

October 18, 2010

OFFICE OF THE ADMINISTRATOR

CERTIFIED MAIL RETURN RECEIPT REQUESTED

Dr. Michael R. Anastasio, President Los Alamos National Security, LLC Los Alamos National Laboratory Mailstop A100, Drop Point 03140071S Bikini Atoll Road, TA-3 Los Alamos, New Mexico 87545-1663

WEA-2010-04

Dear Dr. Anastasio:

This letter refers to a U.S. Department of Energy (DOE) investigation into the facts and circumstances surrounding the electrical shock event that occurred in building 300 at Technical Area 16 (TA-16) at the Los Alamos National Laboratory (LANL) on March 20, 2009. The results of the investigation were provided to Los Alamos National Security, LLC (LANS) in an Investigation Report dated March 2, 2010. An enforcement conference was held on March 23, 2010, with you and members of your staff to discuss the report's findings and the LANS corrective action plan. A summary of the conference is enclosed.

Based on an evaluation of the evidence in this matter, including information presented during the enforcement conference, the National Nuclear Security Administration (NNSA) has concluded that violations of 10 C.F.R. Part 851, *Worker Safety and Health Program*, by LANS have occurred. Accordingly, I am issuing the enclosed Preliminary Notice of Violation (PNOV) to LANS consisting of three Severity Level I violations and one Severity Level II violation with a total proposed civil penalty of \$131,250.

NNSA considers the electrical shock event and the associated violations to be of high safety significance. A LANL technician received first and second degree burns while working on a high voltage fireset, which had the potential to result in a worker fatality. DOE's investigation determined that LANS did not implement critical provisions of the laboratory's work management process and applicable electrical safety requirements when a high voltage electrical hazard was introduced into an otherwise non-electrical work activity, and when LANS excluded electrical safety expertise from the process because of misinterpreted security requirements. In addition, the worker was not qualified to conduct energized work. NNSA believes that the electrical shock event was preventable if LANS personnel had followed established institutional procedures and regulatory requirements for electrical hazard identification and control with the appropriate involvement of subject matter experts.

NNSA acknowledges LANS' prompt response to the electrical shock event and timely investigation to determine the causal factors and extent of these conditions. The LANS



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investigation was formal, detailed, and prompt, and the identified issues were addressed in a broad set of corrective actions. LANS also evaluated elements of the integrated work management and electrical safety programs across the laboratory, with particular emphasis on research and development activities, to identify similar weaknesses and engage a broad spectrum of managers in corrective action at the institutional level. NNSA is particularly interested in the effectiveness of these measures as they reflect LANS' acknowledgment and commitment to improving long-standing hazard assessment and control performance deficiencies embodied in the TA-16 electrical shock event. NNSA considers LANS' efforts to address work planning and control and electrical safety performance at the division and institutional levels to be comprehensive, but NNSA remains concerned about corrective actions to ensure electrical safety officer integration in the review and approval of electrical work. NNSA is therefore granting 50 percent mitigation of the proposed penalties for the first three violations and 25 percent mitigation.

Pursuant to 10 C.F.R. § 851.42, *Preliminary Notice of Violation*, you are obligated to submit a written reply within 30 calendar days of receipt of the enclosed PNOV, and to follow the instructions specified in the PNOV when preparing your response. If no reply is submitted within 30 days, in accordance with 10 C.F.R. § 851.42(d), any right to appeal any matter in the PNOV will be relinquished and the PNOV will constitute a final order.

After reviewing your response to the PNOV, including any proposed additional corrective actions entered into DOE's Noncompliance Tracking System, NNSA will determine whether further action is necessary to ensure compliance with worker safety and health requirements. NNSA will continue to monitor the completion of corrective actions until these matters are resolved.

Sincerely,

Thomas P. D'Agostino Administrator

Enclosures

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cc: Marjorie Gavett, LANS Richard Azzaro, DNFSB

Enclosure

Preliminary Notice of Violation

Los Alamos National Security, LLC Los Alamos National Laboratory

WEA-2010-04

As a result of a U.S. Department of Energy (DOE) investigation into the facts and circumstances associated with the electrical shock event that occurred during work with a training device in building 300 at Technical Area 16 (TA-16) at the Los Alamos National Laboratory (LANL) on March 20, 2009, multiple violations of DOE worker safety and health requirements by Los Alamos National Security (LANS) were identified. The violations involved deficiencies in electrical safety, hazard identification and assessment, hazard prevention and abatement, and training and information.

