

October 24, 2005

Mr. Karl W. Singer  
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SUBJECT: BROWNS FERRY NUCLEAR PLANT UNITS 1, 2, AND 3, SEQUOYAH  
NUCLEAR PLANT UNITS 1 AND 2, AND WATTS BAR NUCLEAR PLANT  
UNIT 1 - AUTHORIZATION FOR USE OF DELTA PROTECTION MURUROA  
SINGLE USE SUPPLIED AIR SUITS, MODEL V4 MTH2, WITH AN ASSIGNED  
PROTECTION FACTOR OF 2000 (TAC NOS. MC6995, MC6996, MC6997,  
MC6998, MC6999, AND MC7000)

Dear Mr. Singer:

By letter dated May 13, 2005, as supplemented by letter dated August 15, 2005, Tennessee Valley Authority submitted a request, under 10 CFR Part 20, for authorization to use the "Delta Protection Mururoa Single Use Supplied Air Suits," Model V4 MTH2 with an assigned protection factor of 2000 at the Browns Ferry, Sequoyah, and Watts Bar Nuclear Power Plants. These suits provide respiratory protection for persons working in areas of airborne radioactivity.

The NRC staff has reviewed the subject request and finds it acceptable subject to the controls and program elements noted in the enclosed NRC staff's related Safety Evaluation.

Sincerely,

**/RA/**

Douglas V. Pickett, Senior Project Manager, Section 2  
Project Directorate II  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket Nos. 50-259, 50-260, 50-296,  
50-327, 50-328, and 50-390

Enclosure: Safety Evaluation

cc w/enclosure: See next page

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**BROWNS FERRY NUCLEAR PLANT  
SEQUOYAH NUCLEAR PLANT  
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

USE OF FRENCH DESIGNED RESPIRATORY PROTECTION EQUIPMENT

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2 AND 3

SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2

WATTS BAR NUCLEAR PLANT, UNIT 1

TENNESSEE VALLEY AUTHORITY

DOCKET NOS. 50-259, 50-260, 50-296, 50-327, 50-328 AND 50-390

1.0 INTRODUCTION

By letter dated May 13, 2005, as supplemented by letter dated August 15, 2005, Tennessee Valley Authority (TVA, the licensee) submitted a request for authorization to use the "Delta Protection Mururoa Single Use Supplied Air Suits," Model V4 MTH2 at the Browns Ferry, Sequoyah, and Watts Bar Nuclear Power Plants. Title 10 of the *Code of Federal Regulations* (10 CFR) Section 20.1703(b) requires prior authorization from the U.S. Nuclear Regulatory Commission (NRC) for the use of equipment that has not been tested or certified by the National Institute for Occupational Safety and Health (NIOSH). Model V4 MTH2 has not been tested or certified by NIOSH. Therefore, the licensee has requested that the NRC authorize the use of these suits for respiratory protection for persons working in areas of airborne radioactivity.

In addition, 10 CFR Section 20.1705 requires prior authorization from the NRC before using an assigned protection factor (APF) in excess of those specified in 10 CFR Part 20, Appendix A, "Assigned Protection Factors for Respirators." The licensee's letter also requested NRC approval to use an APF of 2000 with these suits.

2.0 REGULATORY EVALUATION

Title 10 CFR Part 20, "Standards for Protection Against Radiation," Subpart H, "Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas," concerns the use of respiratory equipment for protection against airborne radioactive materials.

Title 10 CFR Section 20.1703, "Use of individual respiratory protection equipment," paragraph (a), requires that respiratory protection equipment used by a licensee to limit the intake of radioactive material be tested and certified by NIOSH. Section 20.1703(b) states that a licensee can submit an application to the NRC for authorized use of respiratory protection equipment that has not been tested and certified by NIOSH.

Title 10 CFR Part 20, Appendix A, does not provide an APF for atmosphere supplying respirator (air-line respirator) suits in a continuous-flow operating mode. Instead, it references footnote (g) that states, "No NIOSH approval schedule is currently available for atmosphere supplying suits. This equipment may be used in an acceptable respiratory protection program as long as all the other minimum program requirements, with the exception of fit testing, are met (i.e., Section 20.1703)."

Title 10 CFR Section 20.1705, "Application for use of higher assigned protection factors," states that a licensee shall obtain NRC authorization before using assigned protection factors in excess of those specified in Appendix A to 10 CFR Part 20. Thus, the licensee must obtain NRC approval to take credit for an APF for the French designed respiratory protection equipment.

