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Vol. 20, No. 3

Regulatory and Technical Reports (Abstract Index Journal)

Compilation for
Third Quarter 1995
July – September

U.S. Nuclear Regulatory Commission

Office of Administration

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A year's subscription of this report consists of four quarterly issues.

NUREG–0304
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PREFACE

This compilation consists of bibliographic data and abstracts for the formal regulatory and technical reports issued by the U.S. Nuclear Regulatory Commission (NRC) Staff and its contractors. It is NRC's intention to publish this compilation quarterly and to cumulate it annually. Your comments will be appreciated. Please send them to:

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The main citations and abstracts in this compilation are listed in NUREG number order: NUREG-XXXX, NUREG/CP-XXXX, NUREG/CR-XXXX, and NUREG/IA-XXXX. These precede the following indexes:

Secondary Report Number Index
Personal Author Index
Subject Index
NRC Originating Organization Index (Staff Reports)
NRC Originating Organization Index (International Agreements)
NRC Contract Sponsor Index (Contractor Reports)
Contractor Index
International Organization Index
Licensed Facility Index

A detailed explanation of the entries precedes each index.

The bibliographic elements of the main citations are the following:

Staff Report

NUREG-0808: MARK II CONTAINMENT PROGRAM EVALUATION AND ACCEPTANCE CRITERIA. ANDERSON, C. J. Division of Safety Technology. August 1981. 90 pp. 8109140048. 09570:200.

Where the entries are (1) report number, (2) report title, (3) report author, (4) organizational unit of author, (5) date report was published, (6) number of pages in the report, (7) the NRC Document Control System accession number, (8) the microfiche address (for internal NRC use).

Conference Report

NUREG/CP-0017: EXECUTIVE SEMINAR ON THE FUTURE ROLE OF RISK ASSESSMENT AND RELIABILITY ENGINEERING IN NUCLEAR REGULATION. JANERP, J.S. Argonne National Laboratory. May 1981. 141 pp. 8105280299. ANL-81-3. 08632:070.

Where the entries are (1) report number, (2) report title, (3) report author, (4) organization that compiled the proceedings, (5) date report was published, (6) number of pages in the report, (7) the NRC Document Control System accession number, (8) the report number of the originating organization, (9) the microfiche address (for NRC internal use).

Contractor Report

NUREG/CR-1556: STUDY OF ALTERNATE DECAY HEAT REMOVAL CONCEPTS FOR LIGHT WATER REACTORS-CURRENT SYSTEMS AND PROPOSED OPTIONS. BERRY, D.L.; BENNETT, P.R. Sandia Laboratories. May 1981. 100 pp. 8107010449. SAND80-0929. 08912:242.

Where the entries are (1) report number, (2) report title, (3) report authors, (4) organizational unit of authors or publisher, (5) date report was published, (6) number of pages in the report, (7) the NRC Document Control System accession number, (8) the report number of the originating organization (if given), (9) the microfiche address (for NRC internal use).

Grant Report

NUREG/GR-0013: APPLICATIONS OF A NEW MAGNETIC MONITORING TECHNIQUE TO IN SITU EVALUATION OF FATIQUE DAMAGE IN FERROUS COMPONENTS. JILES, D.C.; BINER, S.B.; GOVINDARAJU, M.; et al. Iowa State Univ., Ames, IA. June 1994. 41 pp. 9407250286. 80328:195.

Where the entries are(1) report number, (2) report title, (3) report authors, (4) organizational unit of authors or publisher, (5) date report was published, (6) number of pages in the report, (7) the NRC Document Control System accession number, (8) the report number of the originating organization (if given), (9) the microfiche address (for NRC internal use).

International Agreement Report

NUREG/IA-0001: ASSESSMENT OF TRAC-PD2 USING SUPER CANNON AND HDR EXPERIMENTAL DATA. NEUMANN, U. Kraftweek Union. August 1986. 223 pp. 8608270424. 37659:138.

Where the entries are(1) report number, (2) report title, (3) report author, (4) organizational unit of author, (5) date report was published, (6) number of pages in the report, (7) the NRC Document Control System accession number, (8) the report number of the originating organization (if given), and (9) the microfiche address (for NRC internal use).

The following abbreviations are used to identify the document status of a report:

ADD - addendum
APP - appendix
DRFT - draft
ERR - errata
N - number
R - revision
S - supplement
V - volume

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Copies of NRC staff and contractor reports may be purchased either from the Government Printing Office (GPO) or from the National Technical Information Service, Springfield, Virginia 22161. To purchase documents from the GPO, send a check or money order, payable to the Superintendent of Documents, to the following address:

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NRC Report Codes

The NUREG designation, NUREG-XXXX, indicates that the document is a formal NRC staff-generated report. Contractor-prepared formal NRC reports carry the report code NUREG/CR-XXXX. This type of identification replaces contractor-established codes such as ORNL/NUREG/TM-XXX and TREE-NUREG-XXXX, as well as various other numbers that could not be correlated with NRC sponsorship or the work being reported.

In addition to the NUREG and NUREG/CR codes, NUREG/CP is used for NRC-sponsored conference proceedings NUREG/GR is used for NRC grant reports, and NUREG/IA is used for international agreement reports.

All these report codes are controlled and assigned by the staff of the Technical Publications Section of the NRC Division of Freedom of Information and Publications Services.

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Main Citations and Abstracts

The report listings in this compilation are arranged by report number, where NUREG-XXXX is an NRC staff-originated report, NUREG/CP-XXXX is an NRC-sponsored conference report, NUREG/CR-XXXX is an NRC contractor-prepared report, and NUREG/IA-XXXX is an international agreement report. The bibliographic information (see Preface for details) is followed by a brief abstract of this report.

NUREG-0040 V19 N02: LICENSEE CONTRACTOR AND VENDOR INSPECTION STATUS REPORT. Quarterly Report,April-June 1995.(White Book) * Office of Nuclear Reactor Regulation (Post 941001). August 1995. 181pp. 9509070144. 85398:116.

This periodical covers the results of inspections performed by the NRC's Special Inspection Branch, Vendor Inspection Section, that have been distributed to the inspection organizations during the period from April through June 1995.

NUREG-0090 V17 N04: REPORT TO CONGRESS ON ABNORMAL OCCURRENCES.October-December 1994. * Office for Analysis & Evaluation of Operational Data, Director. May 1995. 39pp. 9511140069. 86174:317.

Section 208 of the Energy Reorganization Act of 1974 identifies an abnormal occurrence (AO) as an unscheduled incident or event that the Nuclear Regulatory Commission determines to be significant from the standpoint of public health or safety and requires a quarterly report of such occurrences to be made to Congress. This report provides a description of those incidents and events that have been determined to be AOs during the period of October 1 through December 31, 1994. This report addresses four Aos at NRC-licensed facilities. These occurrences involved the following: a generic concern relating to core shroud cracking in boiling water reactors; recurring incidents of administering higher doses than procedurally allowed for diagnostic imaging at a single facility; one medical teletherapy misadministration and one medical brachytherapy misadministration. Agreement States submitted four AO reports. These four occurrences involved the following: one major contamination at a commercial facility; two medical brachytherapy misadministrations; and one medical teletherapy misadministration. The report also contains updates of seven AOs previously reported by the Agreement States. Two "Other Events of Interest" are also being reported. These occurrences involved the operability of safety relief valves at a nuclear powerplant, and an error in the installation process of a Leksell Gamma Knife ** Teletherapy unit that resulted in an operational failure.

NUREG-0090 V18 N01: REPORT TO CONGRESS ON ABNORMAL OCCURRENCES.January-March 1995. * Office for Analysis & Evaluation of Operational Data, Director. July 1995. 25pp. 9507250296. 84831:118.

Section 208 of the Energy Reorganization Act of 1974 identifies an abnormal occurrence (AO) as an unscheduled incident or event that the Nuclear Regulatory Commission determines to be significant from the standpoint of public health or safety and requires a quarterly report of such occurrences to be made to Congress. This report provides a description of those incidents and events that have been determined to be AOs during the period of January 1 through March 31, 1995. This report addresses one AO at an NRC-licensed facility which involved a medical brachytherapy misadministration. The report also contains updates of one AO previously reported by an NRC licensee and three AOs previously reported by the Agreement States. No "Other Events of Interest" items are being reported.

NUREG-0304 V20 N01: REGULATORY AND TECHNICAL REPORTS (ABSTRACT INDEX JOURNAL). Compilation For First Quarter 1995,January-March. * Division of Freedom of Information & Publications Services (Post 940714). July 1995. 48pp. 9508160248. 85041:277.

This journal includes all formal reports in the NUREG series prepared by the NRC staff and contractors; proceedings of conferences and workshops; as well as international agreement reports. The entries in this compilation are indexed for access by title and abstract, secondary report number, personal author, subject, NRC organization for staff and international agreements, contractor, international organization, and licensed facility.

