APS

Palo Verde Nuclear
Generating Station

David Mauldin
Vice President
Nuclear Engineering
and Support

TEL (623) 393-5553
FAX (623) 393-6077

Mail Station 7605
P.O. Box 52034
Phoenix, AZ 85072-2034

NRC Generic Letter 2003-01

102-05018-CDM/TNW/JAP
December 5, 2003

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-37
Washington, DC 20555-0001

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2 and 3
Docket Nos. STN 50-528/529/530
180-Day Response to NRC Generic Letter 2003-01: Control Room Habitability

Dear Sirs:

On June 12, 2003, the U. S. Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 2003-01: Control Room Habitability. This generic letter requested that licensees submit "information that demonstrates that the control room at each of their respective facilities complies with the current licensing and design bases, and applicable regulatory requirements, and that suitable design, maintenance and testing control measures are in place for maintaining this compliance." GL 2003-01 requested that licensees provide this information within 180 days from the issuance of the generic letter, which would be December 9, 2003.

By this letter, Arizona Public Service Company (APS) is providing the requested information to the NRC. The Enclosure to this letter contains this information.

No commitments are being made to the NRC by this letter.

Should you have any questions, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,

Michael J. Winsor for CDM

CDM/TNW/JAP

Enclosure w/ Attachments 1, 2, and 3

cc:	B. S. Mallett	Regional Administrator, NRC Region IV
	M. B. Fields	NRC NRR Project Manager
	N. L. Salgado	NRC Senior Inspector for PVNGS

A102

Enclosure

APS' 180-Day Response to NRC Generic Letter 2003-01

On June 12, 2003, the NRC issued Generic Letter (GL) 2003-01, "Control Room Habitability," requesting specified information from reactor licensees. Provided below is Arizona Public Service Company's response to GL 2003-01 for the Palo Verde Nuclear Generating Station Units 1, 2, and 3.

GL 2003-01 REQUEST NO. 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.**

PVNGS RESPONSE:

Palo Verde Nuclear Generating Station (PVNGS) is a 3-unit reactor site located approximately 50 miles west of Phoenix, Arizona and is operated by Arizona Public Service Company (APS). All three reactors are Combustion Engineering designed pressurized water reactors. Each reactor unit has its own individual control room (CR) complex. The associated control room habitability (CRH) systems do not share structures, systems or components (SSCs) with each other. The three control rooms' habitability systems are of identical design and configuration. PVNGS' compliance with the General Design Criteria (GDC) Appendix A to 10 CFR Part 50 is documented in its Updated Final Safety Analysis Report (UFSAR), primarily in section 3.1 of the UFSAR with references to other UFSAR sections, as appropriate.

As described in UFSAR 3.1.15, the PVNGS CRs are designed to meet GDC 19 during all design basis events. As discussed in section 6.4.7 and Chapter 15 of the PVNGS UFSAR, the most limiting dose consequence to CR operators was evaluated and criteria for a maximum inleakage developed. The analysis concluded that the 30-day exposure to Control Room Operators remains within the requirements of 10 CFR 50 Appendix A GDC 19 for the most limiting design basis accident (DBA) as long as the inleakage is less than or equal to 61 SCFM.

APS is a member of an industry consortium of six plants as a result of a mutual agreement known as Strategic Teaming and Resource Sharing (STARS). The STARS group consists of the six plants operated by TXU Generation Company LP, Union Electric Company, Wolf Creek Nuclear Operating Corporation, Pacific Gas and Electric Company, STP Nuclear Operating Company, and APS. A CRH self-assessment was performed at PVNGS in June 2000 (reference 1). The self-assessment was conducted using a format derived by the STARS initiative on CRH. The assessment utilized peer assessors from other STARS plants. Also, the same STARS facilitator that was involved in previous STARS CRH assessments facilitated the PVNGS assessment.

The assessment was initiated to support the PVNGS Unit 2 power uprate / steam generator replacement project, in preparation for determining actual control room envelope (CRE) unfiltered inleakage. This assessment also provided industry information to the Nuclear Energy Institute (NEI) in the development of a CRH assessment document.

The scope of the assessment included performing a review of the CR architecture, the CR heating, ventilating, and air conditioning (HVAC) design, applicable licensee commitments, design bases documentation, operation, maintenance, and testing procedures. The attributes of this assessment are consistent with the guidance of NEI 99-03, Appendix C.

As a result of the self-assessment, two potential vulnerabilities for unfiltered inleakage for the PVNGS' CREs were identified. These potential vulnerabilities and current status of each are:

Item	Issue	November 2003 Status
1	A control building normal ventilation system duct that traverses the CRE to supply air in the adjacent corridor building is a potential source for unfiltered inleakage.	Inleakage from this source was evaluated to be negligible. APS is considering the removal of this vulnerability through the site design change process.
2	Instrument and service air lines within the CRE are potential sources for unfiltered inleakage.	Ultrasonic and snoop testing identified minor leaks. Corrective actions have been completed.

Additional discussion of the control building duct and the CR ventilation system is provided in response to 1(a) below.

The results of the assessment confirmed that the CRs meet the applicable habitability requirements and that the applicable SSCs are designed, constructed, configured, operated and maintained in accordance with the PVNGS' design and licensing bases.

Tracer gas testing was performed in April 2001 (reference 2) on the Unit 2 CR for quantifying unfiltered air inleakage. The testing included the test methodology of ASTM E741, "Standard Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution" (reference 3). The results indicated zero unfiltered inleakage during operation of the Train-A and Train-B Control Room Essential Filtration Systems (CREFS). This was documented in the PVNGS Unit 2 Control Room Inleakage Test Report (reference 2).

