

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

March 3, 1998

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Serial No. 98-100
NL&OS/DAS R2
Docket Nos. 50-280/281
50-338/339
License Nos. DPR-32/37
NPF-4/7

Dear Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
NORTH ANNA POWER STATION UNITS 1 AND 2
10 CFR 20 EXEMPTION REQUEST

On March 27, 1997 pursuant to 10 CFR 20.1703(a)(2), Virginia Electric and Power Company requested specific authorization to use respiratory protection equipment which has not been tested and certified by NIOSH/MSHA to provide the proposed degree of protection under anticipated conditions of use. Since it is our intent to use the same respiratory protection equipment as emergency devices, an exemption is required from the requirements of 10 CFR 20.1703 paragraphs (a)(1) and (c) and 10 CFR 20 Appendix A, Protection Factors for Respirators. These regulations require that respiratory protection equipment used in normal and emergency conditions be certified by NIOSH/MSHA. Therefore, in addition to a specific authorization for use, an exemption from the requirements of 10 CFR 20.1703 paragraphs (a)(1) and (c) and 10 CFR 20, Appendix A, Protection Factors for Respirators, Footnote d, is necessary to permit use of the respiratory protection equipment for normal and emergency use.

Surry and North Anna Power Stations have subatmospheric containments. Personnel entries require Self-Contained Breathing Apparatus (SCBA) charged with 35% oxygen / 65% nitrogen breathing gas mixture to compensate for the reduced oxygen partial pressure. Mine Safety Appliances Company (MSA) Models 401, Ultralite and Custom 4500 Dual Purpose Pressure Demand SCBAs are NIOSH/MSHA certified for use with compressed air. However, these SCBA were not formally tested by NIOSH/MSHA for enriched oxygen application. Virginia Electric and Power Company contracted with the National Aeronautics and Space Administration (NASA) and Lawrence Livermore National Laboratory (LLNL) to have these NIOSH/MSHA approved SCBAs tested to confirm the compatibility of their materials and design with enriched oxygen application and thereby demonstrate the equipment is capable of providing the proposed degree of protection under the anticipated conditions of use. The test results were acceptable. Therefore, pursuant to 10 CFR 20.2301, Virginia Electric and Power requests specific exemption from 10 CFR 20.1703 paragraphs (a)(1) and (c) and 10 CFR 20, Appendix A, Protection Factors for Respirators, Footnote d, to use MSA Models 401 (constructed of

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either brass or aluminum components), Ultralite and Custom 4500 Dual-Purpose Pressure-Demand SCBA supplied with a 35% oxygen/65% nitrogen breathing gas mixture and make allowance for the protection factors as specified for Pressure-Demand SCBA in 10 CFR 20, Appendix A (i.e., 10,000 or greater) during normal and emergency use.

10 CFR 50, Appendix R, Section III, Paragraph H, also requires full-face respiratory equipment used for emergencies to be certified by NIOSH/MSHA. However, pursuant to 10 CFR 50.46, Surry and North Anna Power Stations are not required to meet this specific regulation based on the dates of the operating licenses.

The attachment to this letter provides the basis for this exemption request and a summary of the test protocol and results. Copies of the final test reports were included as Attachments 2 and 3 to the March 27, 1997 letter.

Should you have any questions regarding the exemption request, please do not hesitate to contact us.

Very truly yours,



James P. O'Hanlon
Senior Vice President - Nuclear

Attachment
Basis for exemption request

Commitments made by this letter:

None

cc: U. S. Nuclear Regulatory Commission
Region II
Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
Atlanta, Georgia 30303

Mr. R. A. Musser
NRC Senior Resident Inspector
Surry Power Station

Mr. M. J. Morgan
NRC Senior Resident Inspector
North Anna Power Station

Attachment

**10 CFR 20.1703 (a)(1) and (c)
and 10 CFR 20 Appendix A, Protection Factors for Respirators
Exemption Request**

**Virginia Electric and Power Company
Surry and North Anna Power Stations**

10 CFR 20 Exemption Request Self-Contained Breathing Apparatus (SCBA)

Purpose:

10 CFR 20.1703(a)(1) specifies that respiratory protection equipment be tested and certified or have certification extended by the National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA) to make allowance for protection factors. 10 CFR 20.1703(a)(2) permits a licensee to request specific authorization from the Commission for equipment which has not been tested and certified by NIOSH/MSHA. A prerequisite for such an authorization is demonstration by testing or reliable test information that the material and performance characteristics of the equipment are capable of providing the proposed degree of protection under anticipated conditions of use. Specific authorization has been requested in our letter dated March 27, 1997 (Serial No. 97-092).