NUREG-0325 R18: U.S. NUCLEAR REGULATORY COMMISSION ORGANIZATION CHARTS AND FUNCTIONAL STATEMENTS.July 23, 1995. * Ofc of Personnel (Post 870413). July 1995. 67pp. 9511060194. 86094:255.

Functional statements and organization charts for the U.S. Nuclear Regulatory Commission offices, divisions, and branches are presented.

NUREG-0525 V02 R03: SAFEGUARDS SUMMARY EVENT LIST (SSEL).January 1, 1990 Through December 31, 1994. FADDEN,M.; YARDUMIAN,J. Operations Branch. July 1995. 140pp. 9511060198. 86103:096.

The Safeguards Summary Event List provides brief summaries of hundreds of safeguards-related events involving nuclear material or facilities regulated by the U.S. Nuclear Regulatory Commission. Events are described under the categories: Bomb-related, Intrusion, Missing/Allegedly Stolen, Transportation-related, Tampering/Vandalism, Arson, Firearms-related, Radiological Sabotage, Non-radiological Sabotage, and Miscellaneous. Because of the public interest, the Miscellaneous category also includes events reported involving source material, byproduct material, and natural uranium, which are exempt from safeguards requirements. Information in the vent descriptions was obtained from official NRC sources.

NUREG-0540 V17 N05: TITLE LIST OF DOCUMENTS MADE PUBLICLY AVAILABLE.May 1-31, 1995. * Division of Freedom of Information & Publications Services (Post 940714). July 1995. 300pp. 9511140075. 86175:001.

This document is a monthly publication containing descriptions of information received and generated by the U.S. Nuclear Regulatory Commission (NRC). This information includes (1) docketed material associated with civilian nuclear power plants and other uses of radioactive materials, and (2) nondocketed material received and generated by NRC pertinent to its role as a regulatory agency. The following indexes are included: Personal Author, Corporate Source, Report Number, and Cross Reference of Enclosures to Principal Documents.

NUREG-0540 V17 N06: TITLE LIST OF DOCUMENTS MADE PUBLICLY AVAILABLE.June 1-30, 1995. * Division of Freedom of Information & Publications Services (Post 940714). August 1995. 276pp. 9508160276. 85041:001.

This document is a monthly publication containing descriptions of information received and generated by the U.S. Nuclear Regulatory Commission (NRC). This information includes (1) docketed material associated with civilian nuclear power plants and other uses of radioactive materials, and (2) nondocketed material received and generated by NRC pertinent to its role as a regulatory agency. The following indexes are included: Personal Author, Corporate Source, Report Number, and Cross Reference of Enclosures to Principal Documents.

NUREG-0540 V17 N07: TITLE LIST OF DOCUMENTS MADE PUBLICLY AVAILABLE.July 1-31, 1995. * Division of Freedom of Information & Publications Services (Post 940714). September 1995. 278pp. 9510030198. 85664:001.

See NUREG-0540,V17,N06 abstract.

NUREG-0750 V40: NUCLEAR REGULATORY COMMISSION ISSUANCES.Opinions And Decisions Of The Nuclear Regulatory Commission With Selected Orders.July-December 1994. * Division of Freedom of Information & Publications Services (Post 940714). July 1995. 400pp. 9508300374. 85286:001.

Legal issuances of the Commission, the Atomic Safety and Licensing Board Panel, the Administrative Law Judges, and NRC Program Offices are presented.

NUREG-0750 V41 I02: INDEXES TO NUCLEAR REGULATORY COMMISSION ISSUANCES.January-June 1995. * Division of Freedom of Information & Publications Services (Post 940714). September 1995. 65pp. 9510180192. 85849:001.

Digests and indexes for issuances of the Commission, the Atomic Safety and Licensing Board Panel, The Administrative Law Judges, the Directors' Decisions, and the Decisions on Petitions for Rulemaking are presented.

NUREG-0750 V41 N05: NUCLEAR REGULATORY COMMISSION ISSUANCES FOR MAY 1995.Pages 321-380. * Division of Freedom of Information & Publications Services (Post 940714). July 1995. 68pp. 9507250293. 84831:050.

See NUREG-0750,V40 abstract.

NUREG-0750 V41 N06: NUCLEAR REGULATORY COMMISSION ISSUANCES FOR JUNE 1995.Pages 381-496. * Division of Freedom of Information & Publications Services (Post 940714). August 1995. 124pp. 9509080022. 85405:146.

See NUREG-0750,V40 abstract.

NUREG-0750 V42 N01: NUCLEAR REGULATORY COMMISSION ISSUANCES FOR JULY 1995.Pages 1-45. * Division of Freedom of Information & Publications Services (Post 940714). August 1995. 53pp. 9509080026. 85405:270.

See NUREG-0750,V40 abstract.

NUREG-0837 V15 N02: NRC TLD DIRECT RADIATION MONITORING NETWORK.Progress Report,April-June 1995. STRUCKMEYER,R. Region 1 (Post 820201). August 1995. 230pp. 9508300331. 85287:060.

This report provides the status and results of the NRC Thermoluminescent Dosimeter (TLD) Direct Radiation Monitoring Network. It presents the radiation levels measured in the vicinity of NRC licensed facilities throughout the country for the second quarter of 1995.

NUREG-0936 V14 N01: NRC REGULATORY AGENDA.Semiannual Report,January-June 1995. * Division of Freedom of Information & Publications Services (Post 940714). September 1995. 56pp. 9510030203. 85663:193.

The NRC Regulatory Agenda is a compilation of all rules on which the NRC has recently completed action, or has proposed action, or is considering action, and all petitions for rulemaking which have been received by the Commission and are pending disposition by the Commission. The Regulatory Agenda is updated and issued semiannually.

NUREG-0940 V14 N2 P1: ENFORCEMENT ACTIONS:SIGNIFICANT ACTIONS RESOLVED,INDIVIDUAL ACTIONS.Quarterly Progress Report,April-June 1995. * Ofc of Enforcement (Post 870413). August 1995. 226pp. 9509080019. 85404:138.

This compilation summarizes significant enforcement actions that have been resolved during one quarterly period (April - June 1995) and includes copies of Orders sent by the Nuclear Regulatory Commission to individuals with respect to these enforcement actions. It is anticipated that the information in this publication will be widely disseminated to managers and employees engaged in activities licensed by the NRC. The Commission believes this information may be useful to licensees in making employment decisions.

NUREG-0940 V14 N2 P2: ENFORCEMENT ACTIONS:SIGNIFICANT ACTIONS RESOLVED,REACTOR LICENSEES.Quarterly Progress Report,April-June 1995. * Ofc of Enforcement (Post 870413). August 1995. 189pp. 9509080016. 85405:016.

This compilation summarizes significant enforcement actions that have been resolved during one quarterly period (April - June 1995) and includes copies of letters, Notices, and Orders sent by the Nuclear Regulatory Commission to reactor licensees with respect to these enforcement actions. It is anticipated that the information in this publication will be widely disseminated to managers and employees engaged in activities licensed by the NRC, so that actions can be taken to improve safety by avoiding future violations similar to those described in this publication.

NUREG-0940 V14 N2 P3: ENFORCEMENT ACTIONS: SIGNIFICANT ACTIONS RESOLVED MATERIAL LICENSEES.Quarterly Progress Report,April-June 1995. * Ofc of Enforcement (Post 870413). August 1995. 223pp. 9509130141. 85432:111.

This compilation summarizes significant enforcement actions that have been resolved during one quarterly period (April - June 1995) and includes copies of letters, Notices, and Orders sent by the Nuclear Regulatory Commission to material licensees with respect to these enforcement actions. It is anticipated that the information in this publication will be widely disseminated to managers and employees engaged in activities licensed by the NRC, so that actions can be taken to improve safety by avoiding future violations similar to those described in this publication.

NUREG-1123 R01: KNOWLEDGE AND ABILITIES CATALOG FOR NUCLEAR POWER PLANT OPERATORS: BOILING WATER REACTORS. * Office of Nuclear Reactor Regulation (Post 941001). August 1995. 412pp. 9509250374. 85579:001.

This document provides the basis for the development of content-valid licensing examinations for reactor operators and senior reactor operators. The examinations developed using the BWR catalog will cover those topics listed under Title 10, Code of Federal Regulations, Part 55. The BWR catalog contains approximately 7,000 knowledge and ability (K/A) statements for reactor operators and senior reactor operators. Each K/A statement has been rated for its importance to safe operation of the plant in a manner ensuring personnel and public health and safety. The BWR K/A catalog is organized into six major sections: Organization of the Catalog; Plant Wide Generic Knowledge and Abilities; Plant Systems Grouped by Safety Functions; Emergency and Abnormal Plant Evolutions; Components; and Theory.