As a result of GL 2003-01, the June 2000 CRH self-assessment (reference 1) was reviewed in July/August 2003. A physical walkdown of each unit's applicable habitability SSCs was also performed at this time. The review concluded that the CRH system remains in an acceptable condition for both design and regulatory requirements.

Additionally in August and September 2003, a differential pressure (DP) profile was performed in all three CRs to correlate with the original component test performed in April 2001 in Unit 2 (reference 2). This activity is consistent with the benchmarking described in NEI 99-03, Appendix D, where a facility design can be compared to a similar plant design that has already correlated the integrated tracer gas test with component tests. The results confirm that the design and operation of all three CRs are identical and thus are bounded by the design and licensing bases for unfiltered inleakage.

PVNGS has established administrative controls to ensure continued compliance with the CRH design and licensing bases. PVNGS System Engineering is responsible for monitoring the effectiveness of these controls and does so as part of the system performance monitoring program. A list of associated plant procedures (including surveillance tests) and maintenance tasks are included in the supplemental information on control room integrity administrative controls. (Attachment 1)

GL 2003-01 REQUEST NO. 1(a):

> **Emphasis should be placed on confirming 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.**

PVNGS RESPONSE:

PVNGS performed an analysis which determined that the maximum unfiltered inleakage must be below 61 scfm. This demonstrated compliance with 10 CFR 50, Appendix A, GDC 19, and Standard Review Plan, Section 6.4 limits. The NRC reviewed and approved the results of this analysis as part of Amendment No. 149 to Facility Operating License No. NPF-51 for PVNGS Unit 2, dated September 29, 2003.

Tracer gas testing on the Unit 2 CR in April 2001 (reference 2) confirmed that the CRH system meets the design basis requirement of having less than 51 scfm of unfiltered system inleakage. The test results indicated no measurable unfiltered inleakage for both Train-A and Train-B CRH systems. Details on the results of Unit 2's tracer gas testing are contained in Attachment 2.

During the Unit 2 tracer gas testing, a DP profile was performed on the CR interior to confirm that the CRH envelope was adequately pressurized with respect to the adjacent areas. The data confirmed that all areas within the CRH envelope were pressurized with respect to outside adjacent areas.

The June 2000 CRH self-assessment identified a non-CR system duct as being a potential vulnerability to introducing unfiltered inleakage into the CR. This duct is a part of the control building normal ventilation system and is not associated with the CR ventilation system. This control building duct traverses the CR complex to supply air to an adjacent area (Attachment 3 is a simplified diagram of this duct and the CRE). After the Unit 2 tracer gas-testing phase was complete, this duct was tested for leakage using a pressure decay test as described in ANSI N510-1989. This "component test" identified a leak rate of 2.1 scfm (out-leakage) at the tested conditions.

The June 2000 CRH self-assessment, along with testing performed in Unit 2, validated the design of the PVNGS CREs and their associated control room essential filtration system (CREFS) in that they have low susceptibility to unfiltered inleakage that would exceed design basis limits. This is due to the design of the CRH system that combines the CREFS and Control Room Emergency Air Temperature Control System (CREATCS) that eliminates specific inleakage vulnerabilities. The PVNGS ventilation design is discussed in further detail in response to Part 1(c) below.

Confirmatory DP testing, consistent with that described in NEI 99-03, Appendix D, was performed on all PVNGS CRs during August and September 2003 to correlate the baseline information previously developed in Unit 2 (reference 2) with the Unit 1 and Unit 3 CREs and CREFS. As the PVNGS CR design was previously validated as having low susceptibility to unfiltered inleakage and a correlation established between the integrated tracer gas test and component test methods, no additional tracer gas testing was performed.

This August/September 2003 testing consisted of placing each CREFS train in its respective emergency mode configuration and performing a detailed DP profile of the CRE in relation to adjacent areas. This provided confirmation that during a design basis event when the CREFS is in operation, all areas of the CRE have positive pressures with respect to adjacent areas. This was performed in conjunction with the routine surveillance test that satisfies current CREFS technical specification requirements (SR 3.7.11.4). In addition to measuring the DP of adjacent areas, as identified by the existing surveillance test procedures, the DP of the control building traverse ventilation duct (previously described) with respect to the CRE was measured.

Control Building Traverse Duct Discussion

Description

The 140' elevation of the control building contains the major portion of the CRE. As previously discussed, a control building normal (non-CR) ventilation duct traverses the CRE. This duct transfers conditioned air from the control building normal ventilation system to the 140' elevation of the adjacent corridor building. The duct does not communicate with the CRE. During a Control Room Essential Filtration Actuation Signal (CREFAS), a potential exists for the pressure in the normal ventilation duct to be at a pressure higher than the pressure in the CRE. As a result, this duct is considered a potential source for unfiltered inleakage.

A CREFAS can be initiated by an automatic actuation (no operator input required) or a manual action (initiated by the operator). When the automatic CREFAS is initiated by a Safety Injection Actuation Signal (SIAS)/Containment Spray Actuation Signal (CSAS), or Loss of Offsite Power (LOP), the required essential ventilation equipment will start and pressurize the CR with filtered air and secure the control building normal ventilation system. With the control building normal ventilation system off, the duct traversing the CR is no longer pressurized and is essentially at atmospheric pressure.

Should the CREFAS be initiated by a cross trip from a radiation monitor(s) in the fuel building, radiation monitor(s) for the containment air, CR outside air make up plenum radiation monitor(s), or manual operator action, the required essential ventilation equipment will be started and pressurize the control room with filtered air. However, the control building normal ventilation system does not automatically shut down. With the control building normal traverse duct pressurized, the potential for unfiltered inleakage exists.

