ENERGY NORTHWEST
People·Vision·Solutions

P.O. Box 968 • Richland, WA • 99352-0968

March 2, 2007
GO2-07-045

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Subject: **COLUMBIA GENERATING STATION, DOCKET NO. 50-397**
FINAL RESPONSE TO GENERIC LETTER 2003-01 "CONTROL ROOM HABITABILITY"

Reference: Letter dated August 11, 2003 from DK Atkinson (Energy Northwest) to the NRC, "60-Day Response to Generic Letter 2003-01 Control Room Habitability"

Dear Sir or Madam:

In the referenced letter, Energy Northwest (EN) provided an initial response to Generic Letter 2003-01. This letter serves as EN's final response to Generic Letter 2003-01. Attachment 1 provides the final response and Attachment 2 identifies the commitment contained in this response. If you have any questions regarding this matter, please contact GV Cullen, Licensing Supervisor at (509) 377-6105.

Respectfully,

Andy Knauer For

WS Oxenford
Vice President, Technical Services
Mail Drop PE04

Attachments: 1. Generic Letter 2003-01 Final Response
2. Commitments

cc: BS Mallett – NRC RIV
CF Lyon – NRC NRR
NRC Senior Resident Inspector/988C
RN Sherman – BPA/1399
WA Horin – Winston & Strawn

A102

Generic Letter 2003-01 Final Response

The following information documents Energy Northwest's final response to the requested information of Generic Letter 2003-01:

1. **Provide confirmation that your facility's control room meets the applicable habitability regulatory requirements (e.g., GDC 1, 3, 4, 5, and 19) and that the CRHSs are designed, constructed, configured, operated, and maintained in accordance with the facility's design and licensing bases.**

   Energy Northwest's Response

   As summarized below, the Columbia Generating Station (CGS) control room meets the applicable habitability regulatory requirements.

   - GDC 1, Quality Standards and Records
     This criterion requires that structures, systems, and components (SSCs) important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions performed.

     The structures, systems, and components credited in support of main control room habitability have been designed, fabricated, erected, tested and maintained in accordance with the Energy Northwest Quality Assurance (QA) Program. The Energy Northwest QA program is described in Chapter 17 of the CGS Final Safety Analysis Report (FSAR) and the Operational Quality Assurance Program Description (EN-QA-004).

     The CGS QA program ensures sound engineering in all phases of design, construction, operation and maintenance through conformity to regulatory requirements and design bases and adherence to recognized codes and standards. The QA program applies to operations and maintenance activities throughout the life of CGS. Documents are maintained which demonstrate that the requirements of the QA program are being satisfied. In accordance with the QA program, sufficient records are maintained to provide evidence of the quality of plant safety-related items and activities.

     CGSs structures, systems, and components are classified in Chapter 3 of the FSAR with respect to their location and service and their relationship to the safety function to be performed. The control room structure and essential portions of the Control Room Heating, Ventilating, and Air Conditioning system (CR HVAC) are classified as safety related (Quality Class 1).

- GDC 3, Fire Protection
  This criterion requires SSCs important to safety be designed and located to minimize the probability and effects of fires and explosions.

  The potential effects of smoke on control room habitability were evaluated qualitatively by Fire Protection Engineering. This evaluation concludes that a single fire/smoke event would not degrade and/or impair the control room staff's ability to safely control and shutdown the reactor.

  In the event of a control room fire or if the control room becomes uninhabitable due to smoke, there are accessible paths to the remote shutdown room. The remote shutdown room would remain free of the effects of a fire that caused control room evacuation.

  The only area from where smoke could potentially infiltrate into the control room in appreciable quantities is from the cable spreading room. However, control room positive differential pressure would minimize smoke intrusion. In order to maintain the highest level of protection for control room habitability in the event of a cable spreading room fire, the pressurization mode is used. The sealed penetrations to the control room from other adjoining areas will prevent sufficient smoke from infiltrating into the control room which would otherwise impair the control room staff's ability to control the plant and provide shutdown capability.