NUREG-1145 V11: U.S. NUCLEAR REGULATORY COMMISSION 1994 ANNUAL REPORT. * Office of Administration, Director (Post 940714). June 1995. 300pp. 9507170098. 84671:001.

This report covers the major activities, events, decisions, and planning that took place during Fiscal Year 1994 within the U.S. Nuclear Regulatory Commission (NRC) or involving the NRC.

NUREG-1266 V09: NRC SAFETY RESEARCH IN SUPPORT OF REGULATION - FY 1994. * Office of Nuclear Regulatory Research (Post 941217). June 1995. 100pp. 9507200206. 84750:001.

This report, the tenth in a series of annual reports, was prepared in response to congressional inquiries concerning how nuclear regulatory research is used. It summarizes the accomplishments of the Office of Nuclear Regulatory Research during FY 1994. The goal of the Office of Nuclear Regulatory Research (RES) is to ensure the availability of sound technical bases for timely rulemaking and related decisions in support of NRC regulatory/licensing/inspection activities. RES also has responsibilities related to the resolution of generic safety issues and to the review of licensee submittals regarding individual plant examinations. It is the responsibility of RES to conduct the NRC's rulemaking process, including the issuance of regulatory guides and rules that govern NRC licensed activities.

NUREG-1272 V08 N02: OFFICE FOR ANALYSIS AND EVALUATION OF OPERATIONAL DATA.1993 Annual Report - Nuclear Materials. * Office for Analysis & Evaluation of Operational Data, Director. May 1995. 122pp. 9511140066. 86176:001.

The annual report of the U.S. Nuclear Regulatory Commission's Office for Analysis and Evaluation of Operational Data (AEOD) is devoted to the activities performed during 1993. The report is published in two separate parts. NUREG-1272, Vol. 8, No. 1, covers power reactors and presents an overview of the operating experience of the nuclear power industry from the NRC perspective, including comments about the trends of some key performance measures. The report also includes the principal findings and issues identified in AEOD studies over the past year and summarizes information from such sources as licensee event reports, diagnostic evaluations, and reports to the NRC's Operations Center. NUREG-1272, Vol. 8, No. 2, covers nuclear materials and presents a review of the events and concerns during 1993 associated with the use of licensed material in nonreactor applications, such as personnel overexposures and medical misadministrations. Note that the subtitle of No. 2 has been changed from "Nonreactors" to "Nuclear Materials." Both reports also contain a discussion of the Incident Investigation Team program and summarize both the Incident Investigation Team and Augmented Inspection Team reports. Each volume contains a list of the AEOD reports issued for 1981-1993.

NUREG-1307 R05: REPORT ON WASTE BURIAL CHARGES.Escalation Of Decommissioning Waste Disposal Costs At Low-Level Waste Burial Facilities. * Division of Regulatory Applications (Post 941217). August 1995. 59pp. 9509070078. 85404:079.

One of the requirements placed upon nuclear power reactor licensees by the U.S. Nuclear Regulatory Commission (NRC) is for the licensees to periodically adjust the estimate of the cost of decommissioning their plants, in dollars of the current year, as part of the process to provide reasonable assurance that adequate funds for decommissioning will be available when needed. This report, which is scheduled to be revised periodically, contains the development of a formula for escalating decommissioning cost estimates that is acceptable to the NRC, and contains values for the escalation of radioactive waste burial costs, by site and by year. The licensees may use the formula, the coefficients, and the burial escalation from this report in their escalation analyses, or they may use an escalation rate at least equal to the escalation approach presented herein.

NUREG-1363 V06: ATOMIC SAFETY AND LICENSING BOARD PANEL BIENNIAL REPORT. Fiscal Years 1993 - 1994. * Atomic Safety & Licensing Board Panel. August 1995. 54pp. 9509070103. BIENNIAL. 85398:297.

In Fiscal Year 1993, the Atomic Safety and Licensing Board Panel ("the Panel") handled 30 proceedings. In Fiscal Year 1994, the Panel handled 36 proceedings. The cases addressed issues in the construction, operation, and maintenance of commercial nuclear power reactors and other activities requiring a license from the Nuclear Regulatory Commission. This report sets out the Panel's caseload during the year and summarizes, highlights, and analyzes how the wide-ranging issues raised in those proceedings were addressed by the Panel's judges and licensing boards.

NUREG-1423 V05: A COMPILATION OF REPORTS OF THE ADVISORY COMMITTEE ON NUCLEAR WASTE.July 1993 - June 1995. * Advisory Committee on Nuclear Waste. August 1995. 75pp. 9509130173. 85433:144.

This compilation contains 13 reports issued by the Advisory Committee on Nuclear Waste (ACNW) during the sixth and seventh years of its operation. The reports were submitted to the Chairman and Commissioners of the U.S. Nuclear Regulatory Commission. All reports prepared by the Committee have been made available to the public through the NRC Public Document Room and the U.S. Library of Congress.

NUREG-1505 DRFT FC: A NONPARAMETRIC STATISTICAL METHODOLOGY FOR THE DESIGN AND ANALYSIS OF FINAL STATUS DECOMMISSIONING SURVEYS.Draft Report For Comment. GOGOLAK,C.V. Energy,Dept.of, Environmental Measurements Laboratory. HUFFERT,A.M.; POWERS,G.E. Division of Regulatory Applications (Post 941217). August 1995. 216pp. 9509200281. 85541:080.

This report describes a nonparametric statistical methodology for the design and analysis of final status decommissioning surveys in support of the proposed rulemaking on decommissioning. The techniques described are alternatives to the existing parametric statistical methodology in NRC draft NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination." Proposed nonparametric statistical methods for testing compliance with decommissioning criteria are provided for radionuclides which occur in natural background and for those that do not occur in natural background. The tests considered applicable are the Wilcoxon Signed Ranks test, Sign test, and Quantile test for the analysis of a single data set, and the Wilcoxon Rank Sum test and a Quantile test for comparing two independent data sets. An Elevated Measurement Comparison is also described to deal with any unusually high observations. This report contains information on the Data Quality Objectives process as it relates to the planning and analysis of final site surveys. The proposed process includes methods for determining the number of samples needed to obtain statistically valid comparisons with decommissioning criteria and the methods for conducting the statistical tests with the resulting sample data.

NUREG-1506 DRFT FC: MEASUREMENT METHODS FOR RADIOLOGICAL SURVEYS IN SUPPORT OF NEW DECOMMISSIONING CRITERIA.Draft Report For Comment. HUFFERT,A.M. Division of Regulatory Applications (Post 941217). MILLER,K.M. Energy,Dept.of, Environmental Measurements Laboratory. August 1995. 78pp. 9509200363. 85541:001.

This report describes proposed methodologies for measuring low-level radiation and radioactivity that could be used in conducting surveys associated with decommissioning of licensed NRC facilities. Guidance on survey planning within the context of the Data Quality Objective approach and on specific instrumentation for measurements of gross and nuclide-specific radiation and radioactivity is given. Scanning, direct measurements, and sampling are discussed in terms of the application to particular measurement locations. The basic survey meter techniques that are commonly used at present are outlined and more detailed information is given on the capabilities and application of in situ spectrometric techniques for providing high sensitivity for individual photon-emitting radionuclides. The use of various techniques in concert is recommended, as the different measurements, taken collectively, serve as a quality control check. The methodologies described provide the means to measure residual radionuclides at concentrations corresponding

to the proposed decommissioning criteria which are in the range of 3 to 15 mrem per year for unrestricted release of a facility.

NUREG-1507 DRFT FC: MINIMUM DETECTABLE CONCENTRATIONS WITH TYPICAL RADIATION SURVEY INSTRUMENTS FOR VARIOUS CONTAMINANTS AND FIELD CONDITIONS.Draft Report For Comment. HUFFERT,A.M. Division of Regulatory Applications (Post 941217). ABELQUIST,E.W. Oak Ridge Associated Universities. BROWN,W.S. Brookhaven National Laboratory. August 1995. 160pp. 9509200367. 85540:156.

This report describes and quantitatively evaluates the effects of various factors on the detection sensitivity of commercially available portable field instruments being used to conduct radiological surveys in support of decommissioning. NRC is currently involved in a rulemaking effort to establish residual contamination criteria for release of facilities for restricted or unrestricted use. In support of that rulemaking, NRC has prepared a draft Generic Environmental Impact Statement (GEIS), consistent with the National Environmental Policy Act. The effects of this new rulemaking on the overall cost of decommissioning are among the many factors considered in the GEIS. The overall cost includes the costs of decontamination, waste disposal, and radiological surveys to demonstrate compliance with the applicable guidelines. An important factor affecting the costs of such surveys is the minimum detectable concentrations (MDCs) of field survey instruments in relation to the residual contamination guidelines. The purpose of this study was two-fold. First, the data were used to determine the validity of the theoretical MDCs used in the draft GEIS. Second, the results of the study, published herein, provide guidance to licensees for (a) selection and proper use of portable survey instruments and (b) understanding the field conditions and the extent to which the capabilities of those instruments can be limited. Such instruments as gas proportional, Geiger-Mueller, zinc sulfide, and sodium iodide detectors were evaluated.

