FORMS/ETC.

Site Access Training (H-100)

TODE = DDE + CDE

Total Organ Dose Equivalent (TODE)

The sum of the DDE and the CDE to an organ or tissue.

Deep-dose Equivalent (DDE)

The dose equivalent at a tissue depth of 1 cm. (Applies to external whole-body exposure.)

Committed Dose Equivalent (CDE)

The dose equivalent to organs or tissues of reference that will be received from an intake of radioactive material by an individual during the fifty-year period following the intake.

TEDE = EDEX + CEDE
where CEDE = CDE x Wt

Total Effective Dose Equivalent (TEDE)

The sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures). TEDE = EDEX + CEDE

Weighting Factor

For an organ or tissue, the proportion of the risk of stochastic effects when the whole body is irradiated uniformly.

Effective Dose Equivalent (for External Exposures) (EDEX)

The dose equivalent at a tissue depth of 1 cm. (Applies to external whole-body exposure.)

Committed Effective Dose Equivalent (CEDE)

The sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the CDE to these organs or tissues.

The exposure limit for whole body exposures is lower than that for a single organ because all organs and tissues are exposed in a whole body exposure, while only a single organ is involved in the single organ exposure limits. The risk to the organ is incorporated in the exposure calculations which must be done if organs or tissues are exposed.

New dose quantities were incorporated in the 10 CFR 20 law which took effect on 1/1/94. Notice that each of the following quantities are types of dose equivalents. The following definitions describe the new quantities. (Note: the types of doses are quantities; the units used for these quantities are the rem or the Sievert.)

•**DE: Dose Equivalent**. The product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and sievert.

•**CDE: Committed Dose Equivalent**. Means the dose equivalent to organs or tissues of reference that will be received from an intake of radioactive materials by an individual during the 50 year period following the intake.

•**EDE: Effective Dose Equivalent**. It is the sum of the products of the dose equivalent to the organ or tissue and the weighting factors applicable to each of the body organs or tissues that are irradiated.

•**CEDE: Committed Effective Dose Equivalent**. It is the sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues.

•**DDE: Deep Dose Equivalent**. Applies to external whole-body exposure. It is the dose equivalent at a tissue depth of 1 centimeter (1000 mg/cm2).

•**TODE: Total Organ Dose Equivalent**. The sum of the CDE and DDE for the maximally exposed organ.

•**SDE: Shallow Dose Equivalent**. Applies to the external exposure of the skin or an extremity, is taken as the dose equivalent at a tissue depth of 0.007 centimeter (7 mg/cm2), averaged over an area of 1 square centimeter.

•**LDE: Lens of Eye Dose Equivalent**. Applies to the external exposure of the lens of the eye and is taken as the dose equivalent at tissue depth of 0.3 centimeter (300 mg/cm2).

•**TEDE: Total Effective Dose Equivalent**. The sum of the deep dose equivalent (for external exposures) and the committed dose equivalent (for internal exposures).

Reference Man is a hypothetical aggregation of human physical and physiological characteristics arrived at by international consensus used to relate biological insult to a common base.

NRC FORM 3
(10-2008)

UNITED STATES NUCLEAR REGULATORY COMMISSION
Washington, DC 20555-0001

NOTICE TO EMPLOYEES

STANDARDS FOR PROTECTION AGAINST RADIATION (PART 20); NOTICES, INSTRUCTIONS AND REPORTS TO WORKERS; INSPECTIONS (PART 19); EMPLOYEE PROTECTION

WHAT IS THE NUCLEAR REGULATORY COMMISSION?

The Nuclear Regulatory Commission is an independent Federal regulatory agency responsible for licensing and inspecting nuclear power plants and other commercial uses of radioactive materials.

WHAT DOES THE NRC DO?

The NRC's primary responsibility is to ensure that workers and the public are protected from unnecessary or excessive exposure to radiation and that nuclear facilities, including power plants, are constructed to high quality standards and operated in a safe and secure manner. The NRC does this by establishing requirements in Title 10 of the Code of Federal Regulations (10 CFR) and in licenses issued to nuclear users.

WHAT RESPONSIBILITY DOES MY EMPLOYER HAVE?

Any company that conducts activities licensed by the NRC must comply with the NRC's requirements. If a company violates NRC requirements, it can be fined or have its license modified, suspended or revoked.

Your employer must tell you which NRC radiation requirements apply to your work and must post NRC Notices of Violation involving radiological working conditions.

WHAT IS MY RESPONSIBILITY?

For your own protection and the protection of your co-workers, you should know how NRC requirements relate to your work and should follow them. If you observe violations of the requirements or have a safety concern, you should report them.

WHAT IF I CAUSE A VIOLATION?

If you engaged in deliberate misconduct that may cause a violation of the NRC requirements, or would have caused a violation if it had not been detected, or deliberately provided inaccurate or incomplete information to either the NRC or to your employer, you may be subject to enforcement action. If you report such a violation, the NRC will consider the circumstances surrounding your reporting in determining the appropriate enforcement action, if any.

HOW DO I REPORT VIOLATIONS AND SAFETY CONCERNS?

If you believe that violations of NRC rules or the terms of the license have occurred, or if you have a safety concern, you should report them immediately to your supervisor. You may report violations or safety concerns directly to the NRC. However, the NRC encourages you to raise your concerns with the licensee since the licensee has the primary responsibility for, and is most able to ensure, safe operation of nuclear facilities. If you choose to report your concern directly to the NRC, you may report it to an NRC inspector or call or write to the NRC Regional Office serving your area. If you send your concern in writing, it will assist the NRC in protecting your identity if you clearly state in the beginning of your letter that you have a safety concern. The NRC's toll-free SAFETY HOTLINE for reporting safety concerns is listed below. The addresses for the NRC Regional Offices and the toll-free telephone numbers are also listed below. You can also e-mail safety concerns to NRC.Allegation@nrc.gov.

WHAT IF I WORK WITH RADIOACTIVE MATERIAL OR IN THE VICINITY OF A RADIOACTIVE SOURCE?

If you work with radioactive materials or near a radiation source, the amount of radiation exposure that you are permitted to receive may be limited by NRC regulations. The limits on exposure for workers at NRC licensed facilities whose duties involve exposure to radiation are contained in sections 20.1201, 20.1207, and 20.1208 of Title 10 of the Code of Federal Regulations (10 CFR 20) depending on the part of the regulations to which your employer is subject. While these are the maximum allowable limits, your employer should also keep your radiation exposure as far below those limits as is "reasonably achievable."

MAY I GET A RECORD OF MY RADIATION EXPOSURE?

Yes. Your employer is required to make available to you the information in your dose records (as maintained under the provisions of 10 CFR 20.2106). In addition your employer is required to provide you with an annual report of the dose you received in that monitoring year if the dose exceedes 100 millirem, or if you request an annual report.

HOW ARE VIOLATIONS OF NRC REQUIREMENTS IDENTIFIED?

NRC conducts regular inspections at licensed facilities to assure compliance with NRC requirements. In addition, your employer and site contractors may conduct their own inspections to assure compliance. All inspectors are protected by Federal law. Interference with them may result in criminal prosecution for a Federal offense.

MAY I TALK WITH AN NRC INSPECTOR?

Yes. NRC inspectors want to talk to you if you are worried about radiation safety or have other safety concerns about licensed activities, such as the quality of construction or operations at your facility. Your employer may not prevent you from talking with an inspector. The NRC will make all reasonable efforts to protect your identity where appropriate and possible.

MAY I REQUEST AN INSPECTION?

Yes. If you believe that your employer has not corrected violations involving radiological working conditions, you may request an inspection. Your request should be addressed to the nearest NRC Regional Office and must describe the alleged violation in detail. It must be signed by you or your representative.

HOW DO I CONTACT THE NRC?

Talk to an NRC inspector on-site or call or write to the nearest NRC Regional Office in your geographical area (see map below). If you call the NRC's toll-free SAFETY HOTLINE during normal business hours, your call will automatically be directed to the NRC Regional Office for your geographical area. If you call after normal business hours, your call will be directed to the NRC's Headquarters Operations Center, which is manned 24 hours a day. You can also e-mail safety concerns to NRC.Allegation@nrc.gov.

CAN I BE FIRED FOR RAISING A SAFETY CONCERN?