10 CFR 20.1703 paragraphs (a)(1) and (c) and 10 CFR 20 Appendix A, Protection Factors for Respirators, Footnote d, require that respiratory protection be certified by NIOSH/MSHA for normal and emergency use. This document provides the basis of our request for exemption from the above regulations. This exemption would permit the use of Mine Safety Appliances Company (MSA) Models 401 (constructed of either brass or aluminum components), Ultralite and Custom 4500 Dual-Purpose Self-Contained Breathing Apparatus (SCBA) supplied with a 35% oxygen / 65% nitrogen breathing gas mixture emergency devices after receiving specific authorization from the NRC.

Background:

The containments at both North Anna and Surry Power Stations are designed to be maintained at subatmospheric pressure during power operations. Actual containment environment varies depending on unit load and time of year, however, pressure ranges between 9.0 and 11.0 pounds per square inch absolute (psia). Additionally, localized air temperatures may exceed 120° Fahrenheit and relative humidity can be 90%.

It is necessary for station personnel to periodically enter containment while the units are operating in order to perform inspections or maintenance. The impact of the above mentioned containment environment on personnel safety was assessed in the mid 1970s due to minor physiological symptoms observed in some personnel working in containment (e.g., dizziness, cramps, shortness of breath). Heat stress management techniques (e.g., stay times, fluids, cooling garments), already developed for general industry, were adapted to mitigate these symptoms and are still in use today. The other containment stress, oxygen deficiency due to reduced pressure, requires a unique solution (i.e., use of SCBA with enriched oxygen breathing gas).

Oxygen Deficiency:

Oxygen deficiency can be caused by a reduction of the percent by volume of oxygen or by reduction of atmospheric pressure. The effect of oxygen deficiency on the body is the same in either case. It is the quantity or partial pressure of oxygen available that is important, not the percent by volume or atmospheric pressure. Specifically, the percentage of oxygen in the air, normally 20.9%, does not change with decreasing absolute pressure (or increasing altitude); however, the oxygen partial pressure does decrease because the total pressure decreases.

People are able to live and work at oxygen partial pressures similar to those found in our containments with little or no physiological problems. This is due to acclimatization. Changes in the body's respiratory, cardiovascular, and hematopoietic systems compensate for reduced oxygen partial pressure. Unfortunately, acclimatization requires too much time to be of any practical use in our situation of limited and infrequent entries into containment.

Solution:

Methods to compensate for the physiological effects of reduced pressure were explored and it was determined that oxygen enriched breathing gas was necessary. Using the guidance contained in ANSI Z88.2-1980, Practices for Respiratory Protection, an oxygen enrichment of 35% (with the balance comprised of nitrogen) was established as proper. ANSI Z88.2-1992 bases its reduced atmospheric pressure conditions guidance on different methodology than that used in the 1980 version. However, a 35% oxygen enrichment is still valid.

Per ANSI Z88.2-1980, Practices for Respiratory Protection, there are two possible respirators acceptable for use in our subatmospheric containments. They include: positive pressure, closed-circuit SCBA and positive pressure, open-circuit SCBA.

Closed-circuit SCBA was evaluated during the mid-1970s. Their disadvantages (contaminant recirculation, increased complexity, 100% oxygen hazard, and heat stress component due to exothermic reaction associated with carbon dioxide scrubbing) outweighed their advantages (lightweight, longer service life).

Open-circuit SCBA supply air which does not add to the user's heat stress load is "user friendly," is highly reliable, and does not produce high oxygen concentration levels, which could make the device a fire hazard. Additionally, for our specific application, use of the same respiratory equipment type inside and outside of containment simplifies employee training and equipment maintenance.

To provide protection for personnel entering containment under subatmospheric conditions, Virginia Electric and Power Company initially purchased MSA Model 401 open-circuit, dual-purpose pressure-demand SCBA constructed of brass components. Procedures were established to utilize these devices with a 35% oxygen / 65% nitrogen breathing gas mixture. This respirator has been in use at North Anna and Surry Power

Stations since 1976 with no incidence of oxygen induced failure or other adverse performance indicators noted.

SCBA Maintenance:

The MSA Model 401 SCBA purchased by Virginia Electric and Power Company is supplied for use with compressed air. Following the recommendations of the Compressed Gas Association's Pamphlet C-10, Recommended Procedures for Changes of Gas Service for Compressed Gas Cylinders, Model 401 cylinders designated for use with 35% oxygen / 65% nitrogen have been qualified for Class 1 Oxidizing Gas Service.

SCBA are maintained by station personnel certified by MSA under their Air Mask Service Center Certification Program and in accordance with MSA's preventive maintenance and repair procedures.

Equipment is designated for containment use with the 35% oxygen / 65% nitrogen mixture and is segregated and controlled to ensure no inadvertent exchange with compressed air units.