In 1988, PVNGS initially identified and evaluated this control building normal traverse duct as a potential CRE inleakage pathway (reference 3). This evaluation resulted in implementing administrative controls in the operating procedures (4XAL-XRK5A) to ensure that the control building normal ventilation system is shut down within 30 minutes after a CREFAS. The required operator action ensures that the control building duct is not pressurized for any significant time duration. With operator action, the increase in dose to the CR operator, if this traverse duct were to leak, was determined to be negligible.

Design / Construction

Calculation 13-MC-HJ-263, *Control Room Pressure Boundary Allowable Open Area,* is a design basis calculation to support authorization of temporary openings in the Control Room Pressure Boundary based on maintaining a minimum positive differential pressure of 0.125 in. w.g. in the control room. The design and construction of the traverse duct is of sound industrial design. The duct has been designed and installed as quality class (Q-class) "Q1P" which defines adherence to seismic category 1 requirements. The design leakage is less than 1% of the design flow at 125% of the design pressure.

The duct is 12" in diameter, constructed of 18-gauge steel (ASTM A527) and coated with 1-1/4 ounces of zinc per square foot. All seams are welded. The duct spool pieces are joined by flanged bolted connections. Each joint has ten ¼" diameter bolts and uses a full face ¼" thick gasket (prior to compression) per specification ASTM D1056.

The duct was installed during initial plant construction to the requirements of specification 13-MM-598, "HVAC Equipment & Installation for APS PVNGS 1, 2, and 3." The PVNGS specification requires that all duct work conform to the Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) Standard, "Duct Manual and Sheet Metal Construction for Vent and A/C Systems, Section I – Low Velocity System and Section II – High Velocity Systems."

The Q-class Q1P duct is securely supported so as to withstand a design basis earthquake and maintain its pressure boundary integrity. The construction specification required the duct to be tested after installation by the pressure decay method as described in ANSI N-510, section 6.4, under a positive pressure of 125% of the system operating pressure of 0.8 inches H2O, and verified to exhibit a leakage of no more than 1% of the flow rate. The design flow rate is 850 scfm. The maximum design of 8.5 scfm of unfiltered air is within the allowable total of 61 scfm. Administrative controls are provided in procedures to secure control building normal ventilation within 30 minutes, which causes this contribution to dose to be negligible.

The June 2000 CRH self-assessment (reference 1) reviewed the initial evaluation of the control building normal ventilation duct vulnerability and administrative actions taken. The assessment recommended testing the CRE for unfiltered inleakage using tracer gas methodology. The assessment also recommended testing of the control building normal traverse duct for leakage. Both tests have been completed in Unit 2. The tracer gas test identified no unfiltered inleakage (within the accuracy of the test). The component testing of the normal duct identified a leak rate of 2.1 scfm (out-leakage) at the tested conditions. However, if all of this leakage is attributed to unfiltered inleakage, it is still well within the limiting design condition for the CRE of 61 scfm unfiltered inleakage.

CRH Test / Observations

During recent habitability reviews of the CR, additional analysis was performed on the subject control building ducts. First, the DP between each duct and its respective CRE was measured concurrent with the normal ventilation system in service and each train of CR essential ventilation in operation. Of the six measurements performed, two measurements, the Unit 1-Train A and Unit 2-Train A, indicated that a portion of the control building normal ventilation traverse duct was at a slightly greater pressure than the pressurized CR. Therefore, further study between the ducts' pressure relationship with the CRE was conducted.

Previously stated was that a quantitative leak test was performed on the Unit 2 control building normal duct at the time of the Unit 2 tracer gas testing. The result was found acceptable, with negligible leakage. In preparation for performing this test, blank-off plates were installed at the first available duct flange outside the CRE. The benefit in implementing the blank-off in this manner is that it does not breach the CRE boundary. However, it was very labor-intensive to achieve this test set-up because one set of duct flanges was accessible only through a vertical HVAC chase from a much lower building elevation.

Due to the difficulty of performing the above quantitative leak test in this manner, the duct leakage for Units 1 and 3 was not directly measured, but were qualitatively assessed by inspection. The inspection was performed to ensure that all duct sections are securely mounted, the flange connection bolts are tight, and the flange gaskets are sufficiently compressed with no detectable leakage. The inspection involved visually assessing each flange's attributes, as noted above, and bubble testing each suspect flange with "snoop", a liquid leak detector that aids in identifying air leaks. The inspections were performed while in each systems' normal mode of operation. This is the configuration that yields the most conservative results.

The inspection of the subject flanges found only one discrepancy. The inspection in Unit 3 identified a leaking flange joint. The leaking joint is within the CRE and upstream of fire damper 3M-HJA-M120. The leak rate could not be established. Subsequent to the identification of this leak, HVAC maintenance personnel re-inspected the flange joint prior to and concurrent with placing the CRE in the pressurized mode using "snoop". When in the essential mode, leakage was determined to be from the CRE into the subject duct. Additionally, the CR pressure was measured and observed to be greater than that of the duct, thus preventing any unfiltered inleakage. A corrective maintenance work order was initiated to address the leaking flange connection during the U3R11 outage (Fall 2004).

The above inspections were successful in identifying leaking components and is considered adequate for ensuring that the CRE boundary is kept in an optimum condition. This inspection methodology is being considered for incorporation into this system's repetitive maintenance program for routine implementation of this "component test" activity.

The recent habitability review also evaluated the current practice of using administrative control for minimizing unfiltered inleakage. It was decided that the best practice would be to isolate the normal duct traversing the CRE and therefore eliminate the possibility of unfiltered inleakage. APS is considering the removal of this vulnerability through the site design change process.