  The design of the control room structure and the CR HVAC procedures prevent smoke infiltration to the control room from other fire areas. There are redundant air supplies for the control room from separate fire areas. The HVAC system in the remote shutdown room is independent of the CR HVAC system and unaffected egress paths from the control room to the remote shutdown room will be available.

  External range fires could result in outside air intake damper closure and the loss of control room pressurization mode; however, SCBA units can be used until the control room is cleared of smoke. Operators are trained on the use of SCBA and adequate SCBA capacity is staged for the control room.

  The primary systems, structures, and components that mitigate the propagation or impact of smoke include: 1) redundant HVAC systems where if one HVAC supply area were on fire, its HVAC can be shutdown and a second HVAC system started that provides fresh air; 2) redundant remote air intakes; 3) physical plant barriers (e.g., fire dampers, fire doors, fire-rated penetration seals) that minimize the passage of fire and smoke; 4) redundant egress pathways; 5) smoke detection and fire suppression systems; 6) locally accessible SCBA units to allow operators to remain in the control room; and 7) fixed and manual smoke removal systems.

- GDC 4, Environmental and Dynamic Effects Design Bases
  This criterion requires SSCs important to safety to be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including LOCAs.

  The main control room and the safety-related and important to safety equipment contained therein are considered to be in a mild environment as described in CGS FSAR 3.11. The direct effects of accidents (other than radiation) do not change the environment for the control room as compared to normal operations. The effects of radiation are controlled by the design of the control room envelope and the HVAC systems that support its function to limit the dose to the limits allowed in GDC 19.

  A secondary effect of a LOCA or ashfall event is the heatup of the standby service water which cools the control room and associated equipment. Evaluations have been performed and documented to assure that the ambient conditions in the control room envelope are such that safety-related and important to safety equipment will function and operator habitability will not be adversely affected.

  The control room structure and safety-related/important to safety equipment have been designed to remain functional after a design basis earthquake. Non-safety-related equipment over and in the vicinity of safety-related/important to safety equipment has been evaluated and supports for the non-safety related equipment have been designed to assure that the non-safety related equipment will not fall on or impact safety-related/important to safety equipment or the control room operators. Hydrodynamic loads do not affect the control room or equipment contained therein.

  The control room envelope is designed to withstand the effects of missiles generated by tornados or rotating equipment outside the control room. A flood analysis has been prepared to assure that flooding due to external floods or pipe breaks/leaks within the plant does not adversely affect the capability of the control room or the equipment contained therein.

  The previously cited analyses address all normal and accident conditions. The control room and safety-related equipment contained therein can be operated, maintained and tested without exceeding the allowed environmental conditions for the control room.

- GDC 5, Sharing of Structures, Systems, and Components
  This criterion requires that SSCs important to safety not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the

event of an accident in one unit, the orderly shutdown and cooldown of the remaining units. CGS is a single unit site and therefore, this criterion is not applicable.

- GDC 19, Control Room
  This criterion requires that a control room be provided from which actions can be taken to operate the nuclear reactor safely under normal conditions and to maintain the reactor in a safe condition under accident conditions, including a LOCA. Adequate radiation protection is to be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of specified values.

  At CGS a control room is provided from which the nuclear power plant can be safely operated under normal conditions and can be maintained in a safe condition following postulated accidents.

  The control room contains the controls and necessary surveillance equipment for operation of the plant functions, such as the reactor and its auxiliary systems, engineered safety features, steam and power conversion systems, and station electrical distribution boards.

  The control room is located in a Safety Class 3, Seismic Category I structure. Safe occupancy of the control room during abnormal conditions is ensured by the design. Adequate shielding is provided to maintain acceptable radiation levels in the control room in the event of a design basis accident for the duration of the accident.

  The control room ventilation system has redundant and spatially separated fresh air intakes and redundant equipment, radiation detectors, and smoke detectors with appropriate alarms and interlocks. Redundant systems are provided for the control room air to be re-circulated during isolation of the control room from outside air.