Federal law prohibits an employer from firing or otherwise discriminating against you for bringing safety concerns to the attention of your employer or the NRC. You may not be fired or discriminated against because you engage in certain protected activities, including but not limited to,

- asking the NRC to enforce its rules against your employer;
- refusing to engage in activities which violate NRC requirements;
- providing information or preparing to provide information to the NRC or your employer about violations of requirements or safety concerns; or
- asking for, or testifying, helping, or taking part in an NRC, Congressional, or any Federal or State proceeding.

WHAT FORMS OF DISCRIMINATION ARE PROHIBITED?

It is unlawful for an employer to fire you or discriminate against you with respect to pay, benefits, or working conditions because you help the NRC or raise a safety issue or otherwise engage in protected activities. Violations of Section 211 of the Energy Reorganization Act (ERA) of 1974 (42 U.S.C. 5851) include actions such as harassment, blacklisting, and intimidation by employers of (i) employees who bring safety concerns directly to their employers or to the NRC; (ii) employees who have refused to engage in an unlawful practice, provided that the employee has identified the illegality to the employer; (iii) employees who have testified or are about to testify before Congress or in any Federal or State proceeding regarding any provision (or proposed provision) of the ERA or the Atomic Energy Act (AEA) of 1954; or (iv) employees who have commenced or caused to be commenced a proceeding for the administration or enforcement of any requirement imposed under the ERA or AEA or who have, or are about to, testify, assist, or participate in such a proceeding.

HOW DO I FILE A DISCRIMINATION COMPLAINT?

If you believe that you have been discriminated against for bringing violations or safety concerns to the NRC or your employer, you may file a complaint with the NRC, the U.S. Department of Labor (DOL), or appropriate state entities. If you desire a personal remedy, a complaint may be filed with the DOL pursuant to Section 211 of the ERA or with appropriate state entities. Your complaint to the DOL must describe in detail the basis for your belief that the employer discriminated against you on the basis of your protected activity, and it must be filed in writing either in person or by mail within 180 days of the date of the alleged discriminatory action or the date you received any notice, in writing or otherwise, of an adverse personnel action, whichever occured first. Additional information is available at the DOL web site at www.osha.gov. Filing an allegation, complaint, or request for action with the NRC does not extend the requirement to file a complaint with the DOL within 180 days. To do so, you may contact the Allegation Coordinator in the appropriate NRC Region, as listed below, who will provide you with the address and telephone number of the correct OSHA Regional office to receive your complaint. You may also check your local telephone directory under the U.S. Government listings for the address and telephone number of the appropriate OSHA Regional office.

WHAT CAN THE DEPARTMENT OF LABOR DO?

If your complaint involves a violation of Section 211 of the ERA by your employer, the DOL provides a process for obtaining a personal remedy. The DOL will notify your employer that a complaint has been filed and will investigate your complaint.

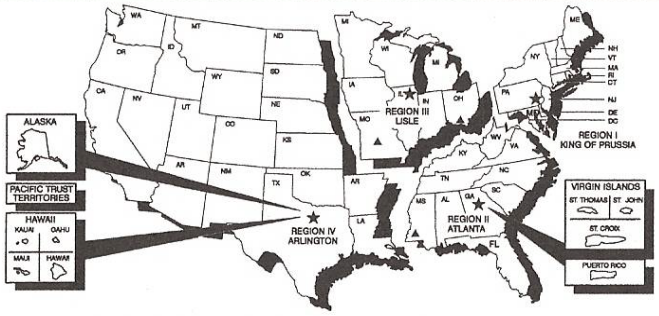
If the DOL finds that your employer has unlawfully discriminated against you, it may order that you be reinstated, receive back pay, or be compensated for any injury suffered as a result of the discrimination and be paid attorney's fees and costs.

Relief will not be awarded to employees who engage in deliberate violations of the Energy Reorganization Act or the Atomic Energy Act.

WHAT WILL THE NRC DO?

The NRC will evaluate each allegation of harassment, intimidation, or discrimination to determine whether sufficient information exists to initiate an investigation. Following this evaluation, an investigator from the NRC's Office of Investigations may interview you and review available documentation. Based on the evaluation, and, if applicable, the interview, the NRC will assign a priority and a decision will be made whether to pursue the matter further through an investigation. The assigned priority is based on the specifics of the case. The NRC may not pursue an investigation of low priority cases to the point that a conclusion can be made whether the harassment, intimidation, or discrimination actually occurred. Even if NRC decides not to pursue an investigation, if you have filed a complaint with the DOL, the NRC will monitor the results of the DOL investigation.

If the NRC or the DOL finds that unlawful discrimination has occurred, the NRC may issue a Notice of Violation to your employer, impose a fine, or suspend, modify, or revoke your employer's NRC license.



▲ - Callaway Plant Site in Missouri and Grand Gulf Plant Site in Mississippi are under the purview of Region IV. The Portsmouth Gaseous Diffusion Plant in Ohio is under the purview of Region II.

UNITED STATES NUCLEAR REGULATORY COMMISSION REGIONAL OFFICE LOCATIONS

A representative of the Nuclear Regulatory Commission can be contacted by employees who wish to register complaints or concerns about radiological working conditions or other matters regarding compliance with Commission rules and regulations at the following addresses and telephone numbers.

REGIONAL OFFICES

REGION	ADDRESS	TELEPHONE
I	U.S. Nuclear Regulatory Commission, Region I 475 Allendale Road King of Prussia, PA 19406-1415	(800) 432-1156
II	U.S. Nuclear Regulatory Commission, Region II Sam Nunn Atlanta Federal Center 61 Forsyth Street, S.W., Suite 23T85 Atlanta, GA 30303-8931	(800) 577-8510
III	U.S. Nuclear Regulatory Commission, Region III 2443 Warrenville Road, Suite 210 Lisle, IL 60532-4352	(800) 522-3025
IV	U.S. Nuclear Regulatory Commission, Region IV 612 East Lamar Blvd., Suite 400 Arlington, TX 76011-4125	(800) 952-9677

To report safety concerns or violations of NRC requirements by your employer,

telephone:

NRC SAFETY HOTLINE

1-800-695-7403

To report incidents involving fraud, waste, or abuse by an NRC employee or NRC contractor,

telephone:

OFFICE OF THE INSPECTOR GENERAL HOTLINE

1-800-233-3497

NRC FORM 4
(1-2008)
10 CFR PART 20

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO.3150-0005 EXPIRES: 11/30/2010

Estimated burden per response to comply with this mandatory collection request: 30 minutes. This information is required to record an individual's lifetime occupational exposure to radiation to ensure that the cumulative exposure to radiation does not exceed regulatory limits. Send comments regarding burden estimate to the Records and FOIA/Privacy Services Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0005), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

CUMULATIVE OCCUPATIONAL DOSE HISTORY

1. NAME (LAST, FIRST, MIDDLE INITIAL)	2. IDENTIFICATION NUMBER	3. ID TYPE	4. SEX ☐ MALE ☐ FEMALE	5. DATE OF BIRTH (MM/DD/YYYY)

6. MONITORING PERIOD (MM/DD/YYYY - MM/DD/YYYY)		7. LICENSEE NAME		8. LICENSE NUMBER		9. ☐ RECORD ☐ ESTIMATE ☐ NO RECORD	10. ☐ ROUTINE ☐ PSE
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD (MM/DD/YYYY - MM/DD/YYYY)		7. LICENSEE NAME		8. LICENSE NUMBER		9. ☐ RECORD ☐ ESTIMATE ☐ NO RECORD	10. ☐ ROUTINE ☐ PSE
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD (MM/DD/YYYY - MM/DD/YYYY)		7. LICENSEE NAME		8. LICENSE NUMBER		9. ☐ RECORD ☐ ESTIMATE ☐ NO RECORD	10. ☐ ROUTINE ☐ PSE
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD (MM/DD/YYYY - MM/DD/YYYY)		7. LICENSEE NAME		8. LICENSE NUMBER		9. ☐ RECORD ☐ ESTIMATE ☐ NO RECORD	10. ☐ ROUTINE ☐ PSE
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD (MM/DD/YYYY - MM/DD/YYYY)		7. LICENSEE NAME		8. LICENSE NUMBER		9. ☐ RECORD ☐ ESTIMATE ☐ NO RECORD	10. ☐ ROUTINE ☐ PSE
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD (MM/DD/YYYY - MM/DD/YYYY)		7. LICENSEE NAME		8. LICENSE NUMBER		9. ☐ RECORD ☐ ESTIMATE ☐ NO RECORD	10. ☐ ROUTINE ☐ PSE
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE

19. SIGNATURE OF MONITORED INDIVIDUAL	20. DATE SIGNED	21. CERTIFYING ORGANIZATION	22. SIGNATURE OF DESIGNEE	23. DATE SIGNED

INSTRUCTIONS AND ADDITIONAL INFORMATION PERTINENT TO THE COMPLETION OF NRC FORM 4

(All doses should be stated in rems)

1. Type or print the full name of the monitored individual in the order of last name (include "Jr," "Sr," "III," etc.), first name, middle initial (if applicable).