Based on the testing and evaluations performed, the PVNGS CREs have been verified that the most limiting unfiltered inleakage is no more than the value assumed in the design basis radiological analyses for CRE habitability.

GL 2003-01 REQUEST NO. 1(b):

> **Emphasis should be placed on confirming 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.**

PVNGS RESPONSE:

Chemical Control Program

Chemical control at PVNGS is governed under the Chemical Control Program as described in the Chemical Use Procedure, 91DP-0EN71. Overall responsibility for the Chemical Control Program is assigned to Regulatory Affâirs Department (Environmental Section) for the development, implementation, and maintenance of this program. Appendix F of this procedure lists chemicals with control room habitability requirements.

Calculation 13-NC-ZJ-207, "Control Room Habitability Analysis For Postulated Chemical Releases" (reference 5), evaluated the effects of postulated chemical releases and prescribes use limitations based on those evaluations. Design Engineering is responsible for calculation 13-NC-ZJ-207 and is represented on the Chemical Use Review Board (CURB) by providing an engineering technical support individual whom acts as a board member. This member evaluates the CRH requirements associated with Chemical Use Permits (CUPs). Any identified restrictions or limitations related to CRH are listed on the CUP issued for a chemical. The CURB evaluates new CUP requests, as well as changes to existing CUPs. The CURB also reviews previously approved CUPs and updates them accordingly. This ensures that only chemicals that are needed have active CUPs, and wherever cost effective, ensures that the least hazardous chemical is used.

Control Room Habitability Hazardous Chemical Assessments

The PVNGS CRs have been evaluated per Regulatory Guide 1.78, Revision 0 (reference 5). The requirements of the regulatory guide are met without the use of engineered instrumentation for the detection of hazardous chemical releases.

It has been determined that most of the chemicals within the 5-mile radius of PVNGS do not pose an acute respiratory hazard to the CR personnel (reference 6). However, several of the chemicals, due to their toxicity, quantity, or location may present an acute respiratory hazard. In such cases the CR operators could respond by taking actions such as donning self-contained breathing apparatus (SCBA) or isolating control room ventilation from outside makeup air. In cases where protective actions may be necessary, as required by Regulatory Guide 1.78, evaluations show that the CR staff have at least two minutes after nasal detection to take protective action, or that the probability of such an accident is negligible.

The PVNGS CR environment is normally supplied with conditioned air from the non-essential (normal) control room ventilation system. The normal ventilation system receives nominal particulate filtration through the use of airwashers and medium efficiency paper filters and supplies makeup air at a rate of 1200 scfm to the CR. The major chemical depots, storage tanks, and related spill accident scenarios within a 5-mile radius were evaluated using this 1200 scfm outside air makeup value.

The essential CR ventilation system is available, if needed, for design basis radiological conditions. During a Control Room Essential Filtration Actuation Signal (CREFAS) the non-essential ventilation system is stopped and the CR is pressurized using filtered makeup air. All makeup air receives HEPA and charcoal filtration. The design of the essential CR ventilation system is such that the unfiltered makeup air to the CR is minimized or eliminated. During a CREFAS the makeup air is less than 1000 scfm.

The essential CR ventilation system can also be operated in the isolation mode – Control Room Ventilation Isolation Actuation Signal (CRVIAS). When in the CRVIAS alignment, the outside makeup air is isolated and all the air in the CRE is recirculated through the essential HEPA and charcoal filtration equipment. Use of the CRVIAS mode is not required for any design basis event; however, it is available at the discretion of the CR staff.

Thus, the most limiting unfiltered airflow is from the normal CR ventilation system, which is 1200 scfm. This normal airflow is used for the evaluation of hazardous chemicals to the CR staff.

The previously described June 2000 CRH self-assessment evaluated the potential impact of hazardous chemicals on the CR and determined that the CRE licensing bases were met.

Smoke Evaluation

The following assessment is performed for smoke in the CR using the guidance of NEI 99-03, Revision 1, Appendix A. The assessment is to ensure that the CR operators maintain the ability to safely shut down the plant during a smoke event originating inside or outside the CR.

The CR design has two separate ventilation systems. These are the non-essential (normal) and essential HVAC systems. The essential system consists of two separate trains. Both the normal and essential systems are dedicated to the CRE on the 140' elevation. The control building also has non-essential and selected essential HVAC systems. The CR and control building systems are independent. The design of the separate control room and control building systems minimize the potential for smoke infiltration into the CR. Should a "smoke" condition exist outside the CRE, it is unlikely the condition would affect the CRE or CR staff. Depending on the exact source of the smoke, the CR could be placed in the CRVIAS mode and isolated from outside makeup air while having all the CR air recirculated through the essential HEPA and charcoal filtration equipment.

Should the source of smoke be from within the CRE, the CR staff could choose to use SCBA located in the CRE, or the CR could be evacuated at the discretion of the CR staff. In the event of a CR evacuation, control of the plant would be transferred to the remote shutdown rooms. The CR is located in the 140' elevation, and the remote shutdown rooms are located in the 100' elevation of the control building. The remote shutdown area is physically located outside the CRE and can be accessed from the CR using one of two alternate paths. There are two exit points from the CR, one plant east and the other plant south. There is no mechanism for a fire in the CR to impair personnel exiting the CR on the 140' elevation and occupy the remote shutdown room on the 100' elevation.