  The NRC has approved the use of an alternative source term, via license amendment 199 (Reference 1). With the alternative source term, CGS control room design meets the dose requirements of GDC 19 under analyzed worst-case design bases accident conditions.

  The control room can be continuously occupied under all operating and accident conditions. In the unlikely event that the control room must be vacated and access is restricted, instrumentation and controls are provided outside the control room from which safe shutdown of the reactor can be accomplished.

In addition, as summarized below, the control room habitability systems (CRHS) are designed, constructed, configured, operated, and maintained in accordance with the CGS design and licensing bases.

- The CGS CRHSs are designed to ensure habitability inside the main control room during all normal and abnormal station operating conditions, including 30 days of habitability following a LOCA, in compliance with GDC 19.

- The control room contains the controls and necessary surveillance equipment for operation of the plant functions, such as the reactor and its auxiliary systems, engineered safety features, steam and power conversion systems, and station electrical distribution boards.

- Safe occupancy of the control room during abnormal conditions is ensured by the design. The main control room is fully shielded and can be isolated to allow habitation during any design basis accident for the duration of the accident. Two redundant ventilation systems ensure that the control room environment is maintained under normal and emergency conditions.

- During normal operation (normal chillers operating and standby service water not operating) the main control room ambient conditions are normally maintained at 75°F ±3° dry-bulb temperature. In the event both normal chillers are inoperative (emergency condition) the control room temperature will be maintained within the design limit (104°F) by control room emergency chilled water or standby service water.

- The ingress of smoke or combustion vapors (due to a fire within the plant but external to the control room), or of airborne radioactive contaminants released due to the design basis accident, is minimized by pressurizing the control room. During a LOCA, the control room emergency filter (CREF) unit maintains a minimum positive pressure of 0.125 in. w.g. with respect to its surroundings as measured in the cable spreading room. The emergency filter units are energized by LOCA signals (F, A, Z) and all outdoor pressurizing air is automatically diverted through the filter units while the main control room kitchen exhaust fan and its isolation damper are shut off.

- Three air intakes are provided from which fresh air can be drawn. One local intake is provided for normal operation and two remote intakes are provided for normal and emergency operation. Fire external to the plant and any ingress of smoke or combustion vapors are detected by smoke detectors in the control room fresh air intake ducting, which will automatically close the fire rated dampers downstream of the smoke detectors.

- Isolation of the control room fresh air intakes places the CR HVAC in an unfiltered recirculation mode. In the event of a hazardous chemical release, the CR HVAC is manually isolated into the recirculation mode by closing the normal fresh air isolation damper.

- All equipment was factory inspected and tested in accordance with the applicable equipment specifications, codes, and quality assurance requirements. System ductwork and erection of equipment was inspected during various construction stages for quality assurance.

- Construction tests were performed on all mechanical components and the system was balanced for the design air and water flows and system operating pressures. Controls, interlocks, and safety devices were checked, adjusted, and tested to ensure the proper sequence of operation. The CRHSs are verified periodically by performance of Technical Specification (TS) surveillance testing.

- The emergency filter units, which are normally in standby, are started periodically to ensure fan operation. The fans are factory tested in accordance with AMCA Standard 210, "Air Moving and Conditioning Association, Test Code for Air Moving Devices." The HEPA and charcoal adsorber filters are periodically tested as required by the TSs. Charcoal sample laboratory test results are required within 31 days of removal.

- All valves associated with the CR HVAC system are factory leak tested bubble tight, at a pressure differential of 0.2 psig. Once installed, the valves are stroked and leak tested periodically to verify operability. The fresh-air intake valves are periodically tested to ensure control room in-leakage through closed intake valves is minimized. Response to actuation signals indicative of a LOCA is also verified.

- The Preventative Maintenance Optimization Program defines and provides a technical basis for those maintenance activities to ensure that the required level of equipment performance and reliability are met for the life of the station.