NUREG-1519: SURFACE INTERACTIONS OF CESIUM AND BORIC ACID WITH STAINLESS STEEL. GROSSMAN,N. Division of Systems Technology (Post 941217). August 1995. 104pp. 9509130158. 85432:009.

In this report, the effects of cesium hydroxide and boric acid on oxidized stainless steel surfaces at high temperatures and near one atmosphere of pressure are investigated. This is the first experimental investigation of this chemical system. The experimental investigations were performed using a mass spectrometer and a mass electrobalance. Surfaces from the different experiments were examined using a scanning electron microscope to identify the presence of deposited species, and electron spectroscopy for chemical analysis to identify the species deposited on the surface. The analysis couples vaporization, deposition, and desorption of the compounds formed under conditions similar to what is expected during certain nuclear reactor accidents. Cesium deposits on an oxidized stainless steel surface at temperatures between 1000 and 1200 Kelvin and on stainless steel surfaces coated with boric oxide in the same temperature ranges. The mechanism for such deposition involved the chemical reaction between cesium and chromate. Some revaporization in the cesium hydroxide-boric acid system was observed. Under the conditions given, boric acid will react with cesium hydroxide to form cesium metaborate. A model is proposed for this chemical reaction.

NUREG-1522: ASSESSMENT OF INSERVICE CONDITIONS OF SAFETY-RELATED NUCLEAR PLANT STRUCTURES. ASHAR,H.; BAGCHI,G. Office of Nuclear Reactor Regulation (Post 941001). June 1995. 116pp. 9508230244. 85127:001.

The report is a compilation from a number of sources of information related to the condition of structures and civil engineering features at operating nuclear power plants in the U.S. The most significant information came from the hands-on inspection of the six old plants (licensed prior to 1977) performed by the staff of the Civil Engineering and Geosciences Branch in the Division of Engineering of the Office of Nuclear Reactor Regulation. For the containment structures, most of the information related to the degraded conditions came from the licensees as part of the Licensing Event Report System (10 CFR 50.73), or as part of the requirement under limiting condition of operation of the plant-specific Technical Specifications. Most of the information related to the degradation of other structures and civil engineering features was extracted from the industry survey, the reported incidents, and the plant visits. The report discusses the condition of the structures and civil engineering features at operating nuclear power plants and provides information that would help detect, alleviate, and correct the degraded conditions of the structures and civil engineering features.

NUREG-1600: GENERAL STATEMENT OF POLICY AND PROCEDURE FOR NRC ENFORCEMENT ACTIONS.Enforcement Policy. * Ofc of Enforcement (Post 870413). July 1995. 35pp. 9507250299. 84831:142.

This document includes the U.S. Nuclear Regulatory Commission's (NRC's or Commission's) revised General Statement of Policy and Procedure for Enforcement Actions (Enforcement Policy) as it was published in the Federal Register on June 30, 1995 (60 FR 34381). This document also includes the notice announcing the removal of the Enforcement Policy from the Code of Federal Regulations (60 FR 34380; June 30, 1995). The Enforcement Policy is a general statement of policy explaining the NRC's policies and procedures in initiating enforcement actions, and of the presiding officers and the Commission in reviewing these actions. This policy statement is applicable to enforcement in matters involving the radiological health and safety of the public, including employees' health and safety, the common defense and security, and the environment. This statement of general policy and procedure is published as NUREG-1600 to provide widespread dissemination of the Commission's Enforcement Policy. However, this is a policy statement and not a regulation. The Commission may deviate from this statement of policy and procedure as appropriate under the circumstances of a particular case.

NUREG/CP-0142 V01: PROCEEDINGS OF THE 7TH INTERNATIONAL MEETING ON NUCLEAR REACTOR THERMAL-HYDRAULICS (NURETH-7).Sessions 1-5. BLOCK,R.C.; FEINER,F. American Nuclear Society. September 1995. 509pp. 9509110196. 85399:001.

This volume includes papers presented at the 7th International Meeting on Nuclear Reactor Thermal-Hydraulics (NURETH-7) September 10-15, 1995 at Saratoga Springs, N.Y. The following subjects are discussed: progress in analytical and experimental work on the fundamentals of nuclear thermal-hydraulics, the development of advanced mathematical and numerical methods, and the application of advancements in the field in the development of novel reactor concepts. Also combined issues of thermal-hydraulics and reactor/power-plant safety, core neutronics and/or radiation.

NUREG/CP-0142 V02: PROCEEDINGS OF THE 7TH INTERNATIONAL MEETING ON NUCLEAR REACTOR THERMAL-HYDRAULICS (NURETH-7).Sessions 6-11. BLOCK,R.C.; FEINER,F. American Nuclear Society. September 1995. 806pp. 9509110202. 85402:001.

See NUREG/CP-0142,V01 abstract.

NUREG/CP-0142 V03: PROCEEDINGS OF THE 7TH INTERNATIONAL MEETING ON NUCLEAR REACTOR THERMAL-HYDRAULICS (NURETH-7).Sessions 12-16. BLOCK,R.C.; FEINER,F. American Nuclear Society. September 1995. 916pp. 9509110205. 85386:001.

See NUREG/CP-0142,V01 abstract.

NUREG/CP-0142 V04: PROCEEDINGS OF THE 7TH INTERNATIONAL MEETING ON NUCLEAR REACTOR THERMAL-HYDRAULICS (NURETH-7).Sessions 17-24. BLOCK,R.C.; FEINER,F. American Nuclear Society. September 1995. 845pp. 9509110210. 85396:001.

See NUREG/CP-0142,V01 abstract.

NUREG/CP-0144 V01: A WORKSHOP ON DEVELOPING RISK ASSESSMENT METHODS FOR MEDICAL USE OF RADIOACTIVE MATERIAL.Summary. TORTORELLI,J.P. Idaho National Engineering Laboratory. August 1995. 122pp. 9508230352. INEL-94/0111. 85118:013.

A workshop was held at the Idaho National Engineering Laboratory, August 16-18, 1994, on the topic of risk assessment on medical devices that use radioactive isotopes. Its purpose was to review past efforts to develop a risk assessment methodology to evaluate these devices and to develop a program plan and scoping document for future development. This report presents a summary of that workshop, related technical papers, presentation material, and a transcript of the workshop. Participants included experts in the fields of radiation oncology, medical physics, risk assessment, human-error analysis, and human factors. Staff from the U.S. Nuclear Regulatory Commission (NRC) associated with the regulation of medical uses of radioactive materials and with research into risk-assessment methods participated in the workshop. The workshop participants concurred in NRC's intended use of risk assessment as an important technology in the development of regulations for the medical use of radioactive material and encouraged the NRC to proceed rapidly with a pilot study. Specific recommendations are included in the executive summary and the body of this report.

NUREG/CP-0144 V02: A WORKSHOP ON DEVELOPING RISK ASSESSMENT METHODS FOR MEDICAL USE OF RADIOACTIVE MATERIAL.Supporting Documents. TORTORELLI,J.P. Idaho National Engineering Laboratory. August 1995. 330pp. 9508230354. INEL-94/0111. 85119:001.

See NUREG/CP-0144,V01 abstract.

NUREG/CP-0146: PROCEEDINGS OF THE WORKSHOP ON GATE VALVE PRESSURE LOCKING AND THERMAL BINDING. BROWN,E.J. Division of Safety Programs (Post 870413). July 1995. 268pp. 9508090040. 84964:001.

The purpose of the Workshop on Gate Valve Pressure Locking and Thermal Binding was to discuss pressure locking and thermal binding issues that could lead to inoperable gate valves in both boiling water and pressurized water reactors. The goal was to foster exchange of information to develop the technical bases to understand the phenomena, identify the components that are susceptible, discuss actual events, discuss the safety significance, and illustrate known corrective actions that can prevent or limit the occurrence of pressure locking or thermal binding. The presentations were structured to cover U.S. Nuclear Regulatory Commission staff evaluation of operating experience and planned regulatory activity; industry discussions of specific events, including foreign experience, and efforts to determine causes and alleviate the affects; and valve vendor experience and recommended corrective action. The discussions indicated that identifying valves susceptible to pressure locking and thermal binding was a complex process involving knowledge of components, systems, and plant operations. The corrective action options are varied and straightforward.

NUREG/CP-0148: TRANSACTIONS OF THE TWENTY-THIRD WATER REACTOR SAFETY INFORMATION MEETING. MONTELEONE,S. Brookhaven National Laboratory. September 1995. 76pp. 9510060240. 85746:182.