The violations have been determined to be three Severity Level I violations and one Severity Level II violation. The total proposed civil penalty is \$131,250. As required by 10 C.F.R. § 851.42(b) and consistent with Part 851, Appendix B, *General Statement of Enforcement Policy*, the violations are listed below. LANS may be required to post a copy of this Preliminary Notice of Violation (PNOV) in accordance with 10 C.F.R. § 851.42(e).

VIOLATIONS

I. Electrical Hazard Identification and Assessment

Title 10 C.F.R. § 851.23, *Safety and health standards*, at paragraph (a)(3) and (4), requires contractors to comply with 29 C.F.R. Part 1910, *Occupational Safety and Health Standards*, and National Fire Protection Association (NFPA) 70E (2004), *Standard for Electrical Safety in the Workplace*.

Title 29 C.F.R. § 1910.303, *General*, at paragraph (b) states that "[e]lectrical equipment shall be [examined to ensure that it is] free from recognized hazards that are likely to cause death or serious physical harm to employees. Safety of equipment shall be determined using the following considerations: (i) [s]uitability for installation and use in conformity with [the provisions of 29 C.F.R. Part 1910, Subpart S, *Electrical*]; ... (iv) [e]lectrical insulation; ... (vii) [c]lassification by type, size, voltage, current capacity, and specific use; and (viii) [o]ther factors that contribute to the practical safeguarding of persons using or likely to come in contact with the equipment."

Title 10 C.F.R. § 851.10, *General requirements*, at paragraph (a), states that "[w]ith respect to a covered workplace for which a contractor is responsible, the contractor must: . . . (2) [e]nsure that work is performed in accordance with: (i) [a]ll applicable requirements of [10 C.F.R. Part 851]; and (ii) [w]ith the worker safety and health program for that workplace."¹

Title 10 C.F.R. § 851.21, *Hazard identification and assessment*, at paragraph (a), states that "[c]ontractors must establish procedures to identify existing and potential workplace hazards and assess the risk of associated worker injury and illness. Procedures must include methods to: (1) [a]ssess worker exposure to chemical, physical, biological, or safety workplace hazards through appropriate workplace monitoring; (2) [d]ocument assessment for chemical, physical, biological, and safety workplace hazards using recognized exposure assessment and testing methodologies and using of accredited and certified laboratories;...(5) [e]valuate operations, procedures, and facilities to identify workplace hazards; [and] (6) [p]erform routine job activity-level hazard analyses." In accordance with subsection (c) of the same section, "[c]ontractors must perform [these activities] initially to obtain baseline information and as often thereafter as necessary to ensure compliance with [the requirements of 10 C.F.R. Part 851, subpart C]."

Title 10 C.F.R. § 851.24, *Functional areas*, at paragraph (a), states that "[c]ontractors must have a structured approach to their worker safety and health program which at a minimum, include provisions for the following applicable functional areas in their worker safety and health program: . . . [e]lectrical safety." Paragraph (b) states that "[i]n implementing the structured approach required by paragraph (a) of [10 C.F.R. § 851.24], contractors must comply with the applicable standards and provisions in Appendix A of [Part 851], entitled *Worker Safety and Health Functional Areas*." Appendix A, section 10, *Electrical Safety*, states that "[c]ontractors must implement a comprehensive electrical safety program appropriate for activities at their site. This program must meet the applicable electrical safety codes and standards referenced in § 851.23."

NFPA 70E (2004) (hereafter, "NFPA 70E"), Article 130, Working On or Near Live Parts, at section 130.1, Justification for Work, states that "[1]ive parts to which an employee might be exposed shall be put into an electrically safe work condition before an employee works on or near them . . ." Section 130.2(A), Shock Hazard Analysis, states that "[a] shock hazard analysis shall determine the voltage to which workers will be exposed...in order to minimize the possibility of electrical shock to personnel."