2. Enter the individual's identification number, including punctuation. This number should be the 9-digit social security number if at all possible. If the individual has no social security number, enter the number from another official identification such as a passport or work permit.

3. Enter the code for the type of identification used as shown below:

CODE	ID TYPE
SSN	U.S. Social Security Number
PPN	Passport Number
CSI	Canadian Social Insurance Number
WPN	Work Permit Number
PADS	PADS Identification Number
OTH	Other

4. Check the box that denotes the sex of the individual being monitored.

5. Enter the date of birth of the individual being monitored in the format MM/DD/YYYY.

6. Enter the monitoring period for which this report is filed. The format should be MM/DD/YYYY - MM/DD/YYYY.

7. Enter the name of the licensee or facility not licensed by NRC that provided monitoring.

8. Enter the NRC license number or numbers.

9. Place an "X" in Record, Estimate, or No Record. Choose "Record" if the dose data listed represent a final determination of the dose received to the best of the licensee's knowledge. Choose "Estimate" only if the listed dose data are preliminary and will be superseded by a final determination resulting in a subsequent report. An example of such an instance would be dose data based on self-reading dosimeter results and the licensee intends to assign the record dose on the basis of TLD results that are not yet available. If the individual or an organization has indicated that the individual was monitored, but the monitoring records could not be obtained, enter "No Record" for this monitoring period. The individual would not be available for a PSE. For monitoring periods during the current year where records are not available, reduce the individual's allowable dose by 1.25 rems for each quarter for which records were unavailable as required by 10 CFR 20.2104(e)(1).

10. Place an "X" in either Routine or PSE. Choose "Routine" if the data represent the results of monitoring for routine exposures. Choose "PSE" if the listed dose data represents the results of monitoring of planned special exposures received during the monitoring period.

11. Enter the deep dose equivalent (DDE) to the whole body.

12. Enter the eye dose equivalent (LDE) recorded for the lens of the eye.

13. Enter the shallow dose equivalent recorded for the skin of the whole body (SDE,WB).

14. Enter the shallow dose equivalent recorded for the skin of the extremity receiving the maximum dose (SDE,ME).

15. Enter the committed effective dose equivalent (CEDE).

16. Enter the committed dose equivalent (CDE) recorded for the maximally exposed organ.

17. Enter the total effective dose equivalent (TEDE). The TEDE is the sum of items 11 and
18. 15.

    Enter the total organ dose equivalent (TODE) for the maximally exposed organ. The TODE
19. is the sum of items 11 and 16.

    Signature of the monitored individual. The signature of the monitored individual on this form indicates that the information contained on the form is complete and correct to the best
20. of his or her knowledge.

    Enter the date this form was signed by the
21. monitored individual.

    [OPTIONAL] Enter the name of the licensee or facility not licensed by NRC, providing monitoring for exposure to radiation (such as a DOE facility) or the employer if the individual is not employed by the licensee and the employer chooses to maintain exposure
22. records for its employees.

    [OPTIONAL] Signature of the person designated to represent the licensee or employer entered in item 21. The licensee or employer who chooses to countersign the form should have on file documentation of all the
23. information on the NRC Form 4 being signed.

    [OPTIONAL] Enter the date this form was signed by the designated representative.

PRIVACY ACT STATEMENT

Pursuant to 5 U.S.C. 552a(e)(3), enacted into law by Section 3 of the Privacy Act of 1974 (Public Law 93-579), the following statement is furnished to individuals who supply information to the U.S. Nuclear Regulatory Commission (NRC) on NRC Form 4. This information is maintained in a system of records designated as NRC-27 and described at 71 Federal Register 59634 (October 10, 2006), or the most recent Federal Register publication of the NRC's Systems of Records Notices that is located in NRC's Agencywide Documents Access and Management System (ADAMS).

1. **AUTHORITY:** 5 U.S.C. 7902; 29 U.S.C. 668; 42 U.S.C. 2051, 2073, 2093, 2095, 2111, 2133, 2134, and 2201(o); 10 CFR 20.2106, 20.2201-20.2204, and 20.2206; Executive Order (E.O.) 9397; E.O. 12196, as amended by E.O.s 12223, 12608; E.O. 12258; E.O. 12399; E.O. 12489; E.O. 12534; E.O. 12610; E.O. 12692.

2. **PRINCIPAL PURPOSE(S):** The information is used by the NRC in its evaluation of the risk of radiation exposure associated with the licensed activity and in exercising its statutory responsibility to monitor and regulate the safety and health practices of its licensees. The data permits a meaningful comparison of both current and long-term exposure experience among types of licensees and among licensees within each type. Data on your exposure to radiation is available to you upon your request.

3. **ROUTINE USE(S):** The information may be used to provide data to other Federal and State agencies involved in monitoring and/or evaluating radiation exposure received by individuals monitored for radiation exposure while employed by or visiting or temporarily assigned to certain NRC licensed facilities; to return data provided by licensee upon request. Information may be disclosed in accordance with any of the Routine Uses listed in the Prefatory Statement of General Routine Uses, including to an appropriate Federal, State, local or Foreign agency in the event the information indicates a violation or potential violation of law; in the course of an administrative or judicial proceeding; to an appropriate Federal, State, local and foreign agency to the extent relevant and necessary for an NRC decision about you or to the extent relevant and necessary for that agency's decision about you; in the course of discovery under a protective order issued by a court of competent jurisdiction, and in presenting evidence; to a Congressional office to respond to their inquiry made at your request; to NRC-paid experts, consultants, and others under contract with the NRC, on a need-to-know basis; or to appropriate persons and entities for purposes of response and remedial efforts in the event of a suspected or confirmed breach of data from this system of records.

4. **WHETHER DISCLOSURE IS MANDATORY OR VOLUNTARY AND EFFECT ON INDIVIDUAL OF NOT PROVIDING INFORMATION:** It is voluntary that you furnish the requested information, including the Social Security number (SSN) in block #2. The SSN is used to assure that NRC has an accurate identifier not subject to the coincidence of similar names or birth dates among the large number of persons on who data is maintained and to assure that there are no missed doses or monitoring periods and an individual gets a complete dose history when requested. The licensee must complete NRC Form 5 on each individual for whom personnel monitoring is required under 10 CFR 20.2106. Failure to do so may subject the licensee to enforcement action in accordance with 10 CFR 20.2401.

5. **SYSTEM MANAGER AND ADDRESS**: REIRS Project Manager, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

NRC FORM 5
(10-2001)
10 CFR PART 20

U.S. NUCLEAR REGULATORY COMMISSION

OCCUPATIONAL DOSE RECORD FOR A MONITORING PERIOD

APPROVED BY OMB NO. 3150-0006 EXPIRES: 10/31/2004

1. NAME (LAST, FIRST, MIDDLE INITIAL)	2. IDENTIFICATION NUMBER	3. ID TYPE	4. SEX	5. DATE OF BIRTH (MM/DD/YYYY)
			☐ MALE ☐ FEMALE	

6. MONITORING PERIOD (MM/DD/YYYY - MM/DD/YYYY)	7. LICENSEE NAME	8. LICENSE NUMBER(S)	9A.	9B.
			☐ RECORD	☐ ROUTINE
			☐ ESTIMATE	☐ PSE

INTAKES

10A. RADIONUCLIDE	10B. CLASS	10C. MODE	10D. INTAKE IN μCi

DOSES (in rem)

DEEP DOSE EQUIVALENT (DDE)	11.
LENS (EYE) DOSE EQUIVALENT (LDE)	12.
SHALLOW DOSE EQUIVALENT, WHOLE BODY (SDE,WB)	13.
SHALLOW DOSE EQUIVALENT, MAX EXTREMITY (SDE,ME)	14.
COMMITTED EFFECTIVE DOSE EQUIVALENT (CEDE)	15.
COMMITTED DOSE EQUIVALENT, MAXIMALLY EXPOSED ORGAN (CDE)	16.
TOTAL EFFECTIVE DOSE EQUIVALENT (ADD BLOCKS 11 AND 15) (TEDE)	17.
TOTAL ORGAN DOSE EQUIVALENT, MAX ORGAN (ADD BLOCKS 11 AND 16) (TODE)	18.