This report contains summaries of papers on reactor safety research to be presented at the 23rd Water Reactor Safety Information Meeting at the Bethesda Marriott Hotel, Bethesda, Maryland, October 23-25, 1995. The summaries briefly describe the program and results of nuclear safety research sponsored by the Office of Nuclear Regulatory Research, U.S. NRC. Summaries of invited papers concerning nuclear safety issues from U.S. government laboratories, the electric utilities, the nuclear industry, and from foreign governments and industry are also included. The summaries have been compiled in one report to provide a basis for meaningful discussion and information exchange during the course of the meeting and are given in the order of their presentation in each session.

NUREG/CR-2907 V13: RADIOACTIVE MATERIALS RELEASED FROM NUCLEAR POWER PLANTS. Annual Report 1992. TICHLER,J.; DOTY,K.; LUCADAMO,K. Brookhaven National Laboratory. August 1995. 350pp. 9509130181. BNL-NUREG-51581. 85431:001.

Releases of radioactive materials in airborne and liquid effluents from commercial light water reactors during 1992 have been compiled and reported. Data on solid waste shipments as well as selected operating information have been included. This report supplements earlier annual reports issued by the former Atomic Energy Commission and the Nuclear Regulatory Commission. The 1992 release data are summarized in tabular form. Data covering specific radionuclides are summarized.

NUREG/CR-4667 V19: ENVIRONMENTALLY ASSISTED CRACKING IN LIGHT WATER REACTORS. Semiannual Report,April-September 1994. CHOPRA,O.K.; CHUNG,H.M.; GAVENDA,D.J.; et al. Argonne National Laboratory. September 1995. 67pp. 9510030169. ANL-95/25. 85688:172.

This report summarizes work performed by Argonne National Laboratory (ANL) on fatigue and environmentally assisted cracking (EAC) in light water reactors from April to September 1994. Topics that have been investigated include (a) fatigue of carbon and low-alloy steel used in piping and reactor pressure vessels, (b) EAC of austenitic stainless steels (SSs) and Alloy 600, and (c) irradiation-assisted stress corrosion cracking (IASCC) of Type 304 SS. Fatigue tests have been conducted on A106-Gr B and A533-Gr B steels in oxygenated water to determine whether a slow strain rate applied during different portions of a tensile-loading cycle are equally effective in decreasing fatigue life. Crack growth data were obtained on fracture-mechanics specimens of SSs and Alloy 600 to investigate EAC in simulated boiling water reactor (BWR) and pressurized water reactor environments at 289 degrees C. The data were compared with predictions from crack growth correlations developed at ANL for SSs in water and from rates in air from Section XI of the ASME Code. Microchemical changes in high- and commercial-purity Type 304 SS specimens from control-blade absorber tubes and a control-blade sheath from operating BWRs were studied by Auger electron spectroscopy and scanning electron microscopy to determine whether trace impurity elements may contribute to IASCC of these materials.

NUREG/CR-5535 V01: RELAP5/MOD3 CODE MANUAL.Code Structure, System Models, And Solution Methods. * Idaho National Engineering Laboratory. August 1995. 412pp. 9509150284. INEL-95/0174. 85495:001.

The RELAP5/MOD3 computer code has been developed for best-estimate simulation of light water reactor coolant systems during postulated accidents. The code models the coupled behavior of the reactor coolant system and the core for loss-of-coolant accidents and operational transients such as anticipated transient without scram, loss of offsite power, loss of feedwater, and loss of flow. A generic modeling approach is used that permits simulating a variety of thermal-hydraulic systems. Control system and secondary system components are included to permit modeling of plant controls, turbines, condensers, and secondary feedwater systems. RELAP5/MOD3 code documentation is divided into seven volumes: Volume I presents modeling theory and associated numerical solution schemes; Volume II details instructions for code application and input data preparation; Volume III presents the results of developmental assessment cases that demonstrate and verify the models used in the code; Volume IV discusses in detail RELAP5 models and corre-

lations; Volume V presents guidelines that have evolved over the past several years through the use of the RELAP5 code; Volume VI discusses the numerical scheme used in RELAP5; and Volume VII presents a collection of independent assessment calculations.

NUREG/CR-5535 V02: RELAP5/MOD3 CODE MANUAL.User's Guide And Input Requirements. * Idaho National Engineering Laboratory. August 1995. 323pp. 9509150290. INEL-95/0174. 85496:049.

See NUREG/CR-5535,V01 abstract.

NUREG/CR-5535 V04: RELAP5/MOD3 CODE MANUAL.Models And Correlations. * Idaho National Engineering Laboratory. August 1995. 430pp. 9509150303. INEL-95/0174. 85498:001.

See NUREG/CR-5535,V01 abstract.

NUREG/CR-5535 V05 R1: RELAP5/MOD3 CODE MANUAL.User's Guideline. FLETCHER,C.D.; SCHULTZ,R.R. Idaho National Engineering Laboratory. August 1995. 293pp. 9509150307. INEL-95/0174. 85497:008.

See NUREG/CR-5535,V01 abstract.

NUREG/CR-5591 V05 N2: HEAVY-SECTION STEEL IRRADIATION PROGRAM.Progress Report For April 1994 Through September 1994. CORWIN,W.R. Oak Ridge National Laboratory. July 1995. 76pp. 9508160263. ORNL/TM-11568. 85042:092.

The goal of the Heavy-Section Steel Irradiation Program is to provide a thorough, quantitative assessment of effects of neutron irradiation on material behavior, and in particular the fracture toughness properties, of typical pressure vessel steels as they relate to light-water reactor pressure-vessel integrity. Effects of specimen size, material chemistry, product form and microstructure, irradiation fluence, flux, temperature and spectrum, and post-irradiation annealing are being examined on a wide range of fracture properties. The HSSI Program is arranged into 14 tasks: (1) program management, (2) fracture toughness (K(Ic)) curve shift in high-copper welds, (3) crack-arrest toughness (K(Ia)) curve shift in high-copper welds, (4) irradiation effects on cladding, (5) K(Ic) and K(Ia) curve shifts in low upper-shelf welds, (6) annealing effects in low upper-shelf welds, (7) irradiation effects in a commercial low upper-shelf weld, (8) microstructural analysis of irradiation effects, (9) in-service aged material evaluations, (10) correlation monitor materials, (11) special technical assistance, (12) JPDR steel examination, (13) technical assistance for JCCCNRS Working Groups 3 and 12, and (14) additional requirements for materials. This report provides an overview of the activities within each of these tasks from April 1994 Through September 1994.

NUREG/CR-5758 V05: FITNESS FOR DUTY IN THE NUCLEAR POWER INDUSTRY.Annual Summary Of Program Performance Reports CY 1994. WESTRA,C.; DURBIN,N.; FIELD,I.; et al. Battelle Seattle Research Center. August 1995. 83pp. 9508230332. PNL-10638. 85118:134.

This report summarizes data from semiannual reports on fitness- for-duty program performance submitted to the NRC by utilities for two reporting periods: Jan. 1 through June 30, 1994, and July 1 through Dec. 31, 1994. In 1994, licensees reported that they had conducted 163,247 tests for the presence of illegal drugs and alcohol. Of these tests, 1,372 (.84%) were confirmed positive. Positive test results varied by category of test and category of worker. The majority of positive test results (977) were obtained through pre-access testing. Of tests conducted on workers having access to the protected area, 233 were positive from random testing and 122 were positive from for-cause testing. Followup testing of workers who had previously tested positive resulted in 50 positive tests. For-cause testing resulted in the highest percentage of positive tests; about 16% of for-cause tests were positive. In comparison, 1.22% of pre-access tests and .28% of random tests were positive. Positive test rates also varied by category of worker. When all types of tests are combined (pre-access, random, for-cause, and followup), short-term contractor personnel had the highest positive test rate at 1.22%. Licensee employees and long-term contractors had lower combined positive test rates (.33% and .49% respectively). Of the substances tested, marijuana was responsible for the highest percentage of positive test results (52.79%), followed by cocaine (24.57%) and alcohol (17.93%).

NUREG/CR-5944 V02: A CHARACTERIZATION OF CHECK VALVE DEGRADATION AND FAILURE EXPERIENCE IN THE NUCLEAR POWER INDUSTRY.1991 Failures. MCELHANEY,K.L. Oak Ridge National Laboratory. July 1995. 87pp. 9508090036. ORNL-6734. 84963:003.

Review and characterization of check valve failures taken from the Institute of Nuclear Power Operation's Nuclear Plant Reliability Data System was performed in accordance with part two of a three-phase project sponsored by the U.S. Nuclear Regulatory Commission. The analysis was performed for check valve failures occurring in 1991 and is intended to update the previous analysis performed for the time period 1984-1990. To maintain consistency and for ease of trending, the 1991 analysis presents the same parameters and cross-correlations in essentially the same format as the 1984-1990 study. Additional data was obtained for the 1991 analysis, including information related to specific check valve type. This information is presented in a separate section of the report.

