

October 2, 2006

Mr. F. G. Burford
Acting Director
Nuclear Safety and Licensing
Entergy Operations, Inc.
1340 Echelon Parkway
Jackson, MS 39213-8298

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 1, GRAND GULF NUCLEAR STATION, UNIT 1, INDIAN POINT NUCLEAR GENERATING UNIT NOS. 1, 2, AND 3, PILGRIM NUCLEAR POWER STATION, RIVER BEND STATION, UNIT 1, VERMONT YANKEE NUCLEAR POWER STATION, AND WATERFORD STEAM ELECTRIC STATION, UNIT 3 - REQUEST FOR USE OF DELTA PROTECTION MURUROA V4F1 R SUPPLIED AIR SUITS (TAC NOS. MD1746, MD1749, MD1750, MD1751, MD1752, MD1753, MD1754, MD1755, AND MD1756)

Dear Mr. Burford:

By letter dated May 16, 2006, as supplemented by letter dated July 13, 2006, pursuant to Part 20 of Title 10 of the *Code of Federal Regulations* (10 CFR Part 20), Section 1703(b), Entergy Operations, Inc., and Entergy Nuclear Operating Inc. (Entergy or the licensee), requested the U.S. Nuclear Regulatory Commission's (NRC's) authorization for use of equipment that has not been tested or certified by the National Institute for Occupational Safety and Health and pursuant to 10 CFR Part 20, Section 1705, requested an assigned protection factor (APF) of 5,000 for this equipment, which exceeds those specified in Appendix A of 10 CFR Part 20, for Arkansas Nuclear One, Unit 1 (ANO-1), Grand Gulf Nuclear Station, Unit 1 (GGNS), Indian Point Nuclear Generating Unit Nos. 1, 2, and 3 (IP1, IP2, IP3), Pilgrim Nuclear Power Station (Pilgrim), River Bend Station, Unit 1 (RBS), Vermont Yankee Nuclear Station (VY), and Waterford Steam Electric Station, Unit 3 (Waterford 3).

Enclosed is the NRC staff's related safety evaluation that concludes that authorization of your requests (a) for the use of Delta Protection Mururoa V4F1 R Supplied Air Suits and (b) an APF factor of 5,000 for this equipment, are within the provisions of 10 CFR Part 20, and are acceptable for ANO-1, GGNS, IP1, IP2, IP3, Pilgrim, RBS, VY, and Waterford 3.

F. G. Burford

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Please contact me at (301) 415-1302, or Bhalchandra K. Vaidya at (301) 415-3308, if you have any questions on this matter.

Sincerely,

/RA/

David Terao, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-313, 50-416, 50-003, 50-247,
50-286, 50-293, 50-458, 50-271, and 50-382

Enclosure: Safety Evaluation

cc w/encl: See next page

F. G. Burford

-2-

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NRR-106

OFFICE	NRR/LPL4/PM	NRR/LPL4/LA	NRR/IHPB/BC	OGC-NLO with comments	NRR/LPL4/BC
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DATE	7/28/06	7/28/06	07 / 18 /2006	8/10/06	10/2/06

OFFICIAL RECORD COPY

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO THE REQUEST FOR USE OF
DELTA PROTECTION MURUROA V4F1 R SUPPLIED AIR SUITS
AND ASSIGNMENT OF A PROTECTION FACTOR OF 5,000
ENTERGY OPERATIONS, INC., AND ENTERGY NUCLEAR OPERATING, INC.
ARKANSAS NUCLEAR ONE, UNIT 1,
GRAND GULF NUCLEAR STATION, UNIT 1,
INDIAN POINT NUCLEAR GENERATING UNIT NOS. 1, 2, AND 3,
PILGRIM NUCLEAR POWER STATION,
RIVER BEND STATION, UNIT 1,
VERMONT YANKEE NUCLEAR POWER STATION, AND
WATERFORD STEAM ELECTRIC STATION, UNIT 3
DOCKET NOS. 50-313, 50-416, 50-003, 50-247, 50-286, 50-293, 50-458, 50-271,
AND 50-382