19. COMMENTS

20. SIGNATURE -- LICENSEE	21. DATE PREPARED

INSTRUCTIONS AND ADDITIONAL INFORMATION PERTINENT TO THE COMPLETION OF NRC FORM 5

(All doses should be stated in rems)

1. Type or print the full name of the monitored individual in the order of last name (include "Jr," "Sr," "III," etc.), first name, middle initial (if applicable).

2. Enter the individual's identification number, including punctuation. This number should be the 9-digit social security number if at all possible. If the individual has no social security number, enter the number from another official identification such as a passport or work permit.

3. Enter the code for the type of identification used as shown below:

CODE	ID TYPE
SSN	U.S. Social Security Number
PPN	Passport Number
CSI	Canadian Social Insurance Number
WPN	Work Permit Number
PADS	PADS Identification Number
OTH	Other

4. Check the box that denotes the sex of the individual being monitored.

5. Enter the date of birth of the individual being monitored in the format MM/DD/YYYY.

6. Enter the monitoring period for which this report is filed. The format should be MM/DD/YYYY - MM/DD/YYYY.

7. Enter the name of the licensee.

8. Enter the NRC license number or numbers.

9A. Place an "X" in Record, Estimate, or No Record. Choose "Record" if the dose data listed represent a final determination of the dose received to the best of the licensee's knowledge. Choose "Estimate" only if the listed dose data are preliminary and will be superseded by a final determination resulting in a subsequent report. An example of such an instance would be dose data based on self-reading dosimeter results and the licensee intends to assign the record dose on the basis of TLD results that are not yet available.

9B. Place an "X" in either Routine or PSE. Choose "Routine" if the data represent the results of monitoring for routine exposures. Choose "PSE" if the listed dose data represents the results of monitoring of planned special exposures received during the monitoring period. If more than one PSE was received in a single year, the licensee should sum them and report the total of all PSEs.

10A. Enter the symbol for each radionuclide that resulted in an internal exposure recorded for the individual, using the format "Xx-###x," for instance, Cs-137 or Tc-99m.

10B. Enter the lung clearance class as listed in Appendix B to 10 CFR Part 20.1001-2401 (D, W, Y, V, or O for other) for all intakes by inhalation.

10C. Enter the mode of intake. For inhalation, enter "H." For absorption through the skin, enter "B." For oral ingestion, enter "G." For injection, enter "J."

10D. Enter the intake of each radionuclide in μCi.

11. Enter the deep dose equivalent (DDE) to the whole body.

12. Enter the eye dose equivalent (LDE) recorded for the lens of the eye.

13. Enter the shallow dose equivalent recorded for the skin of the whole body (SDE,WB).

14. Enter the shallow dose equivalent recorded for the skin of the extremity receiving the maximum dose (SDE,ME).

15. Enter the committed effective dose equivalent (CEDE).

16. Enter the committed dose equivalent (CDE) recorded for the maximally exposed organ.

17. Enter the total effective dose equivalent (TEDE). The TEDE is the sum of items 11 and 15.

18. Enter the total organ dose equivalent (TODE) for the maximally exposed organ. The TODE is the sum of items 11 and 16.

19. COMMENTS.
In the space provided, enter additional information that might be needed to determine compliance with limits. An example might be to enter the note that the SDE,ME was the result of exposure from a discrete hot particle. Another possibility would be to indicate that an overexposed report has been sent to NRC in reference to the exposure report.

20. Signature of the person designated to represent the licensee.

21. Enter the date this form was prepared.

PRIVACY ACT STATEMENT

Pursuant to 5 U.S.C. 552a(e)(3), enacted into law by Section 3 of the Privacy Act of 1974 (Public Law 93-579), the following statement is furnished to individuals who supply information to the U.S. Nuclear Regulatory Commission (NRC) on NRC Form 5. This information is maintained in a system of records designated as NRC-27 and described at 65 Federal Register 56434 (September 18, 2000), or the most recent Federal Register publication of the NRC's "Republication of Systems of Records Notices" that is available at the NRC Public Document Room, 11555 Rockville Pike, Rockville, Maryland or located in NRC's Agencywide Documents Access and Management System (ADAMS).

1. **AUTHORITY:** 42 U.S.C. 2073, 2093, 2095, 2111, 2133, 2134, and 2201(o) (1996); 10 CFR 20.2106, 20.2201-20.2204, and 20.2206 (2000); Executive Order 9397, November 22, 1943.

2. **PRINCIPAL PURPOSE(S):** The information is used by the NRC in its evaluation of the risk of radiation exposure associated with the licensed activity and in exercising its statutory responsibility to monitor and regulate the safety and health practices of its licensees. The data permits a meaningful comparison of both current and long-term exposure experience among types of licensees and among licensees within each type. Data on your exposure to radiation is available to you upon your request.

3. **ROUTINE USE(S):** The information may be used to provide data to other Federal and State agencies involved in monitoring and/or evaluating radiation exposure received by individuals monitored for radiation exposure while employed by or visiting or temporarily assigned to certain NRC licensed facilities; to return data provided by licensee upon request. The information may also be disclosed to an appropriate Federal, State, local or Foreign agency in the event the information indicates a violation or potential violation of law and in the course of an administrative or judicial proceeding. In addition, this information may be transferred to an appropriate Federal, State, local and Foreign agency to the extent relevant and necessary for an NRC decision about you or to the extend relevant and necessary for that agency's decision about you. Information from this form may also be disclosed, in the course of discovery and in presenting evidence, to a Congressional office to respond to their inquiry made at your request, or to NRC-paid experts, consultants, and others under contract with the NRC, on a need-to-know basis.

4. **WHETHER DISCLOSURE IS MANDATORY OR VOLUNTARY AND EFFECT ON INDIVIDUAL OF NOT PROVIDING INFORMATION:** It is voluntary that you furnish the requested information, including social security number (identification number); however, the licensee must complete NRC Form 5 on each individual for whom personnel monitoring is required under 10 CFR 20.2106. Failure to do so may subject the licensee to enforcement action in accordance with 10 CFR 20.2401. The social security number (identification number) is used to assure that NRC has an accurate identifier not subject to the coincidence of similar names or birth dates among the large number of persons on who data is maintained.

5. **SYSTEM MANAGER(S) AND ADDRESS:**
REIRS Project Manager
Radiation Protection and Health Effects Branch
Division of Regulatory Applications
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

EQUIVALENT NRC FORM 5
10 CFR 20

ANNUAL OCCUPATIONAL RADIATION EXPOSURE REPORT

CALVERT CLIFFS NUCLEAR POWER PLANT 1650 CALVERT CLIFFS PARKWAY LUSBY, MD 20657

IDENTIFICATION NUMBER / TYPE

123456789 SSN

TO: JONES MICHAEL A
12345 IVY AVENUE

SMALLTOWN, US 98765

INTAKE FOR YEAR: 2007

NUCLIDE	CLASS	MODE	INTAKE, in uCi

ITEM 7 THROUGH 10 ON THE ATTACHED REPORT LIST EXTERNAL DOSE TO THE WHOLE BODY(DDE), EYE DOSE (LDE),SKIN DOSE-WHOLE BODY (SDE,WB), AND SKIN DOSE EXTREMITY (SDE,ME).

ITEM 11 AND 12 LIST INTERNAL WHOLE BODY DOSE(CEDE) AND ORGAN DOSE(CDE), RESPECTIVELY.

ITEM 13 AND 14 PRESENT YOUR TOTAL DOSE FOR THE PERIOD OF TIME SHOWN.

ITEM 13 IS THE SUM OF ITEM 7 (EXTERNAL WHOLE BODY DOSE) AND ITEM 11 (INTERNAL WHOLE BODY DOSE), WHILE ITEM 14 IS THE SUM OF ITEM 7 (EXTERNAL WHOLE BODY DOSE) AND ITEM 12 (INTERNAL ORGAN DOSE).