Criteria and background information used for the NRC staff's technical evaluation include 10 CFR Part 20, Subpart H; 10 CFR Part 19, paragraph 19.12, "Instruction to Workers";

Regulatory Guide 8.15, Revision 1, "Acceptable Programs for Respiratory Protection"; NUREG/CR-0041, Revision 1, "Manual of Respiratory Protection Against Airborne Radioactive Materials"; 42 CFR Part 84, which addresses NIOSH testing and certification regulations; Los Alamos National Laboratory Report LA-10156-MS, "Acceptance Testing Procedures for Air-Line Supplied Air Suits"; and American National Standards Institute (ANSI) standard ANSI Z88.2-1992, "American National Standard Practices for Regulatory Protection."

### 3.0 TECHNICAL EVALUATION

NRC guidance provided in NUREG/CR-0041 encourages the use of suits, noting that in certain work environments, air-supplied suits may be the best respiratory device when considering heat stress, trying to minimize skin contamination, and trying to maintain worker doses as low as reasonably achievable (ALARA).

Testing conducted by the Institute for Nuclear Protection and Security, the European certifying agency (comparable to NIOSH), and over 20 years of successful use in European power plants of similar certified suits form the basis for the licensee's request. The licensee has requested authorization to use, and to take credit for, the protection provided by the Mururoa V4 MTH2 (Certificate No. 0073/197/162/01/96/0001) during normal (non-emergency) operations. This model has been approved as a single-use suit (a suit that is disposed of after one use), and the licensee proposes to use the suit in the approved configurations, relative to the suit's form, fit, and function.

The European Standard CEN/TC 162N738 (July 1996), "Protective Clothing Against Radioactive Contamination, Part 1: Requirements and Test Methods for Ventilated Protective Clothing Against Particulate Radioactive Contamination," provided testing and acceptance criteria used for certification of the suit. This standard is generally consistent with the pertinent acceptance criteria provided in Los Alamos National Laboratory Report LA-10156-MS, which is used to test and authorize the use of air-supplied suits at Department of Energy sites.

The certification-testing regime was broadly based and encompassed a range of various functional areas, including: suit material strength, tear and puncture resistance, material flammability, wearer comfort, noise level, wearer visibility, air flow, carbon dioxide concentrations, and degree of contaminate in-leakage during a series of varied simulated work practices and exercises. The Mururoa V4 MTH2 passed all required tests, and provided a measured average protection level (fit factor) of 50,000. A fit factor, which was developed in a simulated work environment, is the ratio of contaminate concentration outside the suit to the contaminate concentration inside the suit. Given an overall measured fit factor of 50,000 (averaged over all exercise activities), allowing an APF of 2,000 provides a conservative safety factor for estimating the actual protection provided to the user by the suit in the actual working environment. APFs are generally lower than fit factors for all types of respirators, since workplace demands are typically greater on the user of the respirator than are laboratory conditions and simulated work activities due to higher heat and humidity, longer work durations, greater worker fatigue, etc.

In general, when compared with other air-fed respirators, the Mururoa V4 MTH2 suit models provide the following advantages to the user: (1) dual zippers (metal zipper inside and plastic zipper outside); (2) a welded sleeve-to-insert communication cable; (3) a removable strip near the mouth that could be used for emergency breathing in case of loss of supplied air; (4) an



egress strip stretching from the left arm, over the head, and to the right arm that is used for undressing and for self-rescue in an emergency, such as loss of supplied air; (5) an air intake located at the waist with a built-in regulator that can adjust, but not block, air flow; (6) dual magnetic valves that provide ventilation and relief of excess pressure in case the suit is squeezed or pinched unexpectedly; (7) a very low noise level at maximum air flow; and (8) air flow to the hands, feet, face, and chest.

Safety features also include light-weight (2.5 pounds), one-piece construction with welded gloves and booties with tie straps. Helmets are made with PVC material that provides distortion-free vision and are large enough for wearing a headset. Noise levels are less than 80 decibels at maximum air flow, and air flow can be adjusted by the user for comfort, but cannot be shut off below the required minimum air flow. The Mururoa V4 MTH model also provides two additional vents near the chin for cooling to the face. It is fire resistant up to 65 °C and can be used in temperatures up to 60 °C. Reinforced construction is also provided in the elbow, knee, and crotch areas.