Breathing Gas Mixture:

The 35% oxygen / 65% nitrogen mixture used at the stations is purchased from an outside vendor. Strict controls are employed by the vendor during manufacture of the mixture that involves reconstitution of medical grade liquid oxygen and liquid nitrogen. The vendor is required by purchase order to certify that the oxygen used to produce the breathing gas mixture meets the specifications defined in the latest revision of The United States Pharmacopeia (USP)-The National Formulary (NF). The nitrogen used must meet the specifications defined in the National Formulary. Additionally, the oxygen and nitrogen constituents must be within two percent of the specified volume percentages.

Vendor supplied bulk 35% oxygen / 65% nitrogen mixtures are transferred to dedicated SCBA cylinders using cascade systems or transfer pumps dedicated to 35% oxygen / 65% nitrogen breathing gas mixtures. The cylinder charging systems are specifically designed for transferring respirable gases and are operated by trained personnel in accordance with approved station procedures.

Training:

Personnel who use SCBA equipment (35% oxygen / 65% nitrogen or compressed air) are provided specific training on their proper operation. SCBA user training is a separate course of instruction administered to potential users following basic Respiratory Protection Training. This instruction includes review of appropriate actions in the event of an emergency or an equipment malfunction. (Station procedures also address subatmospheric containment work including emergency actions.) Appropriate

testing is employed, including practical demonstrations, to ensure training effectiveness. Periodic retraining is required to maintain SCBA user qualification.

Equipment Testing for Enriched Oxygen Application:

Although the MSA SCBA referenced have received NIOSH/MSHA certification, they have not specifically been tested for 35% enriched oxygen applications. Specific authorization per 10 CFR 20.1703(a)(2) requires a demonstration by testing or reliable test information that the material and performance characteristics of the equipment are capable of providing the proposed degree of protection under anticipated conditions of use. These devices have been NIOSH/MSHA tested for compressed air application. To specifically address material compatibility in enriched oxygen applications and thereby demonstrate equipment capability under anticipated conditions of use, Virginia Electric and Power Company contracted with both NASA's White Sands Test Facility (WSTF) and Lawrence Livermore National Laboratory (LLNL) to conduct applicable oxygen compatibility testing.

WSTF evaluated the compatibility of the MSA Custom 4500 SCBA with an oxygen enriched breathing gas mixture. (Testing of the MSA Custom 4500 envelopes the lower pressure applications of the MSA Ultralite and Model 401 SCBA). To do this, the flammability of the Custom 4500 was assessed using three types of tests:

1. Promoted ignition tests determined that the aluminum alloy 6061 used in the regulator body of the Custom 4500 would not sustain combustion in an atmosphere up to 52% oxygen at 4500 psig. (Brass used in the regulator of Virginia Electric and Power Company's Model 401 SCBA, is less reactive than aluminum alloy 6061 and hence is conservatively enveloped by this testing.)
2. Regulator combustion tests determined that the combustion of gross hydrocarbon contamination within the test article would not ignite the aluminum alloy 6061 in the regulator body. (Brass used in the regulator of Virginia Electric and Power Company's Model 401 SCBA, is less reactive than aluminum alloy 6061 and hence is conservatively enveloped by this testing.)
3. Compressive heating tests determined that compressive heating of uncontaminated units does not promote ignition of the high-pressure flex hose or the regulator assembly softgoods at the use conditions.

NASA concluded that the MSA Custom 4500 (and therefore the Ultralite and 401 Models) is compatible based on flammability hazards testing for use with a breathing gas mixture of 35% oxygen / 65% nitrogen provided the following stipulations are met:

1. All hydrocarbon contamination is removed. (MSA repair guidance stipulates that no hydrocarbon-based compounds are to be used within the pressure boundary during maintenance.)

2. The SCBAs are maintained so as to preclude the introduction of hydrocarbon contamination. (Virginia Electric and Power Company SCBAs are required to be stored and repaired in clean, dry locations free of chemical contamination.)
3. The temperature of the system does not exceed 135° Fahrenheit when the regulator is first activated. (Containment average air temperature is required by Technical Specifications to be less than or equal to 125° Fahrenheit at Surry and 120° Fahrenheit at North Anna.)

NASA cautioned that their test data did not prove that the MSA SCBA tested was safe to use with an oxygen enriched breathing gas under all circumstances. They recommended that tests be conducted to determine the effects of the user exhaling the oxygen-enriched mixture into a "fire-charged" environment. Subsequent discussions with NASA and MSA personnel resulted in Virginia Electric and Power Company contracting with Lawrence Livermore National Laboratory (LLNL) to evaluate our equipment under the National Fire Protection Association's (NFPA) SCBA Flame and Heat Test.