1.0 INTRODUCTION

By letter dated May 16, 2006 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML061440167), as supplemented by letter dated July 13, 2006 (ADAMS Accession No. ML061980030), pursuant to Part 20 of Title 10 of the *Code of Federal Regulations* (10 CFR Part 20), Section 1703(b), Entergy Operations, Inc. and Entergy Nuclear Operating Inc. (Entergy or the licensee), requested the U.S. Nuclear Regulatory Commission (NRC) authorization for use of equipment that has not been tested or certified by the National Institute for Occupational Safety and Health (NIOSH) and pursuant to 10 CFR Part 20, Section 1705, requested an assigned protection factor (APF) of 5,000 for this equipment, which exceeds those specified in Appendix A of 10 CFR Part 20, for Arkansas Nuclear One, Unit 1 (ANO-1), Grand Gulf Nuclear Station, Unit 1 (GGNS), Indian Point Nuclear Generating Unit Nos. 1, 2, and 3 (IP1, IP2, IP3), Pilgrim Nuclear Power Station (Pilgrim), River Bend Station, Unit 1 (RBS), Vermont Yankee Nuclear Station (VY), and Waterford Steam Electric Station, Unit 3 (Waterford 3).

Specifically, the licensee requested authorization to use the Mururoa atmosphere-supplying suit, V4F1 R Supplied Air Suits, manufactured by Delta Protection, France (hereafter referred to as the Delta R Suit), and to use an APF of 5,000. As defined in 10 CFR 20.1003, an APF

denotes the expected level of protection that would be provided to a trained respirator user by a properly functioning respirator.

2.0 REGULATORY EVALUATION

The following regulatory requirements and guidance documents were used for the NRC staff's evaluation:

1. 10 CFR Part 20, Subpart H; 10 CFR Part 19, Section 19.12, "Instruction to workers";
2. Regulatory Guide 8.15, Revision 1, "Acceptable Programs for Respiratory Protection";
3. NUREG/CR-0041, Revision 1, "Manual of Respiratory Protection Against Airborne Radioactive Material";
4. 42 CFR Part 84, NIOSH testing and certification regulations,
5. Los Alamos National Laboratory Report LA-101560MS, "Acceptance Testing Procedures for Air-Line Supplied Air Suits"; and
6. American National Standards Institute standard ANSI Z88.2-1992, "American National Standard Practices for Regulatory Protection."

The following paragraphs discuss the relevant details:

NUREG/CR-0041 encourages the use of suits, noting that, in certain work environments, air-supplied suits may be the best respiratory application when factoring in heat stress, minimizing skin contamination, and maintaining worker doses as low as is reasonably achievable (ALARA).

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

Paragraph 10 CFR 20.1703(a) requires the use of respiratory equipment certified by the NIOSH, when used to limit the worker intake of radioactive materials. However, currently NIOSH has no testing and certification schedules for air-supplied suits. Authorization by the NRC to use respiratory equipment that has not been tested and certified by NIOSH is provided for in 10 CFR 20.1703(b). Section 20.1703(b) requires the licensees to demonstrate by appropriate testing that a respirator is capable of safely providing the necessary level of user protection under the anticipated conditions of use.

Paragraph 10 CFR 20.1703(f) requires that, when an air-supplied respirator (such as a full suit or hood) is used that could be difficult for a user to remove without assistance, standby rescuers be present to render suit egress assistance to the user in the case of a sudden, unexpected loss of air supply (or other emergencies). Without this prompt assistance, a user could be asphyxiated in a short period of time (less than one minute).

Part 20 of 10 CFR, Appendix A, "Assigned Protection Factors for Respirators," Item II, "Atmosphere Supplying Respirators (particulate, gases and vapors)," does not provide an APF for atmosphere supplying respirator (particulate, gases and vapors) suits in a continuous-flow operating mode. Instead, 10 CFR Part 20, Appendix A, Footnote (g), allows the use of air-supplied suits, but allows no credit to be taken for protection provided by the non-NIOSH approved units (unless approval is granted under 10 CFR 20.1703(b)). It states, "[n]o 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., 10 CFR 20.1703)."

Section 10 CFR 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. Since Appendix A does not provide an APF for atmosphere supplying respirator (air-line respirator) suits in a continuous-flow operating mode, the licensee must obtain NRC approval to take credit for an APF for this model of the respiratory protection equipment.

3.0 TECHNICAL EVALUATION

Pursuant to 10 CFR 20.1703(b), the licensee requested NRC authorization for use of the Delta R Suit that has not been tested or certified by NIOSH. Pursuant to 10 CFR Part 20.1705, the licensee also requested an APF of 5,000 for this equipment, which exceeds those specified in Appendix A of 10 CFR Part 20. The licensee's application, as supplemented, also included the following supporting information:

- 1) Data Sheet for Delta Protection, Mururoa V4F1 R Model Suit providing General Description,
- 2) European Standard EN 1073-1; 1998 for Ventilated Protective Clothing,
- 3) Certificate No. 0073/197/162/02/01/0005 for the Delta R Suit, and
- 4) Donning and Removal Instructions for the Delta R Suit.