Contrary to these requirements, LANS failed to implement procedures to identify existing and potential workplace electrical hazards associated with the trainer device fireset, assess the risk of worker exposure to high voltage electrical energy and subsequent injury

¹ The Los Alamos National Laboratory Integrated Safety Management System Description Document with embedded 10 CFR 851 Worker Safety and Health Program (SD100, dated May 29, 2009) describes the policies and procedures that comprise the Worker Safety and Health Program at LANL as required by 10 C.F.R. § 851.10. SD100 incorporates the LANL Integrated Work Management program (P300, revision 0, dated October 31, 2008) and the LANL Electrical Safety Program document (P101-13, revision 0, dated August 26, 2008) as part of the worker safety and health program for LANL.

or shock, and use subject matter experts to assist in this process. Specific examples are listed below:

- A. LANS did not implement LANL P300 requirements for identifying and analyzing workplace hazards for work on or near exposed electrical conductors or circuit parts that are or could become energized in order to determine the required safety-related work practices. The hazard assessment must be documented in the Integrated Work Document (IWD) for the activity consistent with the P300 requirement.
 - 1. LANS did not identify an electrical hazard in the IWD that governed the trainer device assembly/disassembly work activity (IWD-07-IAT3-005, *Trainer Assembly and Disassembly*, revision 1, dated March 16, 2009). Workers mechanically assembled the trainer, conducted direct current (DC) voltage tests, and performed tie-wrapping of electrical wires on the trainer components.
 - 2. LANS did not evaluate the trainer device assembly/disassembly activity upon the introduction of a high voltage electrical hazard, and did not fully assess exposure to unprotected electrical components in the fireset.
 - 3. LANS did not ensure that the International and Applied Technology (IAT) Division implemented its division procedure, *Integrated Work Management* (revision 1, dated February 10, 2009), consistent with P300 work planning and control requirements. The IAT procedure did not incorporate provisions for ensuring appropriate subject matter expertise (e.g., electrical safety officer) participation in the hazard identification and assessment process. In addition, IAT did not perform the analysis and grading of hazards using the hazard check sheet for the trainer build activity as required by the IAT work management procedure.
- B. LANS did not perform a shock hazard analysis on the trainer device fireset to determine the voltage of conductors to which workers would be exposed, approach boundary requirements, and personal protective equipment (PPE) necessary to execute the work commensurate with the risk of shock. LANL P101-13 requires the IWD to include a shock hazard analysis for work that involves approaching exposed energized electrical components under specific classifications.

Collectively, these deficiencies constitute a Severity Level I violation. As explained in 10 C.F.R. Part 851, appendix B, section VI (b) (1), "[a] Severity Level I violation is a serious violation. A serious violation shall be deemed to exist in a place of employment if there is a potential that death or serious physical harm could result from a condition which exists, or from one or more practices, means, methods, operations, or processes which have been adopted or are in use, in such place of employment."

Proposed Civil Penalty - \$35,000

II. Electrical Hazard Prevention and Abatement

Title 10 C.F.R. § 851.22, *Hazard prevention and abatement*, at paragraph (a), states that "[c]ontractors must establish and implement a hazard prevention and abatement process to ensure that all identified and potential hazards are prevented or abated in a timely manner. Under this subsection, "[f]or hazards identified . . . during the development of procedures, controls must be incorporated in the appropriate...procedure" and "(2) [f]or existing hazards identified in the workplace, contractors must: . . . (iii) [p]rotect workers from dangerous safety and health conditions." Paragraph (b) states that "[c]ontractors must select hazard controls based on the following hierarchy: (1) [e]limination or substitution of the hazards where feasible and appropriate; (2) [e]ngineering controls where feasible and appropriate; (3) [w]ork practices and administrative controls that limit worker exposures; and (4) [p]ersonal protective equipment."

Title 29 C.F.R. § 1910.333, Selection and Use of Work Practices, at paragraph (a), General, states that "[s]afety-related work practices shall be employed to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts, when work is performed near or on equipment or circuits that are or may be energized. The specific safety-related work practices shall be consistent with the nature and extent of the associated electrical hazards."

Title 29 C.F.R. § 1910.335, *Safeguards for personnel protection*, at subparagraph (a)(1)(i), states that "[e]mployees working in areas where there are potential electrical hazards shall be provided with, and shall use, electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed." Personal protective equipment requirements are contained in subpart I of 29 C.F.R. Part 1910.