The design of the PVNGS smoke removal system has the capability to remove smoke from any of the control building elevations. The system utilizes the HVAC chases, not ducting, for fresh air intake and smoke exhaust via the smoke removal fan on the 160' elevation. The air intake design of the smoke removal system is such that it would be unlikely for the smoke exhausted from the roof elevation to migrate back to the control building intake below the roof elevation.

The CR operators have procedures for operation of the smoke removal system. In addition, the site Pre-Fire Strategies Manual provides information for smoke removal with portable equipment should the smoke removal system be unavailable due to the fire. Procedure 40AO-9ZZ19, "Control Room Fire" provides the actions for operations to perform safe shutdown of the plant.

CR minimum staffing levels are maintained in accordance with regulatory requirements. CR personnel are qualified for SCBA use on an annual basis. SCBAs and spare bottles are stored in the CRE.

Periodic training is provided for the CR operators for the CR fire scenario. The fire department is responsible for smoke removal capabilities. During periodic fire drills, the fire department will stage the portable smoke removal equipment to simulate smoke removal. Testing is performed on equipment, generators, and fans, credited for smoke removal.

The CR operators are credited with detecting / sensing smoke from outside air and for taking appropriate actions to isolate the CR to prevent additional infiltration. The CR is provided with a smoke detection system. It is not credible that a single smoke event will simultaneously result in smoke contamination of the CR and remote shutdown room. This ensures that reactor control can be maintained.

GL 2003-01 REQUEST NO. 1(c):

Emphasis should be placed on confirming that your technical specifications verify the integrity of the CRE, and the assumed inleakage rates of potentially contaminated air. If you currently have a delta-P 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 delta-P 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.

PVNGS RESPONSE:

PVNGS has an existing differential pressure (DP) technical specification surveillance requirement (SR 3.7.11.4) that adequately demonstrates the integrity of the CRE. The SR includes monitoring the DP of the CR with respect to adjacent areas. Additionally, the SR includes monitoring the make-up airflow rate that provides the pressurization capabilities (the make-up airflow rate is a key factor in being compliant with GDC 19 criteria). Together, the monitoring of these two characteristics, in keeping within their design basis parameters, demonstrates that the CRE is without excessive system unfiltered inleakage.

The basis for this position rests upon understanding the design of the PVNGS CR ventilation system, as the design eliminates vulnerabilities that induce unfiltered inleakage which occur in other CR ventilation system designs.

Attributes of the design that lend support to eliminating these vulnerabilities include, but are not limited to:

- Simple 1-floor CR complex envelope design. No separate mechanical equipment room associated with the CRE.
- Penetration and Seal program that meets 10 CFR 50 Appendix B requirements.
- Good quality ductwork (bolted flange/welded seam).
- Essential fans are located upstream of the Nuclear Air Treatment Systems (NATS), causing out-leakage. In-line vane axial fans have no fan shaft seal leakage.
- Single fan air-conditioning (A/C) recirculation-filtered pressurization system design as opposed to dual fan A/C and filtered pressurization/isolation system designs. This eliminates potential negative pressure areas in the systems that are subject to unfiltered inleakage.

Attachment 3 is a simplified diagram of the PVNGS CR HVAC design, emphasizing the layout of the Train-A, Train-B, and Normal systems. The Train-B and Normal CR HVAC systems share common CR ducting. The Train-A system stands alone and does not share ducting.

When the CREFS is activated, the CR normal air conditioning unit is isolated and the vane axial fan forces flow through the emergency filter unit providing pressurized air to the CRE. Essential cooling is provided by the cooling coil located at the end of the filter components within the same housing. Make-up air used for pressurization is introduced by drawing the outside air into the return air duct by virtue of the fan's negative pressure. Therefore, it can be ascertained that all negative pressure portions of the system (those portions upstream of the fan) that are subject to inleakage will be filtered by the CREFS unit(s) and those portions of the system that are downstream of the fan are pressurized and subject to exfiltration, eliminating inleakage as long as the pressure is greater than any adjacent areas.

The PVNGS CR essential HVAC system is of a simple, but robust design. The CRE can be maintained at a pressure greater than all adjacent areas. With the positive pressure differential, only out-leakage is possible. By design the only part of the system that is at a pressure less than atmospheric is on the suction side of the fan. The fan increases the air pressure and forces the air though the filtration system and into the CR, all at a pressure above adjacent areas. Inleakage can only occur prior to the filter. So any inleakage is treated the same as make-up air and is therefore filtered.

As discussed in the response to item No.1, APS has performed a tracer gas test in PVNGS Unit 2. The results of the Unit 2-tracer gas test, along with the CR self-assessment performed, validates the design of all three PVNGS CRs as being subject to no measurable unfiltered inleakage. This provides assurance that the existing technical specification surveillance requirement is adequate.

The original design, operational evaluations, tracer gas testing, minor modifications for future improvements, and self-assessments with peer review support the position that the existing PVNGS technical specifications ensure the CRE is adequately protected. Additional tracer gas testing will not provide any useful CR performance information. APS does not plan to amend the PVNGS technical specifications and does not plan to implement any new test methods.

GL 2003-01 REQUEST NO. 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.**

PVNGS Response:

PVNGS does not use compensatory measures to demonstrate CR habitability. PVNGS performed a self-assessment of CRH in 2000 and concluded that regulatory requirements and the design and licensing bases were being met.

GL 2003-01 REQUEST NO. 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.**

PVNGS Response:

PVNGS is required to meet, and does meet the General Design Criteria in Appendix A of 10 CFR Part 50 as described in UFSAR Section 3.1, with references to other UFSAR sections.