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION REQUEST: MINUTES. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714). U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0005), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

THIS REPORT IS FURNISHED TO YOU UNDER THE PROVISIONS OF THE NUCLEAR REGULATORY COMMISSION REGULATIONS IN 10CFR19. YOU SHOULD PRESERVE THIS REPORT FOR FUTURE REFERENCE.

HEALTH PHYSICS (Signature on File)

DATE OF REPORT:
April 08, 2008

EQUIVALENT NRC FORM 5
10 CFR 20

ANNUAL OCCUPATIONAL RADIATION EXPOSURE REPORT

CALVERT CLIFFS NUCLEAR POWER PLANT 1650 CALVERT CLIFFS PARKWAY LUSBY, MD 20657

CONSTELLATION ENERGY LICENSEE # DPR-53/DPR-69/SNM-2505

1.NAME(LAST, FIRST,	JONES MICHAEL A	2.ID/T	123456789	/ SSN	3.SEX M	4.DATE OF BIRT	2/29/1956

5.LICENSEE NAME /LICENSEE #	6.MONITORING PERIOD FROM:	TO:	7.DDE	8.LDE	9.SDE,WB	DOSE, IN REM 10.SDE,ME	11.CEDE	12.CDE	13.TEDE	14.TODE	15.R /E	16.R /P
SECTION I - CURRENT YEAR DOSE: 2007												
1. CONSTELLATION ENERGY	01/01/07	12/31/07	0.102	0.116	0.131	0.131	ND	ND	0.102	0.102	R	R
CURRENT YEAR TOTALS: ROUTINE	**********		0.102	0.116	0.131	0.131	ND	ND	0.102	0.102	***	***
PSE	**********										***	***

COMMENTS:
1. DATE OF REPORT: April 08, 2008
2. IN COLUMNS 7-14, NC = NOT CALCULATED, ND = NOT DETECTABLE, NR = NOT REQUIRED.
3. IN COLUMN 15, R = RECORD DOSE, E = ESTIMATED DOSE.
4. IN COLUMN 16, R = ROUTINE EXPOSURE, P = PLANNED SPECIAL EXPOSURE.

RADIATION WORK PERMIT Page of
CHECK IN WITH RADIATION PROTECTION BEFORE ENTRY

RWP #: 2008-0002 REV #: 1

1. JOB DESCRIPTION:
Operations Activities, Including Fuel Shuffle, in Non-High Radiation Areas

2. LOCATION: All RCAs except Containment

3. ACTIVITY: 1 Low Risk
Operations Activities, including Fuel Shuffle, in Non-High Radiation Areas

4. STOP WORK/BACK OUT:
Dose Limit: 5 mrem Dose Rate Alarm: 20 mrem/h
Component Stop Work Value(LSC): 300,000 dpm/100 cm2

Other: N/A

5. PRE-JOB BRIEF REQUIRED: No

6. RP COVERAGE REQUIRED: As Per RP
Note: N/A

7. Dress Requirements:
ANTI-Cs (contaminated areas only): As Per RP
Other (list): N/A

8. DOSIMETRY: Primary Dosimeter: Normal DLR
Secondary Dosimetry Requirements: EPD
Teledosimetry if required by Radiation Protection
Lapel Requirements: None
Other (list): N/A

9. RESPIRATORS: NONE
Other:

10. ADDITIONAL INSTRUCTIONS:
Rev 1: added evaluation for post job hydro-vac of pool.

1) EMERGENCY CONTINGENCY: In the event of an emergency, responders may enter any areas using this activity. Continuous RP coverage is required. Following closure of the emergency, responders may not enter the RCA without approval of RP Supervision.

Dose Estimate: 1.4 Person-rem

For ALARA Use Only:

RSP 1-200-9
(09/01)

RADIATION WORK PERMIT Page of
CHECK IN WITH RADIATION PROTECTION BEFORE ENTRY

RWP #: 2008-0002 REV #: 1

ACTIVITY DESCRIPTION: 1

Operations Activities, including Fuel Shuffle, in Non-High Radiation Areas

EXPECTED RADIOLOGICAL CONDITIONS

a) Work Area Dose Rates / Contamination / Airborne: See current survey data.

1. LESSONS LEARNED:

a. AIT# 200600002- Transfer of spent resin through an unshielded section of piping that was more radioactive than expected resulted in entry into an unposted high radiation area, unplanned dose, and an EPD dose rate alarm. Future transfers should be planned as radiological medium risk, walked down and potential high radiation areas and elevated dose rate areas identified and posted.

b. EPD transmitters emit signals that may have an adverse effect on plant equipment that is susceptible to Electromagnetic Interference (EMI) or Radio Frequency Interference (RFI). To protect sensitive plant equipment, EPD transmitters can not be worn in the Control Room, Cable Spreading rooms or within 2 feet of EMI/RFI susceptible equipment (for example, digital level and pressure transmitters and plant radiation monitoring system equipment).

2. PREREQUISITES:

OPS personnel are responsible for walkdowns and checklist requirements prior to fuel shuffle.

3. DOSE REDUCTIONS:

a. No Entry Allowed into posted Neutron Radiation Areas.

b. No work allowed which requires equipment to break the surface of the SFP water. Bridge moves and fuel shuffles are allowed.

4. CONTAMINATION CONTROLS:

As per Radiation Protection Tech when working around the hoist mast components.

5. DOSE MONITORING:

a. For fuel shuffle: if bridge RMS is not in service, then Area Radiation Monitoring Equipment is required. Setpoints to be determined by RP Supervision.

b. In high noise areas, use a fiber-optic tube with the EPD, if available or increase frequency of reading your EPD.

6. ENGINEERING CONTROLS:

Evaluate whether hydro-vacuuming of the SFP is required at the completion of work to remove debris resulting from the work.

7. PLANT NOTIFICATIONS:

a. Notify OPS Work Control(OWC) and Plant Chemistry prior to adding water to the SFP.

b. Notify RP for any of the following: breach,draining,resin transfer,ventilation changes.

8. RADWASTE:

N/A

9. ADDITIONAL MEASURES TO REDUCE DOSE:

Use the OPS "RMR" risk RWP 106 to transfer spent resin from any ion exchanger, unless a specific resin transfer has been risk assessed "RLR" AND permission has been received from both RP and OPS Supervision, this RWP will not be used to transfer spent resin.

	Name	Date
Work Group Task Leader:	PURVINS*DEBRA L	28-SEP-08
ALARA Coordinator:	LOPEZ*ROUELL A	25-SEP-08
Principal Radiation Safety Technician:	BALL JR*JULIAN A	25-SEP-08
Terminated:		

RSP 1-200-9
(09/01)

RADIATION WORK PERMIT Page of

CHECK IN WITH RADIATION PROTECTION BEFORE ENTRY

RWP #: 2008-0119 REV #: 0

1. **JOB DESCRIPTION:**
RAPID ENTRY INTO RADIOLOGICALLY CONTROLLED AREAS FOR LEAK IDENTIFICATION AS APPROVED BY RADIATION PROTECTION SUPERVISON/SHIFT MANAGER

2. **LOCATION:** All Radiologically Controlled Areas

3. **ACTIVITY:** 1 High Risk
Leak Identification in CTMT while at Power

4. **STOP WORK/BACK OUT:**
Dose Limit: 2000 mrem **Dose Rate Alarm:** 8000 mrem/h
Component Stop Work Value (LSC): Component Stop Work Value (LSC) Dry Normal: 30 mrad/h
Wet Normal: 300mrad/h Inspections: 3200 mrad/h

Other: Dose limit is the sum of 600 mrem gamma and 1400 mrem neutron. Workers not allowed to enter radiation fields >8000 mrem/h combined gamma and neutron.

5. **PRE-JOB BRIEF REQUIRED:** Integrated
See additional instructions.

6. **RP COVERAGE REQUIRED:** Continuous
Note: Stay Time Calculation required prior to entry.

7. **Dress Requirements:**
ANTI-Cs (contaminated areas only):
Other (list): Anti-C clothing, at the discretion of RP Supervision or Shift Manager.