In summary, the CGS CRHSs are designed, constructed, configured, operated, and maintained in accordance with the facility's design and licensing bases. The Energy Northwest QA program ensures conformance to design bases and regulatory requirements, and adherence to applicable standards and codes. The QA program also applies to system operation and maintenance activities.

1(a) That the most limiting unfiltered inleakage into your CRE (and the filtered inleakage if applicable) is no more than the value assumed in your design basis radiological analyses for control room habitability. Describe how and when you performed the analyses, tests, and measurements for this confirmation.

Energy Northwest's Response

CGS has two emergency pressurization trains (A&B), that can be used simultaneously or individually to pressurize the control room and to filter the outside air flow from the control room intakes following a design basis accident. The original licensing basis control room doses were calculated based on an assumed unfiltered inleakage value of 10.55 cfm. Prior to the issuance of GL 2003-01, Energy Northwest took action to validate this inleakage assumption by performing a tracer gas test. This test was conducted by NCS Corporation and Lagus Applied Technology, Inc., in September 2000. The test results showed a control room unfiltered inleakage rate that was significantly higher than the original license basis value.

This condition was reported to the NRC in LER 2000-006 and a basis for continued operation with this nonconforming condition was developed. A re-evaluation of the control room dose based on the as-tested inleakage was performed. This analysis determined that CGS did not meet the thyroid dose limit specified in SRP 6.4. As a result Energy Northwest implemented appropriate compensatory measures which included an action to administer KI tablets to control room operators in the event of an accident, to ensure their dose would remain below the regulatory limit.

Following the issuance of this Generic Letter and concerns with the accuracy of the September 2000 tracer gas test, Energy Northwest conducted a second tracer gas test during the fall of 2003. A description of the test and its inleakage results were provided in Section 4.2 (pages 22 through 24 in attachment 1) of the September 30, 2004 Energy Northwest license amendment request (LAR) to adopt the alternative source term (AST) pursuant to 10 CFR 50.67 (Reference 2). The NRC has subsequently approved the license amendment request (Reference 1).

Although the second tracer gas test resulted in a much lower inleakage than the first test, Energy Northwest has continued the compensatory measure of administering KI. This compensatory measure will remain in place until implementation of Amendment 199 at CGS (no later than March 27, 2007). The AST LAR analysis included inleakage values that bound the second tracer gas test results. The analysis showed that CGS will be in full compliance with all regulatory dose limits without any compensatory measures.

1(b) That the most limiting unfiltered inleakage into your CRE is incorporated into your hazardous chemical assessments. This inleakage may differ from the value assumed in your design basis radiological analyses. Also, confirm that the reactor control capability is maintained from either the control room or the alternate shutdown panel in the event of smoke.

Energy Northwest's Response

Chemicals on the CGS site were analyzed in accordance with the guidance provided in Regulatory Guide 1.78. Although most of the chemicals were screened out due to the small quantities in small containers, the rest of the chemicals were analyzed assuming the maximum control room intake (1300 cfm in two train pressurization mode) is unfiltered. The results showed that all the chemicals were well below the toxicity limits. Therefore, none of the chemicals pose a threat to the control room operators at CGS.

The design of CGS and the administrative procedures ensure smoke events would not preclude control room habitability or prevent access to or operation of the remote shutdown panel. (see response to GDC-3 above)

1(c) That your technical specifications verify the integrity of the CRE, and the assumed inleakage rates of potentially contaminated air. If you currently have a ΔP surveillance requirement to demonstrate CRE integrity, provide the basis for your conclusion that it remains adequate to demonstrate CRE integrity in light of the ASTM E741 testing results. If you conclude that your ΔP surveillance requirement is no longer adequate, provide a schedule for: 1) revising the surveillance requirement in your technical specification to reference an acceptable surveillance methodology (e.g., ASTM E741), and 2) making any necessary modifications to your CRE so that compliance with your new surveillance requirement can be demonstrated.