References:

1. Self-Assessment of Control Room Habitability at Palo Verde Nuclear Generating Station (June 20-23, 2000).

2. Palo Verde Unit 2 Control Room Inleakage Test Report (13-M721B-00655-0) dated June 22, 2001.

3. EER 88-HJ-001, Evaluation of Corridor Building Supply Duct Status with Respect to Control Room Adjacent Areas.

4. ASTM E741, Standard Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution.

5. 13-NC-ZJ-207, Revision 9, Control Room Habitability Analysis For Postulated Chemical Releases.

6. Study 13-MS-B028, Revision 0, Offsite Hazard Analysis for Redhawk, Mesquite, and Arlington Valley Power Plants. Analyzed the hazards that these new facilities presented to PVNGS.

Attachment 1

GL 2003-01 Response
Control Room Integrity Administrative Controls

14DP-0FP02, *Fire System Impairments and Notifications,* provides instructions for Fire Department (FD) personnel in documenting impairments to the Fire Protection (FP) structures, systems, components, and Fire Rated Assemblies (including pressure boundaries for the Control Room), and for making notifications of fire system impairments. This procedure provides a list of fire protection features that require compensatory actions.

14DP-0FP31, *Fire System Impairment,* is used to identify impairments of Fire Protection (FP) features (structures, systems and components) and establishes methods to maintain the level of FP required when a particular FP feature is rendered inoperable.

14FT-9FP61, *Semi-Annual Operational Test of Appendix R and Appendix A Fire Door Closures*, inspects/verifies each fire door required to satisfy the requirements of 10CFR50 Appendix R (per the PVNGS Safe Shutdown Analysis) and BTP APCSB 9.5-1 Appendix A which is equipped with a self closing device will close and latch properly.

14FT-9FP65, *Appendix R/FTS Fire Barrier Surveillance (for walls, floors/ceilings and raceways)*, describes the acceptance criteria and methods used to perform surveillance of Appendix R and Former Tech Spec barriers including walls, floors and ceilings and the method and forms to use for documenting and evaluating degraded installations.

14FT-9FP66, *Appendix A Fire Barrier Surveillance*, describes the acceptance criteria and methods used to perform surveillance of Appendix A barriers including walls, floors and ceilings and their associated penetration seals, and the method and forms to use for documenting and evaluating degraded barriers.

14FT-9FP70, *Appendix R & Former Tech Spec Penetration Seal Surveillance*, describes the acceptance criteria and methods used to perform Surveillance of Appendix R and Former Tech Spec penetration seals, and the method and forms to use for documenting and evaluating degraded seals.

18FT-9FP21, *Fire Door (Appendix R)/HELB Door Functional Test -Control Building, Diesel Generator Building, and MSSS Building*, performs a functional test of the fire/HELB doors required to satisfy Section III.G separation requirements of 10CFR50 Appendix R (per the PVNGS Safe Shutdown Analysis) and the requirements of 10CFR50.49, "Environmental Quality Control of Electronic Equipment, Impairment to Safety for Nuclear Power Plants", as well as those doors formerly included in the Technical Specifications for fire protection.

18FT-9FP31, *Functional Test of Appendix A Fire Doors –Control Building 74', 100', 120', 140' AND 160'*, verifies the ability of each QAG fire door required by BTP 9.5-1 Appendix A to perform its function as a fire barrier component and is performed by visual inspection and functional testing of critical components.

30DP-9MP01, *Conduct of Maintenance*, is to provide instructions for conducting maintenance in a manner that promotes safety, quality, effective work practices and accountability. This procedure makes reference to 70DP-0EE11, *Control of Welding, Painting and the Use of Solvents*, when the scope of work includes welding, painting or solvent use in areas served by HVAC exhaust air filtration units.

30DP-9WP02, *Work Document Development and Control,* provides standardized direction and guidelines to individuals for the initiation, evaluation, development, processing and control of required work implementation documents. This procedure requires additional review of any Fire Protection structures, systems, or components (i.e., barriers, penetration seals, doors, etc.) for potential FSCCRs in accordance with procedure 14DP-0FP31.

31MT-9ZZ12, *Replacement/Rework of Penetrations and Internal Conduit Seals,* provide instructions for the installation of new seals and to establish procedural controls for the field repair of installed seals to assure compliance with applicable codes, specifications, industry standards and Engineering approved design documents.

33FT-9FP01, *Appendix R and Former Technical Specification Fire Damper Surveillance*, performs a 10% drop test surveillance of the fire dampers required to satisfy the requirements of 10CFR50 Appendix R, as well as the dampers in any of the former Technical Specification fire barriers which did not become Appendix R barriers. The samples are drawn such that all dampers are drop tested within a 15-year period.

33FT-9FP03, *Halon Fire Suppression System Damper Functional Test*, provides verification that ventilation dampers close in the Computer Room, Communications Room and Inverter Room upon activation of the Halon Fire

Suppression System and that the electro thermal link (ETL) firing circuits for the Remote Shutdown Rooms are operable by firing sacrificial ETL's through the associated control panels.

33FT-9FP04, *Appendix A Fire Damper Surveillance Test*, inspects and drop tests 10% of all Appendix A fire dampers once per 18 months to ensure that all dampers will be drop tested within a 15 year period.

33ST-9HJ01, *Control Room AFU Airflow Capacity and Pressurization Test*, verifies the capability of the Control Room Essential Filtration System (CREFS) to perform its function of maintaining pressurization of the Control Room envelope and the assumed inleakage rates of potentially contaminated air.

33ST-9HJ02, *Surveillance Testing of the Control Room Nuclear Air Treatment System*, demonstrates that the required airflow capacity can be achieved when the Control Room Essential Air Filtration Unit (AFU) is in operation, and that the HEPA filter banks and adsorber stage has no filter bypass leakage. Total AFU differential pressure is also verified to be acceptable.