8. **DOSIMETRY:** **Primary Dosimeter:** Normal DLR
Secondary Dosimetry Requirements: EPD

Lapel Requirements: Individual
Other (list): N/A

9. **RESPIRATORS:** OTHER
Other: SCBA or see page 2 #9

10. **ADDITIONAL INSTRUCTIONS:**
a. Additional Stop Work Backout Criteria:
1) Unexpected conditions outside the RWP limits.
2) Personnel emergency or EPD or Atmospheric Monitor alarms.
3) At the discretion of the Shift Manager or RP Supervision.
b. No RSS required for this entry.
c. Update brief can be conducted at the job site prior to entry by the coverage RP.

Dose Estimate: 0 Person-rem

For ALARA Use Only:

RSP 1-200-9
(09/01)

RADIATION WORK PERMIT Page of
CHECK IN WITH RADIATION PROTECTION BEFORE ENTRY

RWP #: 2008-0119 REV #: 0

ACTIVITY DESCRIPTION: 1

Leak Identification in CTMT while at Power

EXPECTED RADIOLOGICAL CONDITIONS

Work Area Neutron Dose Rates: Up to 4,000 mrem/h.
Work Area Gamma Dose Rates: Up to 8,000 mrem/h.
Work Area Contamination: 6-50k for travel path. May be greater in areas of leakage.
Work Area Airborne: See most current Air Sample Data.

Note: Utilize the "Rapid Entry Map Book" to determine the most ALARA travel path, prior to entry.

1. LESSONS LEARNED:

a. JITOE Containment Entry and Exit: Personnel injuries happened during PAL door operation when the doors were mispositioned and the interlocks failed.

2. PREREQUISITES:

N/A

3. DOSE REDUCTIONS:

a. Stay as close as possible to the outside wall of containment while performing inspection/troubleshooting.
b. Use structural components to provide shielding, when possible.

4. CONTAMINATION CONTROLS:

N/A

5. DOSE MONITORING:

a. Ensure worker YTD dose <1,000 mrem.
b. RP to verify that DLR is over the breast-bone and placed as close to the skin as possible.
c. The primary method to track dose from neutrons is for the RP Technician to monitor the neutron dose rates and relay those indications.
d. RP Technician calculates and records neutron dose IAW RSP 1-116.
e. In high background noise areas, if available, use the fiber-optic tube, or increase frequency of reading your EPD.
f. DLRs from individuals making entries are to be read after the entry.
g. Whole body counts required upon completion of work for that shift.
h. Stay times/calculations require approval of the Ops Shift Manager or RP Supervision.

6. ENGINEERING CONTROLS:

N/A

7. PLANT NOTIFICATIONS:

a. RGS to notify the control room prior to entry into CTMT.

8. RADWASTE:

N/A

9. ADDITIONAL MEASURES TO REDUCE DOSE:

a. Upon evaluation of air sample data, RP Supervision may adjust respiratory protection requirements based on "job specific TEDE ALARA evaluation" per RSP 1-200.

	Name	Date
Work Group Task Leader:	PURVINS*DEBRA L	04-JAN-08
ALARA Coordinator:	SERRA*PAUL A	02-JAN-08
Principal Radiation Safety Technician:	ERDMAN*BARRY L	02-JAN-08
Supervisor ALARA:	ERDMAN*BARRY L	02-JAN-08
Supervisor Radiation Safety:	DANSBERGER*BENJAMIN W	03-JAN-08

Attribute	Geiger-Mueller (GM) Tube	Ion Chamber	Scintillation	Proportional Counter	Semiconductor Detector
Radiation Detected	alpha beta x ray gamma	alpha beta x ray gamma	alpha beta x ray gamma neutron	alpha beta x ray gamma neutron	alpha beta x ray gamma
Sensitive Medium	Gas	Gas	Solid Liquid	Gas	Solid
Ranges	0.04 mR/hr to 500 mR/hr	3 mR/hr to 10,000 R/hr	0.005 mR/hr to 200 mR/hr or to 800,000 c/m	to 500,000 c/m	to 100,000 c/m
Output Signal (V)	1	10^{-6}	1	10^{-2}	10^{-3}
Resolving Time (s)	10^{-4}	10^{-4}	10^{-7}	10^{-6}	10^{-9}
Energy Resolution (%)	N/A	N/A	10	15	1
Use	• Low dose-rate surveys • Area monitors • Personnel radiation monitors • Low-level contamination surveys	• Medium and high dose-rate surveys • Area monitors	• Low-level contamination surveys • LSC for tritium	• Low-level contamination surveys • Neutron survey	• Laboratory • Some field use
Advantages	• Large output signal • Moderate sensitivity	• Low energy dependence • Simple to operate	• High sensitivity • Rapid response • Good energy resolution	• Rapid response	• Excellent energy response • Short dead time
Disadvantages	• Long dead time • Energy dependent	• Slow response • Low sensitivity	• Fragile • Expensive	• Requires stable high-voltage supply	• Requires high amplification
Comments	• Radiation detected depends on the type of GM tube • May be energy dependent • Some models saturatedo not use in high radiation fields • Sensitive to microwave fields • Rate meter and audible pulse • Rapid response • Rugged, dependable	• Wide dose-rate range on a single instrument • Low energy dependence • Some models can be used in RF fields • Some models slow to respond	• High sensitivity • Rapid response • Fragile • Audible signal and rate meter • Radiation detected depends on instrument and crystal • Fast neutron detector where dose rate is not required	• Primary use is for alpha detection or neutron surveys • Alpha detector can discriminate between alpha and beta-gamma • Neutron detector can discriminate against gamma radiation • Maintenance may be a problem	• Primary use for alpha and gamma counting environmental samples • May be used for in situ gamma field

Malfunction of Containment Access Traps Personnel for Approximately One Hour at Palisades

On the evening of Aug 4, 2008, the Palisades Nuclear Generating Station was in a cool-down evolution going into an outage. As part of the normal process, containment entries were being made for maintenance and inspection purposes. One group was entering to do some inspections of the RCS at pressure. This group was comprised of licensee personnel, as well as an NRC inspector. They planned to make two entries with the required recovery/cool-off time between to avoid heat stress. Pre-briefs were made on the equipment to be looked at, the objectives of the entry and the allowed stay time. On the first entry all gear, including a walkie-talkie were inspected and carried.

It is important to note that during this period, other groups were entering and leaving containment to accomplish other tasks to support the plant work about to begin.

On the group's second entry after their cool-off period, they performed an abbreviated brief which just focused on the remaining tasks, the places to be visited and the equipment to be observed. In neither brief were the unique manipulations required to operate the access hatches discussed, specifically the necessity to bang on the handle of the emergency hatch handle get the hatch to operate from inside the containment or the main access outer door's difficulty in seating. These were not documented. It is also important to note that the individual who had the walkie-talkie on the first entry did not accompany the group on the second entry. He did not pass off the walkie-talkie and no one in the group obtained an additional one.

After re-entering containment, completing their inspections, and nearing the end of their allowed stay time (for heat stress) the team made its way back to the hatch. The inner door of the airlock would not open. They believed the outer door was not fully secured and the interlock that prevents simultaneous opening of inner and outer door was preventing their opening of the inner door. At that point they noticed that there were no indicator lights on the inside to show the position of the outer door. The group found itself unable to exit containment through the hatch.

The group was now a few minutes over their allowed stay time. They decided to use the emergency personnel hatch to exit. After traversing the containment space, they attempted to open the inner door, and were unable to. They assumed this was because the outer door was not seated. They used the operating mechanism to unseat the outer door then attempted to re-seat it, thinking this would clear the fault and allow the inner door to open. They were not aware of the longstanding Corrective Action Item to repair the sticking mechanism on that door. Nor the workaround, which was to bang on the door handle in a particular way.

When this attempt failed, they decided to locate themselves near the main hatch in as cool a space as possible and wait for another team to enter. While waiting they removed some of their protective clothing and equipment in an attempt to cool down.

During their attempts to operate the doors and during their movements across containment and back, they had attempted to use the phone system to call for help. The system was not working. They were not able to get a dial tone using any of the phone jacks.

The group was entering distress due to heat, and decided to actuate non-safety related equipment in an attempt to have someone dispatched to investigate. They tripped a shield cooling pump which did sound an alarm in the control room. This was acknowledged in the control room and the alternate started. Operating personnel were preoccupied with the cool down, so no one was sent to investigate.

Eventually, another group began the process to enter containment. The trapped group was able to stop them and both groups exited together.