3.1 Design and Safety Features

When compared with other air-fed respirators, the Delta R Suit provides the following advantages for the user: (1) dual zippers (metal zipper inside and plastic zipper outside); (2) 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 left arm, over the head, to the right arm that is used for undressing and for self-rescue in an emergency, such as loss of supplied air; (5) air intake located at the waist with a built-in regulator that self adjusts airflow; (6) dual magnetic exhaust valves that provide ventilation, and relief of excess pressure in case the suit is squeezed/pinched unexpectedly; (7) very low noise level at maximum airflow; and (8) airflow to arms, legs, and face.

Safety features also include light-weight (2.5 pounds) one-piece construction with welded gloves and booties with tie straps. Helmets are made with Poly Vinyl Chloride material that provides distortion-free vision and are large enough for wearing a headset. Noise levels are less than 80 decibels at maximum airflow and airflow can be adjusted by the user for comfort, but cannot be shut off below the required minimum airflow. These suits are fireproof up to 65 °C and can be used in temperatures up to 60 °C. The suits are constructed with reinforced elbows, knees, and crotch areas.

3.2 Testing and Qualification

Testing conducted by the Institute for Nuclear Protection and Security (INPS), the European certifying agency (comparable to NIOSH), with over 20 years of successful use in European power plants of similar certified suits, form the basis for the licensees' request for authorization to use and take credit for the protection provided by these suits during normal operations (non-emergencies). The European Standard EN 1073-1 provided testing and acceptance criteria used for certification of the suits. This standard is generally consistent with the pertinent acceptance criteria provided in the Los Alamos National Laboratory Report, LA-10156-MS (used to test and authorize the use of air-supplied suits at Department of Energy sites).

The INPS certification testing regime was broadly based and included a range of various functional areas, including suit material strength, tear and puncture resistance, material flammability, wearer comfort, noise level, wearer visibility, airflow supply system, carbon dioxide concentrations, and degree of contaminate in-leakage during a series of varied simulated work practices and exercises.

Separate tests were conducted by the manufacturer to verify functionality of the Delta R Suit's self-adjusting airflow regulator. Dynamic response of the regulator was tested by varying inlet pressure in both increasing and decreasing increments, varying pressure availability instantaneously from 0 to 40 pounds per square inch (psi) followed by shutting off and subsequently re-establishing the air supply, and by exposure to an instantaneous pressure of 140 psi followed by step changes down to the suit's certified range.

The Delta R Suit passed all required certification and manufacturer tests and provided a measured average protection level (fit factor) of 50,000. Developed in a simulated work environment, a fit factor is the ratio of contaminate concentration outside the suit to the contaminate concentration inside the suit. APFs are generally lower than fit factors for all types of respirators, as workplace demands such as higher heat and humidity, longer work durations, greater worker fatigue, etc., are typically greater on the respirator user than laboratory conditions and simulated work activities.

3.3 Implementation

The regulation in Subpart H of 10 CFR Part 20 establishes the requirements for implementing a respiratory protection program. These programmatic requirements ensure that worker doses from airborne radioactive materials are maintained ALARA. The licensee has committed to integrate the use of the Delta R Suit into their existing, ongoing respiratory protection programs, which satisfy 10 CFR Part 20 requirements. The NRC staff finds this approach acceptable.

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

1. Paragraph 20.1703(c) requires, among other things, written procedures governing the training of respirator users (i.e., workers). The licensee's submission states that all of its plants have respiratory programs in full compliance with 10 CFR 20. The Delta R Suits

will be integrated into its respiratory program using the information provided by the manufacturer. The licensee has committed to develop new lesson plans to train workers on the Delta R Suit's features, donning, use and removal of the suits, cautions and use of mouth-strip and tear-off strips for routine and emergency egress. The licensee has also committed that the radiological protection (RP) personnel will be provided additional training for the Delta R Suits, including selection, approval, issue, equipment set-up, operation, and maintenance instructions.