NUREG/CR-5973 R02: CODES AND STANDARDS AND OTHER GUIDANCE CITED IN REGULATORY DOCUMENTS. NICKOLAUS,J.R.; BOHLANDER,K.L. Battelle Memorial Institute, Pacific Northwest Laboratory. August 1995. 525pp. 9509130146. PNL-8462. 85429:001.

As part of the U.S. Nuclear Regulatory Commission (NRC) Standard Review Plan Update and Development Program, Pacific Northwest Laboratory developed a listing of industry consensus codes and standards and other government and industry guidance referred to in regulatory documents. In addition to updating previous information, Revision 2 adds more than 500 citations. This listing identifies the version of the code or standard cited in the regulatory document, the regulatory document, and the latest version of the code or standard. It also provides a summary characterization of the nature of the citation. This listing was developed from electronic searches of the Code of Federal Regulations and the NRC's Bulletins, Information Notices, Circulars, Enforcement Manual, Generic Letters, Inspection Manual, Policy Statements, Regulatory Guides, Standard Technical Specifications, and the Standard Review Plan (NUREG-0800).

NUREG/CR-6002: RISK-BASED MAINTENANCE MODELING.Prioritization Of Maintenance Importances And Quantification Of Maintenance Effectiveness. VESELY,W.E.; REZOS,J.T. Science Applications International Corp. (formerly Science Applications, Inc.). * Brookhaven National Laboratory. September 1995. 90pp. 9510030191. BNL-NUREG-52332. 85672:266.

This report describes approaches for prioritizing the risk importances of maintenances using a Probabilistic Risk Assessment (PRA). Approaches are then described for quantifying the reliability and risk effects of maintenance actions. Two different PRA importance measures, minimal cutset importances and risk reduction importances, are used to prioritize maintenances and the report shows that similar results are obtained if appropriate criteria are used. The justifications for the particular importance measures are also developed. The approaches which are developed for quantifying the reliability and risk effects of maintenance actions are extensions of the usual reliability models now used in PRAs. These extended models consider degraded states of the component and quantify the benefits of maintenance in correcting degradations and preventing failures. The negative effects of maintenance, including maintenance downtimes, are also included. These models are specific types of Markov models. This report analyzes a range of postulated values of input data in order to explore the potential usefulness

of these models. The effects of maintenance are quantified to be large in specific cases.

NUREG/CR-6089: DETECTION OF PUMP DEGRADATION. GREENE,R.H.; CASADA,D.A. Oak Ridge National Laboratory. August 1995. 108pp. 9509130143. ORNL-6765. 85430:182.

This study examines the methods of detecting pump degradation that are employed in domestic and overseas nuclear facilities. This report evaluates criteria mandated by required pump testing at U.S. nuclear plants and compares them to state-of-the-art diagnostic programs and practices implemented by other major industries. Since the working condition of the pump driver is critical to pump operability, a review of new applications of motor diagnostics is also provided that highlights developments in this technology. Vibration spectral analysis is a powerful diagnostic tool for the pump analyst. The routine collection and analysis of spectral data is superior to other technologies in its ability to accurately detect numerous types and causes of pump degradation. Existing ASME testing criteria do not require the evaluation of pump vibration spectra but instead overall vibration amplitude. The mechanical information discernible from vibration amplitude is limited, and several pump failures in the nuclear power industry were not detected by vibration amplitude monitoring. Since spectral analysis provides pertinent information concerning the mechanical condition of rotating machinery, its incorporation into ASME testing criteria may merit a relaxation in the monthly-to-quarterly testing schedules that seek to verify pump operability.

NUREG/CR-6100: GATE VALVE AND MOTOR-OPERATOR RESEARCH FINDINGS. STEELE,R.; DEWALL,K.G.; WATKINS,J.C.; et al. Idaho National Engineering Laboratory. September 1995. 130pp. 9510060250. INEL-94/0156. 85745:001.

This report provides an update on the valve research being sponsored by the U.S. Nuclear Regulatory Commission (NRC) and conducted at the Idaho National Engineering Laboratory (INEL). The research addresses the need to provide assurance that motor-operated valves can perform their intended safety function, usually to open or close against specified (design basis) flow and pressure loads. This report describes several important developments: (a) two methods for estimating or bounding the design basis stem factor (in rising-stem valves), using data from tests less severe than design basis tests; (b) a new correlation for evaluating the opening responses of gate valves and for predicting opening requirements; (c) an extrapolation method that uses the results of a best effort flow test to estimate the design basis closing requirements of a gate valve that exhibits atypical responses (peak force occurs before flow isolation); and (d) the extension of the original INEL closing correlation to include low-flow and low-pressure loads. The report also includes a general approach, presented in step-by-step format, for determining operating margins for rising-stem valves (gate valves and globe valves) as well as quarter-turn valves (ball valves and butterfly valves).

NUREG/CR-6125 V03: HUMAN FACTORS EVALUATION OF REMOTE AFTERLOADING BRACHYTHERAPY.Supporting Analyses Of Human-System Interfaces,Procedures And Practices,Training And Organizational Practices And Procedures. CALLAN,J.R.; KELLY,R.T.; QUINN,M.L.; et al. Pacific Science & Engineering Group, Inc. July 1995. 226pp. 9508090067. 84965:001.

A human factors project on the use of nuclear by-product material to treat cancer using remotely operated afterloaders was undertaken by the Nuclear Regulatory Commission. The purpose of the project was to identify factors that contribute to human error in the system for remote afterloading brachytherapy (RAB). This report documents the findings from the second, third, fourth, and fifth phases of the project, which involved detailed analyses of four major aspects of the RAB system linked to human error: human-system interfaces; procedures and practices; training practices and policies; and organizational practices and policies, respectively. Findings based on these analyses provided factual and conceptual support for the final phase of this project, which identified factors leading to human error in RAB. The impact of those factors on RAB performance was then evaluated and prioritized in terms of safety significance, and alternative approaches for resolving safety significant problems were identified and evaluated.

NUREG/CR-6143 V01: EVALUATION OF POTENTIAL SEVERE ACCIDENTS DURING LOW POWER AND SHUTDOWN OPERATIONS AT GRAND GULF,UNIT 1.Summary Of Results. WHITEHEAD,D.W. Sandia National Laboratories. July 1995. 56pp. 9508230248. SAND93-2440. 85118:215.

This document contains a summarization of the results and insights from the Level 1 accident sequence analyses of internally initiated events, internally initiated fire and flood events, seismically initiated events, and the Level 2/3 risk analysis of internally initiated events (excluding fire and flood) for Grand Gulf, Unit 1 as it operates in the Low Power and Shutdown Plant Operational State 5 during a refueling outage. The report summarizes the Level 1 information contained in Volumes 2 - 5 and the Level 2/3 information contained in Volume 6 of NUREG/CR-6143.

NUREG/CR-6150 V01: SCDAP/RELAP5/MOD 3.1 CODE MANUAL.Interface Theory. ALLISON,C.M.; BERNA,G.A.; CORYELL,E.W.; et al. Idaho National Engineering Laboratory. June 1995. 70pp. 9507180412. EGG-2720. 84716:299.

The SCDAP/RELAP5 code has been developed for best estimate transient simulation of light water reactor coolant systems during a severe accident. The code models the coupled behavior of the reactor coolant system, the core, fission products released during a severe accident transient as well as large and small break loss-of-coolant accidents, operational transients such as anticipated transient without SCRAM, loss of offsite power, loss of feedwater, and loss of flow. A generic modeling approach is used that permits as much of a particular system to be modeled as necessary. Control system and secondary system components are included to permit modeling of plant controls, turbines, condensers, and secondary feedwater conditioning systems. This volume describes the organization and manner of the interface between severe accident models which are resident in the SCDAP portion of the code and hydrodynamic models which are resident in the RELAP portion of the code. A description of the organization and structure of SCDAP/RELAP5 is presented. Additional information is provided regarding the manner in which models in one portion of the code impact other parts of the code, and models which are dependent on and derive information from other subcodes.

NUREG/CR-6150 V02: SCDAP/RELAP/MOD 3.1 CODE MANUAL.Damage Progression Model Theory. ALLISON,C.M.; BERNA,G.A.; CHENG,T.C.; et al. Idaho National Engineering Laboratory. June 1995. 190pp. 9507180418. EGG-2720. 84713:172.