The licensee intends to use this suit in highly-contaminated areas, including during steam generator platform work, reactor head work, and cavity decontamination. Based on in-house inspection of suits and review of industry and manufacturer test documentation, the licensee has determined that the Mururoa V4 MTH2 offers a safer and more efficient means to protect workers in areas of high radiological contamination and in areas where there is a potential for airborne contamination. The existing practice of using a combination of rain suits and NIOSH-certified air-supplied hoods provides cooling only to the head and forces workers to wear the ensemble in a manner that makes self-rescue very difficult; thus, a rescue worker is required to be stationed nearby.

The licensee further indicates that the Mururoa V4 MTH2 provides improved cooling over the entire body, and the ease of removal features provide a means to undress that minimizes the potential for personnel contamination events and an easy-escape design. Upon loss of supplied air to the suit, a worker can easily extricate himself or herself from the suit by pulling off the mouth strip and then opening the hood, or by pulling the egress strip from the forearm to the head. Based on these safety features, the NRC staff finds that the suit design should provide for easy and effective self-rescue, thus, avoiding asphyxiation if the air supply is interrupted or lost.

Subpart H of 10 CFR Part 20 establishes the requirements for implementing a respiratory protection program. TVA indicated that their sites have developed respiratory programs in full compliance with 10 CFR Part 20. The licensee intends to integrate the use of the Mururoa suit into its existing, ongoing respiratory protection program that satisfies 10 CFR Part 20 requirements. These programmatic requirements ensure that worker doses from airborne radioactive materials are maintained ALARA. The NRC staff finds this approach acceptable.

The following summary of controls and program elements generally follow the requirements of Subpart H of 10 CFR Part 20 regarding the use of air-supplied suits. Since the licensee has a viable, ongoing respiratory protection program, only items pertinent and specific to the use of suits are discussed below.

1. Section 20.1703(c) requires, in part, written procedures governing the training of respirator users (workers). The licensee has committed to develop new lesson plans to train workers



on the suit's features; how to don, use, and doff the suits; and instructions on using the built-in escape strips for routine and emergency egress conditions. This training should include appropriate hands-on and classroom instruction. Specific training will be provided on actions to be taken by the user in the event of equipment malfunction. The radiation protection personnel will be trained to ensure that they are competent to issue the suits, assist in helping the user don and doff the suits, and set up and operate the unit (including the regulated air supply).

2. Communication channels will be established and maintained between the licensee, the manufacturer and the European certification authority to ensure that users are notified in a timely manner of significant problems that may affect suit safety, performance, or function. Depending on the severity of a problem or defect, the certification agency or the manufacturer may issue a product recall (e.g., a stop-use advisory or user warning issued to all registered users). The licensee will use their Corrective Action Program to document and evaluate any identified defects with the suits. TVA will report any defects (noted in these suits) in a timely manner to the United States nuclear industry through their Operating Experience process and to the manufacturer. This notification will be incorporated into the procedure process in TVA's Radiological Control Technical Procedure-111, "Selection, Issue, and Use of Respiratory Protection Devices."
3. Section 20.1703(c)(4)(vii) requires, in part, written procedures governing respirator storage and quality assurance. The licensee has committed to implement all of the provisions in the manufacturer's "Instructions for Use."
4. The Mururoa suits are single use only, and are not approved for use in atmospheres that are immediately deleterious to life and health. The licensee has stated that they will discard each suit after a single use.

The NRC staff reviewed the licensee's proposal for developing specific training programs to address proper use of the suits, the intention of the licensee to maintain cognizance of and communicate to the nuclear industry any problems or defects, integration of written procedures for Mururoa suit use, and the acknowledgment that Mururoa suits are single use only. Based on these measures being consistent with Section 20.1703 (c), the NRC staff finds the proposed controls and program elements acceptable.

#### 4.0 CONCLUSION

The staff reviewed the licensee's request against the criteria of Subpart H of 10 CFR Part 20. Title 10 Section 20.1703(b) states that a licensee can submit an application to the NRC for authorized use of respiratory protection equipment that has not been tested and certified by NIOSH. In addition, 10 CFR Section 20.1705 states that a licensee shall obtain NRC authorization before using assigned protection factors in excess of those specified in Appendix A to 10 CFR Part 20. Based on the testing data provided; and when used in accordance with the applicable manufacturer's instructions, licensee commitments, and requirements of Subpart H of 10 CFR Part 20; the NRC staff concludes that the licensee's request to use the Mururoa V4 MTH2 supplied air suit with an APF of 2000 is acceptable, subject to the licensee's proposed controls and program elements.

Principal Contributor: K. Alm-Lytz

Date: October 24, 2005