33ST-9HJ03, *Carbon Analysis for the Control Room Essential Nuclear Air Treatment System*, verifies that the activated carbon adsorbent installed in the Control Room Essential Air Filtration Units, meets the iodine removal efficiency criteria derived from the protocol of ASTM D3803-1989 at a temperature of 30 deg. C and 70% relative humidity and an acceptance criteria of ≤ 2.5 % penetration.

38DP-9FP01, *Pressure Boundary Seal Control Tracking*, provides instruction for maintenance personnel in documenting, controlling and tracking impairments to the pressure boundary seals and barriers, for the Control Room, Control Building, and Auxiliary Building. The total allowable square inches that can be open at any given time is 25 square inches. Additional open area requires HVAC Maintenance Engineering review.

40DP-9ZZ17, *Control of Doors, Hatches and Floor Plugs*, provides the controls necessary to ensure doors, hatches and floor plugs that provide specific protective functions for Security, Fire, Ventilation, High Energy Line Breaks, Flooding, Missiles or other miscellaneous hazards are maintained in their normal configuration or have appropriate compensatory measures in place.

40OP-9HJ01, *Control Building HVAC (HJ),* provides startup, operation, and shutdown procedures for the Normal and Emergency Control Room Ventilation system, and the Normal Control Building ventilation.

40ST-9HJ01, *Control Room Essential Filtration System Operability Test,* verifies flow through the HEPA filters and charcoal adsorbers of the Control Room Essential Filtration Units and is accomplished by starting the associated unit and allowing the unit to run for a minimum of 15 minutes.

4XAL-XRK5A, *Panel B05A Alarm Responses*, provides guidance for the proper responses required to the annunciators on panel B05A located in the Main Control Room. The annunciators on this panel are associated with the Plant Protection System and BOP ESFAS System. In the event of a Control Room Essential Filtration Actuation Signal (CREFAS) alarm condition, this procedure recognizes that the branch duct of the Control Building Normal Ventilation System which passes through the Control Room envelope remains pressurized and provides operator action to stop the Control Building Normal Ventilation System within 30 minutes of the CREFAS signal.

70DP-0EE11, *Control of Welding, Painting and the Use of Solvents*, controls welding, painting, and solvent use in areas where their use may affect the function of the nuclear air treatment systems. This procedure provides administrative controls restricting the amount used and times where their application or use is prohibited.

73DP-0FP01, *Fire Protection Test Program Requirement*, identifies Fire Protection Test Program requirements, provides a cross reference between the Fire Protection Test Program requirements and implementing procedures, and delineates responsibilities for the development, maintenance, and performance of the respective procedures.

81DP-0CC05, *Design and Technical Document Control,* describe the requirements, methods, and responsibilities for the control of design input, output, and process documents among PVNGS design organizations and other external design organizations.

81DP-0DC17, *Temporary Modification Control*, provides requirements to ensure Temporary Modifications (TMODs) to plant systems, structures, or equipment conform with system design intent and operability requirements, and comply with

UFSAR Sect. 17.2. 1.1.2. This includes completion of a Design Input Requirements Checklist per procedure 81DP-0CC05.

81DP-0CC26, *Impact Process*, provides guidance for the identification/notification of impacted departments of changes to design output documents and calculations that require changes to plant configuration documents and ensures they are updated in accordance with planned schedules to meet the requirements of ANSI N45.2.11 and ANSI N18.7.

81DP-0EE02, *Design Change Request and Approval*, provides requirements and direction on how to initiate and obtain approval for a design modification to PVNGS' system, structure and components. System Engineers, along with System Teams are required to review all Design Change Requests for their assigned Systems.

81DP-0EE10, *Plant Modifications*, provides requirements, guidance and exceptions for the Plant Modification process, and establishes the method for accomplishing design changes.

81DP-0DC13, *Deficiency (DF) Work Order*, provides guidelines for the completion of Engineering Work Orders which resolve Degraded or Non-Conforming Conditions using Engineering (ENG) Work Orders classified as Deficiency Work Orders (DFWOs). This applies to processing software deficiency corrections and debugging.

81TD-0EE10, *Plant Design and Modification*, supports procedure 81DP-0EE10 in providing the management expectations and administrative requirements necessary for the preparation of a plant design change. This includes, but is not limited to, the topical areas contained in the Design Input Requirements Checklist such as RG 1.78 considerations for new chemicals (Question No.11), passive fire protection features (i.e., penetration seals)(Question No.23), and habitability requirements per GDC 19 (Question No.34).

91DP-0EN71, *Chemical Use Procedure*, describes the Chemical Control Program requirements and provides instructions on how to approve, label, use, store, and dispose of chemicals at PVNGS. This procedure identifies engineering as a Control Room Habitability Specialist to act as a member of the Chemical Use Review Board and reviews CUP requests to evaluate chemicals used onsite for compliance with RG 1.78. Appendix F lists chemicals with control room habitability requirements.

PM Tasks
Control Room Bubbletight Isolation Dampers

The following list represents specific control room bubbletight dampers whose blade seals and shaft packing are replaced on a 3 or 6 cycle basis.

