of the deliverables to comment to ensure all discipline needs are being met.

E-STARS™ Report
Task Detail Report
11/03/2004 1000

TASK INFORMATION

Task#	ORP-WTP-2004-0175		
Subject	CONCUR: (04-WED-056) TRANSMITTAL OF DOE ORP DESIGN OVERSIGHT REPORT: REVIEW OF CONTRACTOR PROCESS FOR DESIGN OF THE MAIN CONTROL ROOM		
Parent Task#		**Status**	CLOSED
Reference		**Due**	
Originator	Almaraz, Angela	**Priority**	High
Originator Phone	(509) 376-9025	**Category**	None
Origination Date	10/18/2004 0927	**Generic1**	
Remote Task#		**Generic2**	
Deliverable	None	**Generic3**	
Class	None	**View Permissions**	Normal
Instructions	Hard copy of the correspondence is being routed for concurrence. Once you have reviewed the correspondence, please approve or disapprove via E-STARS and route to the next person on the list. Thank you. bcc: MGR RDG File WTP OFF File J. J. Short, OPA W. F. Hamel, WED J. E. Orchard, WED J. R. Eschenberg, WTP		

ROUTING LISTS

1 Route List Inactive

- Orchard, John E - Review - Concur with comments - 10/18/2004 0942
- Hamel, William F - Review - Concur with comments - 11/03/2004 1001
- Eschenberg, John R - Review - Concur - 10/27/2004 0951
- Schepens, Roy J - Approve - Approved with comments - 11/03/2004 0946

ATTACHMENTS

Attachments
1. 04-WED-056.JEO.Attachment.doc
2. 04-WED-056.JEO.Control Room Design Oversight.doc

COMMENTS

Poster	Orchard, John E (Almaraz, Angela) - 10/18/2004 0910
	Concur
	John signed the hard copy on 10/18/04
Poster	Schepens, Roy J (Poynor, Cathy D) - 11/03/2004 0911
	Approve
	signed by Howard Gnann for Roy Schepens
Poster	Hamel, William F (Almaraz, Angela) - 11/03/2004 1011
	Concur
	Bill signed the hard copy on 10/25/04

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TASK DUE DATE HISTORY

No Due Date History

SUB TASK HISTORY

No Subtasks

-- end of report --

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E-STARS™ Report
Task Detail Report
10/18/2004 0929

TASK INFORMATION

Task#	ORP-WTP-2004-0175		
Subject	CONCUR: (04-WED-056) TRANSMITTAL OF DOE ORP DESIGN OVERSIGHT REPORT: REVIEW OF CONTRACTOR PROCESS FOR DESIGN OF THE MAIN CONTROL ROOM		
Parent Task#		**Status**	Open
Reference		**Due**	
Originator	Almaraz, Angela	**Priority**	High
Originator Phone	(509) 376-9025	**Category**	None
Origination Date	10/18/2004 0927	**Generic1**	
Remote Task#		**Generic2**	
Deliverable	None	**Generic3**	
Class	None	**View Permissions**	Normal
Instructions	Hard copy of the correspondence is being routed for concurrence. Once you have reviewed the correspondence, please approve or disapprove via E-STARS and route to the next person on the list. Thank you. bcc: MGR RDG File WTP OFF File J. J. Short, OPA W. F. Hamel, WED J. E. Orchard, WED J. R. Eschenberg, WTP		

ROUTING LISTS

1 Route List — Active

- Orchard, John E - Review - Awaiting Response 10/28/04
- Hamel, William F - Review - Awaiting Response 10/25/04
- Eschenberg, John R - Review - Awaiting Response 10/26 04
- Schepens, Roy J - Approve - Awaiting Response

RBH 11/3/04

ATTACHMENTS

Attachments
1. 04-WED-056.JEO.Attachment.doc
2. 04-WED-056.JEO.Control Room Design Oversight.doc

COMMENTS

No Comments

TASK DUE DATE HISTORY

No Due Date History

SUB TASK HISTORY

No Subtasks

-- end of report --

RECEIVED
NOV 03 2004
DOE-ORP/ORPCC