The SCDAP/RELAP5 code has been developed for best estimate transient simulation of light water reactor coolant systems during a severe accident. The code models the coupled behavior of the reactor coolant system, the core, fission products released during a severe accident transient as well as large and small break loss-of-coolant accidents, operational transients such as anticipated transient without SCRAM, loss of offsite power, loss of feedwater, and loss of flow. A generic modeling approach is used that permits as much of a particular system to be modeled as necessary. Control system and secondary system components are included to permit modeling of plant controls, turbines, condensers, and secondary feedwater conditioning systems. This volume contains detailed descriptions of the severe accident models and correlations. It provides the user with the underlying assumptions and simplifications used to generate and implement the basic equations into the code, so

an intelligent assessment of the applicability and accuracy of the resulting calculation can be made.

NUREG/CR-6150 V03: SCDAP/RELAP5/MOD 3.1 CODE MANUAL.User's Guide And Input Manual. ALLISON,C.M.; BERNA,G.A.; CORYELL,E.W.; et al. Idaho National Engineering Laboratory. June 1995. 352pp. 9507180429. EGG-2720. 84715:311.

The SCDAP/RELAP5 code has been developed for best estimate transient simulation of light-water-reactor coolant systems during a severe accident. The code models the coupled behavior of the reactor coolant system, core, fission products released during a severe accident transient as well as large and small break loss-of-coolant accidents, operational transients such as anticipated transient without SCRAM, loss of offsite power, loss of feedwater, and loss of flow. A generic modeling approach is used that permits as much of a particular system to be modeled as necessary. Control system and secondary system components are included to permit modeling of pla. controls, turbines, condensers, and secondary feedwater conditioning systems. This volume, Volume 3, provides guidelines to code users based upon lessons learned during the developmental assessment process. A description of problem control and the installation process is included. Appendix A contains the description of the input requirements.

NUREG/CR-6150 V04: SCDAP/RELAP5/MOD 3.1 CODE MANUAL.MATPRO--A Library Of Materials Properties For Light-Water-Reactor Accident Analysis. ALLISON,C.M.; BERNA,G.A.; CHAMBERS,R.; et al. Idaho National Engineering Laboratory. June 1995. 674pp. 9507180441. EGG-2720. 84714:001.

The SCDAP/RELAP5 code has been developed for best estimate transient simulation of light-water-reactor coolant systems during a severe accident. The code models the coupled behavior of the reactor coolant system, core, fission products released during a severe accident transient as well as large and small break loss-of-coolant accidents, operational transients such as anticipated transient without SCRAM, loss of offsite power, loss of feedwater, and loss of flow. A generic modeling approach is used that permits as much of a particular system to be modeled as necessary. Control system and secondary system components are included to permit modeling of plant controls, turbines, condensers, and secondary feedwater conditioning systems. This volume, Volume 4, describes the material properties correlations and computer subroutines (MATPRO) used by SCDAP/RELAP5. Formulation of the materials properties are generally semi-empirical in nature. A wide variety of material property subroutines are contained in this document. This document also contains descriptions of the reaction and solution rate models needed to analyze a reactor accident.

NUREG/CR-6150 V05: SCDAP/RELAP5/MOD 3.1 CODE MANUAL.Developmental Assessment. ALLISON,C.M.; BERNA,G.A.; BOURDON,S.M.; et al. Idaho National Engineering Laboratory. June 1995. 349pp. 9507180448. EGG-2720. 84717:001.

The SCDAP/RELAP5 code has been developed for best estimate transient simulation of light water reactor coolant systems during a severe accident. The code models the coupled behavior of the reactor coolant system, the core, fission product released during a severe accident transient as well as large and small break loss of coolant accidents, operational transients such as anticipated transient without SCRAM, loss of offsite power, loss of feedwater, and loss of flow. A generic modeling approach is used that permits as much of a particular system to be modeled as necessary. Control system and secondary system components are included to permit modeling of plant controls, turbines, condensers, and secondary feedwater conditioning systems. This volume contains detailed code-to-data calculations performed using SCDAP/RELAP5/MOD3.1, as well as comparison calculations performed with earlier code versions. The results of full plant calculations which include Surry, TMI-2, and Browns Ferry are described. The results of a nodalization study, which accounted for both axial and radial nodalization of the core, are also reported.

NUREG/CR-6159: USING MICRO SAINT TO PREDICT PERFORMANCE IN A NUCLEAR POWER PLANT CONTROL ROOM.A Test Of Validity And Feasibility. LAWLESS,M.T.; LAUGHERY,K.R. Micro Analysis & Design, Inc. PERSENSKY,J.J. Control, Instrumentation & Human Factors Branch (Post 941217). September 1995. 38pp. 9510030209. 85663:255.

The United States Nuclear Regulatory Commission (NRC) requires a technical basis for regulatory actions. In the area of human factors, one possible technical basis is human performance modeling technology including task network modeling. This study assessed the feasibility and validity of task network modeling to predict the performance of control room crews. Task network models were built that matched the experimental conditions of a study on computerized procedures that was conducted at North Carolina State University. The data from the "paper procedures" conditions were used to calibrate the task network models. Then, the models were manipulated to reflect expected changes when computerized procedures were used. These models' predictions were then compared to the experimental data from the "computerized conditions" of the North Carolina State University study. Analyses indicated that the models predicted some subsets of the data well, but not all. Implications for the use of task network modeling are discussed.

NUREG/CR-6184: SEPARATE EFFECTS TESTING AND ANALYSES TO INVESTIGATE LINER TEARING OF THE 1:16-SCALE REINFORCED CONCRETE CONTAINMENT BUILDING. SPLETZER,B.L.; LAMBERT,L.D.; BERGMAN,V.L.; et al. Sandia National Laboratories. May 1995. 250pp. 9507200213. SAND92-1720. 84749:001.

The overpressurization of a 1:6-scale reinforced concrete containment building demonstrated that liner tearing is a plausible failure mode in such structures under severe accident conditions. A combined experimental and analytical program was developed to determine the important parameters that affect liner tearing and to develop reasonably simple analytical methods for predicting when tearing will occur. Three sets of test specimens were designed to allow individual control over and investigation of the mechanisms believed to be important in causing failure of the liner plate. The series of tests investigated the effect on liner tearing produced by the anchorage system, the loading conditions, and the transition in thickness from the liner to the insert plate. Before testing, the specimens were analyzed using two- and three-dimensional finite element models. Based on the analysis, the failure mode and corresponding load conditions were predicted for each specimen. Test data and post-test examination of test specimens show mixed agreement with the analytical predictions with regard to failure mode and specimen response for most tests. Many similarities were also observed between the response of the liner in the 1:6-scale reinforced concrete containment model and the response of the test specimens. This work illustrates the fact that the failure mechanism of a reinforced concrete containment building can be greatly influenced by details of liner and anchorage system design. Further, it significantly increases the understanding of containment building response under severe conditions.

NUREG/CR-6188 V02: MICROBIAL DEGRADATION OF LOW-LEVEL RADIOACTIVE WASTE.Annual Report For FY 1994. ROGERS,R.D.; HAMILTON,M.A.; VEEH,R.H.; et al. Idaho National Engineering Laboratory. August 1995. 66pp. 9509130162. INEL-95/0153. 85430:287.

The Nuclear Regulatory Commission stipulates in 10 CFR 61 that disposed low-level radioactive waste (LLW) be stabilized. To provide guidance to disposal vendors and nuclear station waste generators for implementing those requirements, the NRC developed Technical Position on Waste Form, Revision 1. That document details a specified set of recommended testing

procedures and criteria, including several tests for determining the biodegradation properties of waste forms. Cement has been widely used to solidify LLW; however, the resulting waste forms are sometimes susceptible to failure due to the actions of waste constituents, stress, and environment. The purpose of this research program is to develop modified microbial degradation test procedures that will be more appropriate than the existing procedures for evaluating the effects of microbiologically influenced chemical attack on cement-solidified LLW. Groups of microorganisms indigenous to LLW disposal sites are being employed that can metabolically convert organic and inorganic substrates into organic and mineral acids. Such acids aggressively react with cement and can ultimately lead to structural failure. Results over the past year on the application of mechanisms inherent in microbially influenced degradation of cement-based material are the focus of this annual report. Data-validated evidence of the potential for microbially influenced deterioration of cement-solidified LLW and subsequent release of radionuclides has been developed during this study.

NUREG/CR-6261: A SUMMARY OF ORNL FISSION PRODUCT RELEASE TESTS WITH RECOMMENDED RELEASE RATES AND DIFFUSION COEFFICIENTS. LORENZ,R.A.; OSBORNE,M.F. Oak Ridge National Laboratory. July 1995. 83pp. 9509070074. ORNL/TM-12801. 85401:146.

Fission product release data from the ORNL HI test series and VI test series are summarized in this report and compared with release results from similar tests performed in France (the HEVA test series). The ORNL test results are also compared with four in-reactor tests, the SNL ST-1 and ST-2 tests, and the INEL SFD 1-3 and SFD 1-4 bundle tests. Test atmospheres range from steam to hydrogen, and the temperature range is 1675 to 2700 K.