Damper EQID	Unit 1 PM Task	Unit 2 PM Task	Unit 3PM Task
MHJA(B)M01	070269	070270	070271
MHJA(B)M02	071513	071515	071517
MHJA(B)M03	071514	071516	071518
MHJAM15/BM23	071126	071125	071124
MHJAM16/BM24	071107	071109	071110
MHJAM52/BM55	070426	070427	070428
MHJAM56	071134	071135	071136
MHJAM57/BM57	071060	071061	071062
MHJAM58/BM10	071137	071138	071139
MHJAM59/BM13	071141	071142	071143
MHJBM56	071503	071499	071506

Attachment 2

PVNGS Unit 2 Tracer Gas Test Results

The following is a summary of the Unit 2 tracer gas test results:

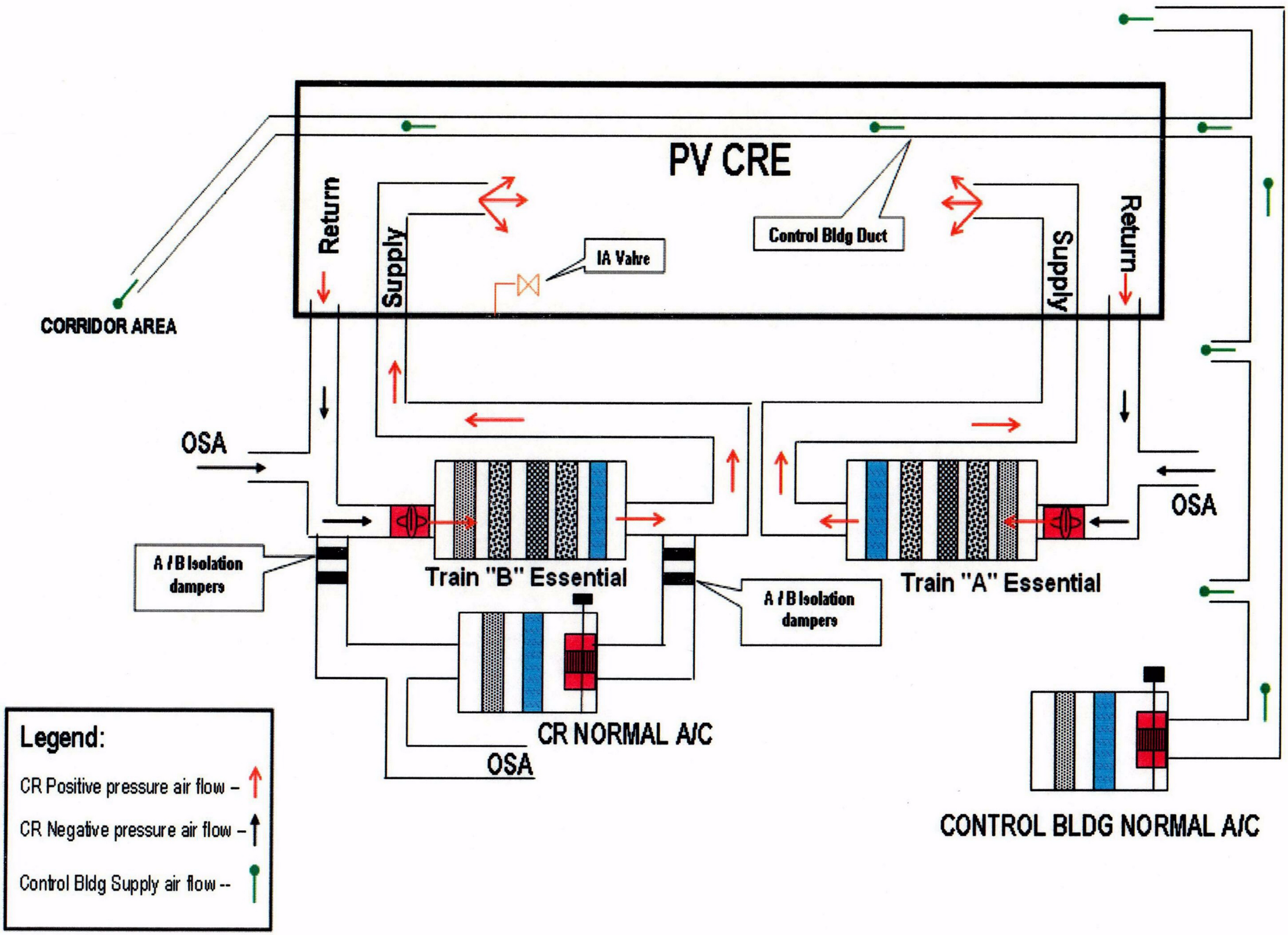
Train "B" Outside Air Flow[1]	**610 ± 22 scfm**
Train "B" Recirculation Flow	**25,500 ± 1400 scfm**
Train "B" Isolation Flow	**28,800 ± 1400 scfm**
Train "A" Outside Air[1]	**610 ± 51 scfm**
Train "B", Total Inleakage from Constant Injection	**610 ± 21 scfm**
Train "B" Concentration Decay Test	**Inleakage flow = 610 ± 30 scfm**
Train "B" CRE Inleakage, (Constant Injection – Outside Air Flow)	**0 scfm[2]**
Train "A" Total Inleakage from Constant Injection	**610 ± 10 scfm**
Train "A" CRE Inleakage, (Constant Injection – Outside Airflow)	**0 scfm[2]**
CRE Volume Estimate from "PUFF" Test, TRAIN "A"	**190,000 ± 19,000 cubic feet (CF)**

(1) Trains wer tested separately
(2) Tracer gas testing for the above results was preformed pursuant to the guidance of ASTM E-741, NEI 99-03, March 2003, and Regulatory Guide 1.197, May 2003.

Source of data:
Palo Verde Unit 2 Control Room Inleakage Test Report (13-M721B-00655-0) dated June 22, 2001

Attachment 3

PVNGS Simplified Control Room Envelope (CRE) Diagram



PVNGS Simplified Control Room Envelope (CRE) Diagram

C01