Obviously there were several breakdowns in the system. The special operating requirements of the emergency personnel access hatch were known by many plant personnel, but not all. Several attempts to fix it had been made since 1999 when the problem was initially entered into the licensee's corrective action plan. The licensee did not have an established alternate mechanism to alert the control room of personnel trapped in containment. The licensee did not have an established system to track team's entry, exit and stay time.

The site took immediate action by placing radios in chargers at the inside and the outside of containment. They also have stationed a maintenance person at the hatch to ensure that the doors are properly re-set after each group either enters or leaves. Many other sites have previously instituted similar and in many cases more stringent access monitoring programs.

The NRC Conducted a Special Inspection (05000255/2008-010) after this event to investigate and document the situation. The inspection report documents the four (4) green findings and is available for review in ADAMS at ML083100669. Included in the report are outlines of the corrective actions planned by the licensee to address the findings, which should prevent recurrence of this event.

This COMM is intended to serve as a reminder to NRC personnel who participate in containment, other confined space entries or who enter heat stress areas, or otherwise hostile environments that, while they must observe the licensee's procedures, they should always assure their own safety.

Event Abstract:

On 31 July 2009, Unit 2 of the Beznau NPP was shut down for maintenance. As part of the scheduled maintenance, it was planned to test the pressure in the primary circuit – this is done every 10 years – and as preparation for the later use of a camera two employees were installing lamps in the enclosed space beneath the reactor pressure vessel. Running through this space are double-walled tubes through which probes can be fed to measure the neutron flux in the core. While the two employees were working under the reactor pressure vessel, the inner tubing was withdrawn from the reactor pressure vessel by employees located in a different room so that other work could be carried out.

The tubing and probes in the reactor normally emit high levels of radiation and so the resultant local dose rate beneath the reactor suddenly jumped to a dose rate of probably more than 1,000 mSv per hour. The two employees left the scene as quickly as possible.

One employee received an individual dose of 37.8 mSv and the other a dose of 25.4 mSv. For radiological protection reasons, the two tasks - the installation of the lamps and the withdrawal of the tubing - should have been done consecutively. Based on investigations to date, it would appear that the work was not properly coordinated and so a time overlap occurred. As a result two employees were exposed to radiation in excess of statutory dose limits.

Event Abstract:

On May 26, 2009 after performing RT with Ir-192 source of 60 Ci radiographer noted that all used films were highly exposed. The unused films were also found exposed. The source guide tube was inspected during which the source assembly fell on the ground. The radiographer picked up the source assembly by hand and put it back into the projector. Erythema appeared on his both hands in three days after the event. In two weeks, blistering appeared on hands which developed into open wounds.

The incident was reported to Pakistan Nuclear Regulatory Authority (PNRA) on July 12, 2009. Inspectors from PNRA visited the radiographer on July 14, 2009 and found healing wounds and black spots on his palm and finger tips. The victim has been sent for further medical investigation and treatment. The dose to the hands (extremities) was estimated to be between 25~30 Sv.
Investigations revealed that the worker violated the procedures under work pressure and safety tools were not properly used. In addition, the radiographer also did not use personal dosimeter and radiation monitor during the activity. Further the incident occurred due to faulty gamma projector and drive cable which caused the source to disconnect and stuck in the guide tube. Weaknesses were observed in management oversight, work supervision and safety culture of the organization.

Work stoppage notice was served immediately to the company. Further enforcement actions are being taken against the company involved in the incident.

Due to overexposure of the worker resulting in acute health effects, the incident is rated at level 3.

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE U.S. NUCLEAR REGULATORY COMMISSION
AND
THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

PURPOSE AND BACKGROUND

1. The purpose of this Memorandum of Understanding between the U.S. Nuclear Regulatory Commission (NRC) and the Occupational Safety and Health Administration (OSHA) is to delineate the general areas of responsibility of each agency; to describe generally the efforts of the agencies to achieve worker protection at facilities licensed by the NRC; and to provide guidelines for coordination of interface activities between the two agencies. If NRC licensees observe OSHA's standards and regulations, this will help minimize workplace hazards.

2. Both NRC and OSHA have jurisdiction over occupational safety and health at NRC-licensed facilities. Because it is not always practical to sharply identify boundaries between the nuclear and radiological safety NRC regulates and the industrial safety OSHA regulates, a coordinated interagency effort can insure against gaps in the protection of workers and at the same time, avoid duplication of effort. This memorandum replaces an existing procedure for interagency activities, "General Guidelines for Interface Activities between the NRC Regional Offices and the OSHA."

HAZARDS ASSOCIATED WITH NUCLEAR FACILITIES

3. There are four kinds of hazards that may be associated with NRC-licensed nuclear facilities:

a. Radiation risk produced by radioactive materials;

b. Chemical risk produced by radioactive materials;

c. Plant conditions which affect the safety of radioactive materials and thus present an increased radiation risk to workers. For example, these might produce a fire or an explosion, and thereby cause a release of radioactive materials or an unsafe reactor condition; and,

d. Plant conditions which result in an occupational risk, but do not affect the safety of licensed radioactive materials. For example, there might be exposure to toxic nonradioactive materials and other industrial hazards in the workplace.

Generally, NRC covers the first three hazards listed in paragraph 3 (a, b, and c), and OSHA covers the fourth hazard described in paragraph 3 (d). NRC and OSHA responsibilities and actions are described more fully in paragraphs 4 and 5 below.

NRC RESPONSIBILITIES

4. NRC is responsible for licensing and regulating nuclear facilities and materials and for conducting research in support of the licensing and regulatory process, as mandated by the Atomic Energy Act of 1954, as amended; the Energy Reorganization Act of 1974, as amended; and the Nuclear Nonproliferation Act of 1978; and in accordance with the National Environmental policy Act of 1969, as amended, and other applicable statutes. These responsibilities cover the first three nuclear facility hazards identified in paragraph 3 (a, b, and c). NRC does not have statutory authority for the fourth hazard described in paragraph 3(d). NRC responsibilities include protecting public health and safety;
protecting the environment; protecting and safeguarding materials and with antitrust laws for certain types of facilities, e.g., nuclear power plants in the interest of national security; and assuring conformity reactors. Agency functions are performed through: standards setting and rulemaking; technical reviews and studies; conduct of public hearings; issuance of authorizations, permits and licenses; inspection, investigation and enforcement; evaluation of operating experience; and confirmatory research.

OSHA RESPONSIBILITIES

5. OSHA is responsible for administering the requirements established under the Occupational Safety and Health Act (OSH Act) (29 U.S.C. 651 et. seq.), which was enacted in 1970. OSHA'S authority to engage in the kinds of activities described below does not apply to those workplace safety and health conditions for which other Federal agencies exercise statutory authority to prescribe and enforce standards, rules or regulations.
Under the OSH Act, every employer has a general duty to furnish each employee with a place of employment that is free from recognized hazards that can cause death or serious physical harm and to comply with all OSHA standards, rules, and regulations.
OSHA standards contain requirements designed to protect employees against workplace hazards. In general, safety standards are intended to protect against traumatic injury, while health standards are designed to address potential overexposure to toxic substances and harmful physical agents, and protect against illnesses which do not manifest themselves for many years after initial exposure.

OSHA standards cover employee exposures from all radiation sources not regulated bY NRC examples include x-ray equipment, accelerators accelerator-produced materials, electron microscopes and betatrons, and naturally occurring radioactive materials such as radium.
It is estimated that the Act covers nearly 6 million workplaces employing more than 50 million workers. Federal OSHA covers approximately three-fifths, or four million, of these States which operate OSHA-approved job safety and health programs, or "Plans," cover the remainder. OSHA State plan States are encouraged, but not required, to delineate their authority for occupational safety and health at NRC-licensed facilities in the same manner as Federal OSHA. The OSHA areas of responsibility described in this memorandum are subject to all applicable requirements and authorities of the OSH Act. However, the industrial safety record at NRC-licensed nuclear power plants is such that OSHA inspections at these facilities are conducted normally as a result of accidents, fatalities, referrals, or worker complaints.