2. IPSN certification and manufacturer information requires that the user verify minimum airflow to the suit (450 litres per minute (l/min)) both prior and during use. To meet this requirement, the licensee has committed to performing an initial test of each facility's breathable air network to insure that it has sufficient capacity (minimum pressure and flow), through an established maximum length of hose, prior to the initial use of the Delta R Suit system. Entergy plants will follow the manufacturer's recommended "Instructions for Use" of the suits, specifically insuring that the minimum operating air pressure 2.5 bar (35 psi) and airflow 450 l/min (16 cubic feet per minute (cfm)) is being supplied to the suits prior to working in them. In addition, Entergy will monitor pressure during regular use.
3. The manufacturer is subjected to checks from the IPSN to insure the product has no risk of injury to the user. A second organization called ASQUAL (an advisory group to regulators) performs annual inspections of the factory to certify that the manufactured product is of the same quality approved by the IPSN. The manufacturer performs several destructive/non-destructive tests for each order received from clients. Any defects reported by clients, investigations, and corrective actions are documented by Delta Protection. Customers are notified of significant problems, and products are recalled if necessary. This information is made available to ASQUAL for their annual inspections. The licensee has committed to use its Corrective Action Program to document and evaluate any unexpected problems with the suits in a timely manner to the U.S. nuclear industry through its operating experience process and to the manufacturer. This communication network is analogous to the NIOSH-vendor-user link established in the U.S.
4. Paragraph 20.1703(c)(4)(vii) requires, among other things, written procedures governing respirator storage and quality assurance. These suits have a 3-year shelf-life and must be stored in the original packing, at temperatures between 32 °F and 140 °F. Since the suits are approved in Europe, for single use only, there are no maintenance requirements. The vendor's manufacturing process is inspected annually by ASQUAL, a European quality assurance organization, to ensure that the required level of process and product quality is maintained. Additionally, on a formalized sample basis, the vendor performs destructive and non-destructive testing of the product line.
5. In its submission, the licensee has made the commitment that since the Delta R Suit is a one-piece, single-use-only suit, the suit will only be used during normal (non-emergency) operations, and will not be used in immediately dangerous to life and health (IDLH) environment.

3.4 Evaluation

The licensee intends to use the suit to minimize personnel exposure/contamination in radiation areas with high contamination or potential for high airborne radioactivity. Examples of these areas include the steam generator primary man-ways, underneath the reactor head, and in the reactor cavity. In its application dated May 16, 2006, based on its evaluation, the licensee made the following observations:

- a) The Delta R Suits were found to offer a safer and more efficient means to protect workers in areas of high radiological contamination and in areas where there is potential for airborne contamination.
- b) These suits provide improved cooling over the entire body, while the existing combination of rain suits and air-supplied, NIOSH-certified hoods available to the licensees provide cooling only to the head and force workers to wear the ensemble in a manner that makes self-rescue nearly impossible, thus requiring a rescue worker to be stationed nearby. Therefore, the Delta R Suit is preferable to the currently used bubble-hood because the safety features of the Delta R Suit eliminate the need for using a standby rescue person (per 10 CFR 20.1703(f)), thus helping to minimize occupational radiation exposures.
- c) 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. The ease of removal features provide a means to undress that minimizes the potential for personnel contamination events and provides an easy-escape design.
- d) The Delta R Suit provides sufficient airflow to the wearer when used with an air supply system that can provide 450 l/min (16 cfm) airflow at a minimum operating air pressure of 2.5 bar (35 psi).

Additionally, in its application dated May 16, 2006, the licensee stated that these suits will not be used in areas that are IDLH; IDLH areas pose immediate hazards to life or immediate irreversible debilitating effects on health. For example, air-supplied respirators (without auxiliary self-contained breathing air capability) may not be used to enter areas of unknown airborne hazards that may be present during emergencies.

The NRC staff finds that based on these safety features, the suit design provides for easy and effective self-rescue, thus, avoiding asphyxiation if the air supply is interrupted or lost. Due to these design features of the suit, coupled with required training of all suit users on escape methods, and limiting the use of the suits to non-IDLH atmospheres, the requirement for standby rescue persons in 10 CFR 20.1703(f) is not applicable. Therefore, an exemption from 10 CFR 20.1703(f) is not needed to use these suits in the manner proposed by the licensee.

As a result of external radiation levels present in typical job sites, suit users are typically provided with RP coverage such as closed-circuit television or on-scene RP coverage, and continuous audio communication. This communication and coverage adds to the assistance available to the suit user, if needed.

With respect to the licensee’s request for the use of an APF of 5,000, given an overall assigned fit factor of 50,000 (averaged over all exercise activities), the NRC staff finds that allowing an APF of 5,000 provides a conservative safety factor for estimating the actual protection provided to the user by the suit in the actual working environment and, therefore, use of an APF of 5,000 for the Delta R Suit is acceptable.