The LLNL SCBA Flame and Heat Test evaluates a SCBA's performance in a typical fire fighting thermal and flashover environment while being operated at moderate to high breathing rates. The facepiece design used with the Custom 4500, Ultralite and 401 Model SCBA is interchangeable. Therefore, testing of a common facepiece design addressed all three SCBA models. LLNL concluded that a MSA Custom 4500, equipped with the interchangeable silicone facepiece, meets the NFPA Flame and Heat Test requirements whether operated with 35% oxygen / 65% nitrogen breathing gas mixture or with compressed air. (Virginia Electric and Power Company procedural guidance presently requires that SCBA using the 35% oxygen / 65% nitrogen breathing gas mixture be equipped with silicone facepieces.)

Use History:

In addition to the formal testing outlined above, Virginia Electric and Power Company has accumulated over twenty years of actual safe operating experience using SCBAs with 35% oxygen / 65% nitrogen. Over this time period, no incidents of oxygen induced failure or equipment maintenance problems associated with enriched oxygen operation have been recorded. We believe that this safe operational experience provides additional "reliable test information" as to the acceptability of the use of enriched oxygen with MSA SCBA.

10 CFR 20.2301 Requirements

10 CFR 20.2301 states that the Commission may grant an exemption from requirements contained in 10 CFR 20 provided that: 1) the exemption is authorized by law, 2) the exemption will not result in an undue hazard to life or property.

1. The requested exemption is authorized by law.

No law exists which would preclude the activities covered by this exemption request. 10 CFR 20.1703(a)(2) permits a licensee to request specific authorization from the Commission for equipment which has not been tested and certified by NIOSH/MSHA. A prerequisite for such an authorization is demonstration by testing or reliable test information that the material and performance characteristics of the equipment are capable of providing the proposed degree of protection under anticipated conditions of use. The equipment is certified for compressed air applications, but has not been certified for enriched oxygen applications. Virginia Electric and Power Company has demonstrated by testing that the radiological protection equipment is capable of providing the proposed degree of protection under anticipated conditions of use. This testing and the results are documented in test reports previously submitted to the NRC on March 27, 1997 (Serial No. 97-092). The combination of formal testing conducted for Virginia Electric and Power Company by NASA and LLNL, our extensive safe use history and the existing NIOSH/MSHA certification for the SCBAs meets this regulatory requirement.

2. The requested exemption does not present an undue hazard to life or property.

The demonstration testing results submitted to the NRC on March 27, 1997 (Serial No. 97-092) documents that the MSA Models 401 (constructed of either brass or aluminum components), Ultralite, and Custom 4500 Dual-Purpose Pressure-Demand SCBA supplied with 35% oxygen / 65% nitrogen breathing gas mixture meets the requirements of a fully certified Self Contained Breathing Apparatus during normal and emergency use. Therefore, this exemption will not present an undue risk to the public health and safety nor the plant personnel performing routine duties or responding to emergency situations.

Environmental Impact Assessment

Virginia Electric and Power Company believes that the combination of formal testing conducted for Virginia Electric and Power Company by NASA and LLNL, our extensive safe use history and the existing NIOSH/MSHA certification for the SCBAs meets this regulatory requirement. Therefore, in accordance with 10 CFR 20.1703(a)(2), we previously requested specific authorization to use MSA Models 401 (constructed of either brass or aluminum components), Ultralite, and Custom 4500 Dual-Purpose Pressure-Demand SCBA supplied with 35% oxygen / 65% nitrogen breathing gas mixture and to make allowance for protection factors as specified for pressure-demand SCBAs in 10 CFR 20, Appendix A during normal and emergency use.

In order to permit the NRC to grant a specific authorization to use the MSA SCBAs with 35% oxygen / 65% nitrogen breathing gas for normal and emergency use, an exemption is necessary from 10 CFR 20.1703 paragraphs (a)(1) and (c) and 10 CFR 20 Appendix A, Protection Factors for Respirators, Footnote d.

Virginia Electric and Power Company has evaluated the environmental impact of the proposed exemption and determined that the exemption does not adversely impact the environment as discussed below.

The proposed exemption does not alter plant operations or any method of operations that impact effluents. In addition, the licensed plant power level is not being changed. Therefore, the exemption does not involve a change in the types or an increase in the amounts of radiological or non-radiological effluents that may be released off site.

The proposed exemption does not create any different radiological or non-radiological effluents or change the quantity of radiological or non-radiological effluents released from the plant. The proposed exemption involves activities located entirely within the restricted area as defined in 10 CFR Part 20.

Although the SCBA has not been certified by NIOSH for enriched oxygen applications, adequate testing has been performed to demonstrate that the equipment is capable of providing the proposed degree of protection under the anticipated conditions of use. Therefore, there is no increase in the individual or cumulative occupational radiation exposure as a result of these exemptions.

Thus, the 10 CFR 20 exemption to permit use of non-NIOSH certified SCBA, will not result in any radiological or non-radiological impacts. In addition, the amount of radioactive waste is not affected by this change.