INTERFACE PROCEDURES:

6. In recognition of the agencies' authorities and responsibilities enumerated above, the following procedures will be followed:

Although NRC does not conduct inspections of industrial safety, in the course of inspections of radiological and nuclear safety, NRC personnel may identify safety concerns within the area of OSHA responsibility or may receive complaints from an employee about OSHA-covered working conditions. In such instances, NRC will bring the matter to the attention of licensee management. NRC inspectors are not to perform the role of OSHA inspectors; however, they are to elevate OSHA safety issues to the attention of NRC Regional management when appropriate. If significant safety concerns are identified or if the licensee demonstrates a pattern of unresponsiveness to identified concerns, the NRC Regional Office will inform the appropriate OSHA Regional Office. In the case of complaints, NRC will withhold, from the licensee, the identity of the employee. In addition, when known to NRC, NRC will encourage licensees to report to OSHA accidents resulting in a fatality or multiple hospitalizations.

When such instances occur within OSHA State Plan States' jurisdiction, the OSHA Regional Office will refer the matter to the State for appropriate action.

7. OSHA Regional Offices will inform the appropriate NRC Regional Office of matters which are in the purview of NRC, when these come to their attention during Federal or State safety and health inspections or through complaints. The following are examples of matters that would be reported to the NRC:
   a. Lax security control or work practices that would affect nuclear or radiological health and safety.

   b. Improper posting of radiation areas. c. Licensee employee allegations of NRC license or regulation violations.

8. The NRC and OSHA need not normally conduct joint inspections at NRC-licensed facilities. However, under certain conditions, such as investigations or inspections following accidents or resulting from reported activities as discussed in items 6 and 7 above, it may be mutually agreed on a case-by-case basis that joint investigations are in the public interest.

9. The chemical processing of nuclear materials at some NRC-licensed fuel and materials facilities presents chemical and nuclear operational safety hazards which can best be evaluated by joint NRC-OSHA team assessments. Each agency will make its best efforts to support such assessments at about 20 facilities once every five years. Of these facilities, about one-third are in the OSHA Plan States. OSHA will also assist in promoting such participation by State personnel in OSHA Plan States.

10. Based upon reports of injury or complaints at nuclear power plant sites, OSHA will provide NRC with information on those sites where increased management attention to worker safety is needed. The NRC will bring such information indicating significant breakdown in worker safety to the attention of licensee management and monitor corrective actions. This will not interfere with OSHA authority and responsibility to investigate industrial accidents and worker complaints.

11. Power reactor sites are inspected by NRC Region-based and Resident Inspectors. Personnel from NRC Regional Offices routinely conduct inspections at most fuel and materials licensed facilities. In order to enhance the ability of NRC personnel to identify safety matters under OSHA purview during nuclear and radiological safety inspections, OSHA will provide NRC Regional personnel with basic chemical and industrial safety training and indoctrination in OSHA safety standards, consistent with ongoing OSHA training programs. To enhance the ability of OSHA and State Plan personnel to effectively participate in the Operational Safety Team Assessments, NRC will provide training in basic radiation safety requirements, consistent with ongoing NRC training programs. Details of such training will be as mutually agreed by the NRC Technical Training Center and the OSHA National Training Institute.

12. Resolution of policy issues concerning agency jurisdiction and operational relations will be coordinated by the NRC Deputy Executive Director for Operations, and by the OSHA Director of Policy. Appropriate Headquarters points of contact will be established.

13. Resolution of issues concerning inspection and enforcement activities involving both NRC and OSHA jurisdiction at NRC-licensed facilities will be handled between NRC's Office of Enforcement and OSHA's Directorate of Compliance Programs. Each NRC and OSHA Regional Office will designate points of contact for carrying out Interface activities.

FOR THE NUCLEAR REGULATORY COMMISSION

Victor Stello, Jr.
Executive Director for Operations

FOR THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

John A. Pendergrass
Assistant Secretary

October 21, 1988

Safety Shoes & Glasses

The Admin Service Center places orders to obtain protective shoes and glasses for employees who are subjected to safety hazards.

To request eyeglasses or shoes-

Please forward an email through your supervisor for approval to ASC or send an approved **NRC Form 30** to O2-A11.

Please include the reason that the safety equipment is needed.

Contact

Tojuana Fortune Grasty	**Administrative Services Specialist**	**301-415-4272**	**ASC@nrc.gov**

Magnitude of Changes in Collective Effective Dose and Effective Dose per Individual in the U.S. Population Between the Early 1980s (NCRP Report No. 93) and 2006 (NCRP Report No. 160)

Exposure Category	Collective Effective Dose (person-Sv)[a]			Effective Dose per Individual in the U.S. Population (mSv)[a]		
	(1) 2006	(2) Early 1980s	Ratio (1) / (2)	(1) 2006	(2) Early 1980s	Ratio (1) / (2)
Ubiquitous background	933,000	690,000	1.35	3.11	3.00	1.04
Medical	899,000	123,000	7.3	3.00	0.53	5.7
Consumer	39,000	12,000 – 29,000	—[b]	0.13	0.05 – 0.13	—[b]
Industrial, security, medical, educational and research	1,000	200	—[b]	0.003	0.001	—[b]
Occupational	1,400	2,000	—[b]	0.005	0.009	—[b]
Total	1,870,000	835,000	2.2	6.2	3.6	1.7

[a]The quantities used in NCRP Report No. 93 were expressed in effective dose equivalent.
[b]Not listed; disparate aggregated sources.

MEDICAL = 48%

NCRP 1929 2009

http://NCRPonline.org
http://NCRPPublications.org

Ionizing Radiation

Dose Ranges

(Rem)

Cancer Radiotherapy: total dose to tumor

Whole body, acute: G-I destruction; lung damage; cognitive dysfunction (death certain in 5 to 12 days)*

Whole body, acute: cerebral/ vascular breakdown (death in 1-5 days)*

0 2000 4000 6000 8000 10,000 rem

Total Body Irradiation (TBI) Therapy

Life Span Study (A-bomb survivors)

Whole body, acute: circulating blood cell death; moderate G-I damage (death probable in 2-3 weeks)*

Whole body, acute: marked G-I and bone marrow damage (death probable in 1-2 weeks)*

Estimated dose for 3-yr **Mars** mission

0 200 400 600 800 1,000 rem

Human LD_{50} range, acute exposure with **no** medical intervention (50% death in 3-6 weeks)*

Human LD_{50} range, acute exposure with medical intervention

*Note: Whole body acute prognoses assume no medical intervention.)

Cancer Epidemiology

Evidence for small increases in human cancer above 10 rem acute exposure, 20 rem chronic exposure

Typical mission doses on **Int. Space Station (ISS)**

0 20 40 60 80 100 rem

NRC guideline for lifesaving ~ 25 rem

"Radiological Emergency" guidelines for public relocation

DOE Low Dose Program

"Full-body CT screening" (one scan)

H I J

0 1 2 3 4 5 6 7 8 9 10 rem

DOE administrative control = 2 rem/yr = 20 mSv/yr

NRC Dose Limit for Workers = 5 rem/yr = 50 mSv/yr

Typical annual doses for **commercial airline flight crews**

Medical Diagnostics (A-J)

A B C D E F G

0 200 400 600 800 1,000 mrem = 1 rem

Natural background, average ≅ 300 mrem/yr (includes radon)

Temporary "Special Case" annual Public Limit (NRC, DOE)

Cleanup criteria for site decommissioning/ license termination 25 mrem/yr

Regulations & Guidelines

(~ four orders of magnitude)

Round-trip NY to London

0 10 20 30 40 50 60 70 80 90 100 mrem

NCRP "Negligible Dose"

Typical maximum doses from DOE facility releases

ANSI standard N43.17 Personnel scanner, max = 25 mrem/yr

NRC Dose Limit for Public 100 mrem/yr = 1 mSv/yr (DOE, ICRP, NCRP)

Medical Diagnostics, rem

A- Chest x-ray (1 film)	0.01
B- Dental oral exam	0.16
C- Mammogram	0.25
D- Lumbosacral spine	0.32
E- PET	0.37
F- Bone (Tc-99m)	0.44
G- Cardiac (Tc-99m)	0.75
H- Cranial CT (MSAD) (multiple scan average dose)	5
I- Barium contrast G-I fluoroscopy (2 min scan)	8.5
J- Spiral CT	3 - 10

LD_{50} = Lethal Dose to 50% (the acute whole body dose that results in lethality to 50% of the exposed individuals)

Absorbed dose: 100 rad = 1 Gray

Dose equivalent: 100 rem = 1 Sievert