NFPA 70E, Section 110.8, *Working On or Near Electrical Conductors or Circuit Parts*, at subsection (b)(1), states, in part, that "[i]f the live parts operating at 50 volts or more are not placed in an electrically safe work condition, other safety-related work practices shall be used [by contractors] to protect employees who might be exposed to electrical hazards involved. Such work practices shall protect each employee from...contact with live parts operating at 50 volts or more directly with any part of the body or indirectly through some other conductive object."

NFPA 70E, Section 130.2(A), *Shock Hazard Analysis*, states that "[a] shock hazard analysis shall determine...the boundary requirements, and the personal protective equipment necessary in order to minimize the possibility of electric shock to personnel." Section 130.2(B), *Shock Protection Boundaries*, states, in part, that "[t]he shock protection boundaries identified as Limited, Restricted, and Prohibited Approach Boundaries are applicable to the situation in which approaching personnel are exposed to live parts." Section 130.2(C), *Approach to Exposed Live Parts Operating at 50 Volts or More*, states that "[n]o qualified person shall approach or take any conductive object closer to the exposed live parts operating at 50 volts or more than the Restricted Approach Boundary set forth in Table 130.2(C) [*Approach Boundaries to Live Parts for*]

Shock Protection]..." Section 130.6, Other Precautions for Personnel Activities, at paragraph (D), Conductive Articles being Worn, states that "[c]onductive articles of jewelry and clothing...shall not be worn where they present an electrical contact hazard with exposed live parts."

Contrary to these requirements, LANS failed to implement procedures to control or eliminate worker exposure to shock and electrocution, and restrict worker approach to shock approach boundaries during trainer assembly and disassembly activities based on the type and degree of hazard. LANS did not document appropriate electrical safety work practices and controls in the IWD applicable to the trainer assembly/disassembly activity based on the type and degree of potential electrical hazards presented by high voltage components of a fireset. Specific examples are listed below:

- A. The IWD did not identify hazardous energy controls in work steps for the mechanical assembly of the trainer and tie-wrapping of electrical wires by workers who worked on or near energized electrical components. The IWD did not specify engineering, administrative, or other work controls appropriate for the electrical hazards for each step, including insulation, barriers, PPE, or two-person or safety watch rule. LANS did not establish the necessary controls for workers performing electrical work graded as a moderate hazard according to P300, where required by NFPA 70E, or where required by P101-13.
- B. LANS did not identify and implement hazard controls based on a shock hazard analysis for the actual mode of work involving the capacitor bank and high voltage batteries.
- C. LANS did not determine the shock protection boundaries for the trainer assembly and disassembly activity involving a high voltage DC fireset in accordance with the approach boundaries to live parts for DC in accordance with P101-13.
- D. LANS did not identify and communicate to workers the PPE appropriate for the mode and class of electrical work that was being performed. In addition, the IWD did not restrict workers from wearing conductive objects, such as jewelry and clothing, while working on or near energized electrical components.
- E. LANS did not apply the hierarchy of hazard controls by considering the elimination of the electrical hazard by modifying the trainer device components or deenergizing the fireset.

Collectively, these deficiencies constitute a Severity Level I violation.

Proposed Civil Penalty - \$35,000

III. Training and Information

Title 29 C.F.R. § 1910.332(b), *Content of training*, at subparagraph (b)(1), states that "[e]mployees shall be trained in and be familiar with the safety-related work practices required by §§1910.331 through 1910.335 that pertain to their respective job assignments." Section 1910.333(c), *Working on or near exposed energized parts*, at subparagraph (c)(2), *Work on energized equipment*, states that "[o]nly qualified persons may work on electric circuit parts or equipment that has not been deenergized..."

NFPA 70E, Section 110.7(G)(1), General, states that "[b]efore starting each job, [contractors] shall conduct a job briefing with the employees involved. The briefing shall cover such subjects as hazards associated with the job, work procedures involved, special precautions, energy source controls, and personal protective equipment requirements." Section 110.7(G)(2), *Repetitive or Similar Tasks*, states that for repetitive and similar work or operations, "[a]dditional job briefings shall be held if significant changes that might affect the safety of employees occur during the course of the work." Section 110.8(A)(2), *Live Parts – Unsafe Work Condition*, states that "[o]nly qualified persons shall be permitted to work on electrical conductors or circuit parts that have not been put into an electrically safe work condition."