If your facility does not currently have a technical specification surveillance requirement for your CRE integrity, explain how and at what frequency you confirm your CRE integrity and why this is adequate to demonstrate CRE integrity.

Energy Northwest's Response:

CGS TS 3.7.3, "Control Room Emergency Filtration (CREF) System," specifies the surveillance requirements related to the operability of control room envelope (CRE). This TS includes all of the surveillance requirements currently specified in the latest NRC-approved versions of the Standard Technical Specifications for General Electric Plants for the BWR 4 and 6 designs (Reference NUREG-1433 revision 3 and 1434 revision 3, respectively, both dated June 2004).

Specifically, SR 3.7.3.4 requires verification that each CREF subsystem can maintain a positive pressure of > 1/8 inches water gauge relative to the radwaste and turbine buildings (as measured in the radwaste building cable spreading room) during the pressurization mode of operation at an outside air flow rate of <1000 cfm. This surveillance is required to be performed every 24 months on a staggered basis.

Positive pressure surveillance testing does serve to verify the operability of the CREF subsystem train and provides an indication of CRE integrity. However, this testing does not confirm CRE integrity using specific inleakage values. Energy Northwest acknowledges that some form of inleakage testing appears to be the optimal method for confirming boundary integrity. Energy Northwest will submit a license amendment request to revise the CGS TS by July 31, 2007. This license amendment request will utilize the guidance of TSTF-448, as appropriate.

In the initial response to this Generic Letter, Energy Northwest committed to conduct a series of tracer gas tests in the fall of 2003. These tests, performed by NUCON International, Inc., utilized the ASTM E741 methodology and current state-of-the-art testing technology. Details of these tests and the results were provided in the Energy Northwest LAR (Reference 2). Based on these test results, no modifications to the CRE will be needed to establish compliance with the licensing basis approved by the NRC in Amendment 199 (Reference 1).

Future testing and other activities to confirm the integrity of the CRE will be performed in accordance with the CGS TS following the adoption of TSTF-448 as committed above.

2. **If you currently use compensatory measures to demonstrate control room habitability, describe the compensatory measures at your facility and the corrective actions needed to retire these compensatory measures.**

Energy Northwest's Response

CGS currently employs a compensatory measure of administering KI to control room staff in the event of an accident to block iodine doses to the thyroid (limiting organ dose) to meet GDC 19 requirements. Under the analyzed worst-case design basis accident conditions, GDC 19 control room dose criteria are met (29.4 rem to the thyroid versus the 30 rem criterion) provided KI is administered within 1 to 2 hours following initial exposure to the contaminated control room atmosphere.

Subsequently, CGS has received a license amendment (i.e., Amendment 199) to allow use of an Alternative Source Term in accordance with 10 CFR 50.67 and Regulatory Guide 1.183 that provides a bounding value for control room inleakage. Upon implementation of amendment 199, scheduled no later than March 27, 2007,

CGS control room dose will be below regulatory limits and hence the compensatory measure of administering KI will be retired at that time.

3. **If you believe that your facility is not required to meet either the GDC, the draft GDC, or the "Principal Design Criteria" regarding control room habitability, in addition to responding to 1 and 2 above, provide documentation (e.g., Preliminary Safety Analysis Report, Final Safety Analysis Report sections, or correspondence) of the basis for this conclusion and identify your actual requirements.**

Energy Northwest's Response

CGS is required to meet the GDCs.

REFERENCES

1. Letter dated November 27, 2006, BJ Benney (NRC) to JV Parrish (EN), "Columbia Generating Station -Issuance of Amendment Re: Alternative Source Term (TAC NO. MC4570)"

2. Letter G02-04-170 dated September 30, 2004, DK Atkinson (EN) to NRC, "License Amendment Request --Alternative Source Term"

List of Regulatory Commitments

1. Energy Northwest will submit a license amendment request to revise the CGS TS by July 31, 2007. This license amendment request will utilize the guidance of TSTF-448, as appropriate.