3.5 Regulatory Commitments

The following table identifies the regulatory commitments made by Entergy:

List of Regulatory Commitments

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE- TIME ACTION	CONTINUING COMPLIANCE	
The commitments made in the licensee’s request dated May 16, 2006 (CNRO-2006-00021):			
The Mururoa V4F1 R suit will be integrated into Entergy Operations Inc. station respiratory program using the information provided by the manufacturer.		x	Before use of suit
New lesson plans will be developed to train workers on the Mururoa’s features, donning, use and removal, cautions and use of mouth strip, and tear off strips for routine and emergency egress.		x	Before use of suit
Radiation Protection personnel will be provided additional training for the Mururoa suit including selection, approval, issue, equipment set-up, operation, and maintenance instructions.		x	Before use of suit
All suits and cartridges will be treated as “Single Use” only.		x	Before use of suit
The suit system will not be used in an Immediately Dangerous to Life and Health (IDLH) environment.		x	Before use of suit
Entergy will use the Corrective Action Program to document and evaluate any unexpected problems with the suit.		x	Before use of suit
Entergy will report any defects in a timely manner to the U.S. Nuclear Industry [Operating Experience Network] through [in accordance with] our [Entergy’s] operating experience process.		x	[Following identification of defects]

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE- TIME ACTION	CONTINUING COMPLIANCE	
The commitments made in the licensee's supplemental request dated July 13, 2006:			
Entergy commits to notifying the manufacturer (as well as the U.S. Nuclear Industry) of any defects experienced during the use of the MURUROA V4F1 R devices.		x	Following identification of defects
Entergy will use the suit as allowed in the certification (with CEJN or STAUBLI fittings).		x	Before use of suit
Procedures for use of the suit systems are integrated into the respiratory programs required by Subpart H of 10 CFR Part 20. Fit testing of user is not applicable to fully encapsulating suits. Prior to use, wearers are trained on these conditions of use as well as the emergency escape features of the suits.		x	Before use of suit
Entergy will perform an initial test of their breathable air network systems to insure that it has sufficient capacity (min. pressure and flow) through an established maximum length of hose, prior to the initial use of the Mururoa V4F1 R suit system. This test will establish the conditions at the distribution manifold actually necessary to ensure that the air supplied to the suit inlet is consistent with the conditions for which the equipment was certified.		x	Before use of suit
Entergy plants will follow the manufacturers recommended "Instructions for Use" of the suits, specifically insuring that the minimum operating air pressure 2.5 bar (35 PSI) and airflow 450 l/min (16 CFM) is being supplied to the suits prior to working in them. Pressure will be monitored during use.		x	Before use of suit
All suits will be treated as "Single Use" only (this commitment supersedes that of items 4 of CNRO-2006-00021).		x	Before use of suit

The NRC staff finds that reasonable controls for the implementation and for subsequent evaluation of proposed changes pertaining to the above regulatory commitments are provided by the licensee's administrative processes, including its commitment management program. Should the licensee choose to incorporate a regulatory commitment into the emergency plan, the updated final safety analysis report, or other documents with established regulatory controls, the associated regulations would define the appropriate change-control and reporting requirements. The NRC staff has determined that the commitments do not warrant the creation

of regulatory requirements, which would require prior NRC approval of subsequent changes. The NRC staff has agreed that Nuclear Energy Institute 99-04, Revision 0, "Guidelines for Managing NRC Commitment Changes," provides reasonable guidance for the control of regulatory commitments made to the NRC staff (see Regulatory Issue Summary 2000-17, "Managing Regulatory Commitments Made by Power Reactor Licensees to the NRC Staff," dated September 21, 2000). The commitments should be controlled in accordance with industry guidance or comparable criteria employed by a specific licensee. The NRC staff may choose to verify the implementation and maintenance of these commitments in a future inspection or audit.

4.0 CONCLUSIONS

Based on the testing data provided, and when used in accordance with the applicable manufacturer's instructions, licensee's commitments, and requirements of 10 CFR Part 20 Subpart H, the NRC staff concludes that the licensee's request to use the Delta R Suit (Certificate No. 0073/197/162/02/01/0005) satisfies the 10 CFR Part 20 ALARA requirements, and will provide the suit wearer with an adequate level of protection while working in high and potentially high airborne radioactivity areas.

Therefore, the NRC staff finds that the licensee's requests (a) for the use of the Delta R Suit and (b) assignment of an APF of 5,000 for this equipment, are acceptable for ANO-1, GGNS, IP1, IP2, IP3, Pilgrim, RBS, VY, and Waterford 3.

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Date: October 2, 2006

Indian Point Nuclear Generating
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May 2006

Indian Point Nuclear Generating
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May 2006

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