Title 10 C.F.R. § 851.25, *Training and information*, at paragraph (b), states that "[t]he contractor must provide: (1) [t]raining and information for new workers, before or at the time of initial assignment to a job involving exposure to a hazard; (2) [p]eriodic training as often as necessary to ensure that workers are adequately trained and informed; [and] (3) [a]dditional training when safety and health information or a change in workplace conditions indicates that a new or increased hazard exists." Paragraph (c) states that "[c]ontractors must provide training and information to workers who have worker safety and health program responsibilities that is necessary for them to carry out those responsibilities."

Contrary to these requirements, LANS failed to ensure that workers were trained and knowledgeable in safety-related work practices and procedural requirements as necessary to provide protection from electrical hazards associated with trainer assembly and disassembly activities. Specific examples are listed below:

A. LANS did not verify that workers were properly authorized and qualified to perform work on or near high voltage components of an energized fireset. The worker who received the electric shock was not a LANL qualified electrical worker and was not assigned to the *Energized R&D Electrical Worker Training Plan No. 2876* required by P101-13 for workers who perform work on energized electrical components, equipment, and circuits in the research and development (R&D) environment. Furthermore, LANS did not ensure that the worker completed courses with the necessary frequency to maintain competency and meet the requirements of the *General Worker/Electrical Hazards Training Plan No. 2914*.

- B. LANS did not conduct a job briefing with affected workers to inform them of the controls necessary to avoid exposure to the electrical hazards when working on or near the high voltage components of the fireset. P101-13 requires the person-in-charge (PIC) to conduct a pre-job briefing to communicate to workers the scope, hazards, expected outcomes, and controls in the IWD. The PIC did not conduct additional briefings when workers performed tasks involving adding a high voltage fireset to the device, which was a significant change that introduced the risk of electrical shock to workers. In addition, the PIC did not ensure that hazards and controls were properly addressed and communicated during a validation walkdown of the trainer assembly and disassembly activity with team members assigned to conduct the work.
- C. LANS did not ensure that workers' training, education and experience was commensurate with the classes and modes of work that were documented in the workers' electrical worker qualification forms as required by P101-13. Workers were not trained in the specialized R&D electrical equipment and qualified to perform work in hazard classes prescribed by P101-13.
- D. LANS did not provide IAT Division workers with information necessary to perform work safely on or near high voltage components of a fireset that was not listed by a Nationally Recognized Testing Laboratory. Workers were not supplied with designer/builder instructions, drawings, restrictions and limitations, and specific equipment data, such as voltage and current, that was relevant for work involving the fireset.

Collectively, these deficiencies constitute a Severity Level I violation.

Proposed Civil Penalty - \$35,000

IV. Electrical Safety Program

Title 29 C.F.R. § 1910.303(b), *Examination, installation, and use of equipment*, at paragraph (b)(1), states that "[e]lectrical equipment shall be [examined to ensure that it is] free from recognized hazards that are likely to cause death or serious physical harm to employees. Safety of equipment shall be determined using the following considerations: ... (vii) [c]lassification by type, size, voltage, current capacity and specific use; and (viii) [o]ther factors that contribute to the practical safeguarding of person likely to come in contact with the equipment."

Title 29 C.F.R. § 1910.303(e), *Marking*, at subparagraph (1), states that "[e]lectric equipment may not be used unless the following markings have been placed on the equipment: (i) [t]he manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product may be identified; [and] (ii) [o]ther markings giving voltage, current, wattage, or other rating as necessary."

NFPA 70E, Section 110.7(A), *General*, states that "[t]he employer shall implement an overall electrical safety program that directs activity appropriate for the voltage, energy level, and circuit conditions." Section 110.7(F), *Hazard/Risk Evaluation Procedure*, states that "[a]n electrical safety program shall identify a hazard/risk evaluation procedure to be used before work is started on or near live parts operating at 50 volts or more or where an electrical hazard exists."

Contrary to these requirements, LANS failed to implement LANL electrical safety program provisions that required electrical safety subject matter expert review of electrical safety equipment hazards and controls. Specific examples are listed below:

- A. LANS did not ensure that work activities with exposure to electrical hazards were reviewed by appropriate subject matter experts before granting authorization to start work and did not implement the electrical-safety related work practices required by P101-13 to prepare and conduct work on or near high voltage electrical components. P101-13 contains LANL requirements for implementing 10 C.F.R. Part 851, appendix A(10), 29 C.F.R. Part 1910, Subpart S, and NFPA 70E. The following elements of the LANL electrical safety program were not implemented by IAT Division personnel:
 - IAT did not ensure that the organization's electrical safety officer (ESO) participated in identifying and analyzing hazards for the trainer assembly/disassembly activity. P300 defines the requirements and process for identifying and analyzing workplace hazards and the use of subject matter experts to assist in this process. P300 requires a subject matter expert to evaluate "moderate" hazard work by participating in the IWD review or approving the work, and P101-13 contains requirements for review and approval of IWD's involving electrical work by the electrical safety officers assigned to an organization.
 - 2. IAT did not ensure that an ESO inspected and approved the trainer for the assembly and disassembly activity before use by workers. P101-13 states that all electrical equipment that contains or produces hazardous energy used at LANL must be NRTL listed or approved by an ESO and labeled before use.
 - 3. IAT did not ensure that an ESO evaluated and accepted the hazard abatement measures and engineering controls incorporated into the high voltage fireset. The room temperature vulcanized silicone rubber applied to the resistor component of the fireset was not an appropriate and comprehensive means to protect workers from a potential electric shock.
 - 4. IAT did not ensure that workers performed work on or near energized electrical components of the fireset only when authorized by an IWD.

B. LANS did not restrict the approach of workers to the allowable approach boundary distances in P101-13 for a fireset equipped with a 3,570 volt DC battery that was not placed in an electrically safe work condition.

Collectively these deficiencies constitute a Severity Level II violation. As explained in Part 851, appendix B, section VI(b)(2), "[a] Severity Level II violation is an other-thanserious violation. An other-than-serious violation occurs where the most serious injury or illness that would potentially result from a hazardous condition cannot reasonably be predicted to cause death or serious physical harm to employees but does have a direct relationship to their safety and health."

Proposed Civil Penalty - \$26,250

REPLY

Pursuant to the provisions of 10 C.F.R. § 851.42, LANS is hereby obligated, within 30 calendar days of receipt of this PNOV, to submit a written reply. The reply should be clearly marked as a "Reply to the Preliminary Notice of Violation."

If LANS elects not to contest any aspect of this PNOV, including the alleged violations contained herein; and agrees to comply with the proposed remedy, then the reply should state that LANS waives any right to contest this PNOV and the proposed remedy. In such cases, the civil penalty of \$131,250 must be paid within 30 calendar days after receipt of this PNOV by check, draft, or money order payable to the Treasurer of the United States (Account 891099) and mailed to the address provided below. This PNOV will constitute a final order upon the filing of the reply and receipt of payment.

If LANS disagrees with any aspect of this PNOV or the proposed civil penalty, then as applicable and in accordance with 10 C.F.R. § 851.42(c)(1), the reply must: "(i) [s]tate any facts, explanations and arguments that support a denial of the alleged violation; (ii) [d]emonstrate any extenuating circumstances or other reason why the proposed remedy should not be imposed or should be mitigated; (iii) [d]iscuss the relevant authorities that support the position asserted, including rulings, regulations, interpretations, and previous decisions issued by DOE." In addition, 10 C.F.R. § 851.42(c)(2) requires that "[c]opies of all relevant documents must be submitted with the reply."

Corrective actions that have been or will be taken to avoid further violations should be delineated with target and completion dates in DOE's Noncompliance Tracking System.

Please send the appropriate reply by overnight carrier to the following address:

Director, Office of Enforcement Attention: Office of the Docketing Clerk U.S. Department of Energy 19901 Germantown Road Germantown, MD 20874-1290 A copy of the reply should also be sent to my office and the Manager of the Los Alamos Site Office.

Pursuant to 10 C.F.R. § 851.42(d), if LANS does not submit a written reply within 30 calendar days of receipt of this PNOV, LANS relinquishes any right to appeal any matter in this PNOV and this PNOV, including the proposed remedy, will constitute a final order.

Thomas P. D'Agostino ostine

Administrator National Nuclear Security Administration

Washington, DC this /8 day of 0c7,2010