NUREG/CR-6263 V01: HIGH INTEGRITY SOFTWARE FOR NUCLEAR POWER PLANTS.Candidate Guidelines, Technical Basis And Research Needs.Executive Summary. SETH,S.; BAIL,W.; CLEAVES,D.; et al. MITRE Corp. June 1995. 86pp. 9508020314. MTR 94W0000114. 84908:262.

The work documented in this report was performed in support of the U.S. Nuclear Regulatory Commission to examine the technical basis for candidate guidelines that could be considered in reviewing and evaluating high integrity computer software used in the safety systems of nuclear power plants. The framework for the work consisted of the following software development and assurance activities: requirements specification; design; coding; verification and validation, including static analysis and dynamic testing; safety analysis; operation and maintenance; configuration management; quality assurance; and planning and management. Each activity (framework element) was subdivided into technical areas (framework subelements). The report describes the development of approximately 200 candidate guidelines that span the entire range of software life-cycle activities; the assessment of the technical basis for those candidate guidelines; and the identification, categorization and prioritization of research needs for improving the technical basis. The report has two volumes: Volume 1, Executive Summary, includes an overview of the framework and of each framework element, the complete set of candidate guidelines, the results of the assessment of the technical basis for each candidate guideline, and a discussion of research needs that support the regulatory function; Volume 2 is the main report.

NUREG/CR-6263 V02: HIGH INTEGRITY SOFTWARE FOR NUCLEAR POWER PLANTS.Candidate Guidelines, Technical Basis And Research Needs.Main Report. SETH,S.; BAIL,W.; CLEAVES,D.; et al. MITRE Corp. June 1995. 430pp. 9508020315. MTR 940000114. 84909:001.

See NUREG/CR-6263,V01 abstract.

NUREG/CR-6265: MULTIDISCIPLINARY FRAMEWORK FOR HUMAN RELIABILITY ANALYSIS WITH AN APPLICATION TO ERRORS OF COMMISSION AND DEPENDENCIES. BARRIERE,M.T. Brookhaven National Laboratory. WREATHALL,J. John Wreathall & Co., Inc. COOPER,S.E.; et al. Science Applications International Corp. (formerly Science Applications, Inc.). August 1995. 289pp. 9509200039. BNL-NUREG-52431. 85539:094.

Since the early 1970s, human reliability analysis (HRA) has been considered to be an integral part of probabilistic risk assessments (PRAs). Nuclear power plant (NPP) events, from Three Mile Island through the mid-1980s, showed the importance of human performance to NPP risk. Recent events demonstrate that human performance continues to be a dominant source of risk. In light of these observations, the current limitations of existing HRA approaches become apparent when the role of humans is examined explicitly in the context of real NPP events. The development of new or improved HRA methodologies to more realistically represent human performance is recognized by the Nuclear Regulatory Commission (NRC) as a necessary means to increase the utility of PRAs. To accomplish this objective, an Improved HRA Project, sponsored by the NRC's Office of Nuclear Regulatory Research (RES), was initiated in late February, 1992, at Brookhaven National Laboratory (BNL) to develop an improved method for HRA that more realistically assesses the human contribution to plant risk and can be fully integrated with PRA. This report describes the research efforts including the development of a multidisciplinary HRA framework, the characterization and representation of errors of commission, and an approach for addressing human dependencies. The implications of the research and necessary requirements for further development also are discussed.

NUREG/CR-6277 V01: HUMAN FACTORS EVALUATION OF TELETHERAPY. Identification Of Problems And Alternative Approaches. HENRIKSEN,K.; KAYE,R.D.; JONES,R.; et al. Hughes Training, Inc. July 1995. 92pp. 9508010236. 84908:099.

A series of human factors evaluations were undertaken to better understand the contributing factors to human error in the teletherapy environment. Teletherapy is a multidisciplinary methodology for treating cancerous tissue through selective exposure to an external beam of ionizing radiation. A team of human factors specialists, assisted by a panel of radiation oncologists, medical physicists, and radiation therapists, conducted site visits to radiation oncology departments at community hospitals, university centers, and free-standing clinics. A function and task analysis was initially performed to guide subsequent evaluations in the areas of system-user interfaces, procedures, training and qualifications, and organizational policies and practices. The present work focuses solely on training and qualifications of personnel (e.g., training received before and during employment), and the potential impact of organizational factors on the performance of teletherapy. Organizational factors include such topics as adequacy of staffing, performance evaluations, commonly occurring errors, implementation of quality assurance programs, and organizational climate.

NUREG/CR-6277 V02: HUMAN FACTORS EVALUATION OF TELETHERAPY.Function And Task Analysis. KAYE,R.D.; HENRIKSEN,K.; JONES,R.; et al. Hughes Training, Inc. July 1995. 250pp. 9508020293. 84910:067.

See NUREG/CR-6277,V01 abstract.

NUREG/CR-6277 V03: HUMAN FACTORS EVALUATION OF TELETHERAPY.Human-System Interfaces And Procedures. KAYE,R.D.; HENRIKSEN,K.; JONES,R.; et al. Hughes Training, Inc. July 1995. 70pp. 9508020295. 84915:001.

See NUREG/CR-6277,V01 abstract.

NUREG/CR-6277 V04: HUMAN FACTORS EVALUATION OF TELETHERAPY.Training And Organizational Analysis. HENRIKSEN,K.; KAYE,R.D.; JONES,R.; et al. Hughes Training, Inc. July 1995. 71pp. 9508020296. 84908:191.

See NUREG/CR-6277,V01 abstract.

NUREG/CR-6277 V05: HUMAN FACTORS EVALUATION OF TELETHERAPY.Literature Review. HENRIKSEN,K.; KAYE,R.D.; JONES,R.; et al. Hughes Training, Inc. July 1995. 113pp. 9508020306. 84915:071.

See NUREG/CR-6277,V01 abstract.

NUREG/CR-6305: BLT-EC (BREACH, LEACH, TRANSPORT, AND EQUILIBRIUM CHEMISTRY), A FINITE-ELEMENT MODEL FOR ASSESSING THE RELEASE OF RADIONUCLIDES FROM LOW-LEVEL WASTE DISPOSAL UNITS.Background, Theory, And Model Description. MACKINNON,R.J.; SULLIVAN,T.M. Brookhaven National Laboratory. SIMONSON,S.A.; et al. Massachusetts Institute of Technology, Cambridge, MA. August 1995. 155pp. 9509200030. BNL-NUREG-52446. 85540:001.

Performance assessment models typically account for sorption and dissolution-precipitation by using an empirical distribution coefficient (K(d)) that combines the effects of all chemical reactions between solid and aqueous phases. There is an increasing awareness that performance assessments based solely on empirically based K(d) models may be incomplete, particularly for applications involving radionuclides having sorption and solubility properties that are sensitive to variations in the in situ chemical environment. To accommodate such variations and to assess impact on radionuclide mobility, one must model radionuclide release, transport, and chemical processes in a coupled fashion. This modeling was incorporated into the two-dimensional, finite-element, computer code BLT-EC which can predict container degradation, waste-form leaching, and advective-dispersive, multispecies, solute transport. BLT-EC accounts for retardation directly by modeling the chemical processes of complexation, sorption, dissolution-precipitation, ion-exchange, and oxidation-reduction reactions. Herein we: (1) describe in detail physical and chemical processes that control the release and migration of radionuclides from shallow land LLW disposal facilities; (2) formulate the mathematical models that represent these processes; (3) outline how these models are incorporated and implemented in BLT-EC; and (4) demonstrate application of BLT-EC on sample problems.

NUREG/CR-6313 V01: ROBUST, ACCURATE, AND NON-CONTACTING VIBRATION MEASUREMENT SYSTEM.Summary of Comparison Measurements Of The Robust Laser Interferometer And Typical Accelerometer Systems. GOODENOW,T.C.; SHIPMAN,R.L.; HOLLAND,H.M. Epoch Engineering, Inc. June 1995. 74pp. 9507200222. 84749:285.

Epoch Engineering, Incorporated (EEI) has completed a series of vibration measurements comparing their newly-developed Robust Laser Interferometer (RLI) with accelerometer instrumentation systems. EEI has successfully demonstrated, on several pieces of commonplace machinery, that non-contact, line-of-sight measurements are practical and yield results equal to or, in some cases, better than customary field implementations of accelerometers. The demonstration included analysis and comparison of such phenomena as nonlinearity, transverse sensitivity, harmonics, and signal-to-noise ratio. Fast Fourier Transformations were performed on the accelerometer and the laser system outputs to provide a comparison basis. The RLI was demonstrated, within the limits of the task, to be a viable, line-of-sight, non-contract alternative to accelerometer systems. Several different kinds of machinery were instrumented and compared, including a small pump, a gear-driven cement mixer, a rotor kit, and two small fans. Known machinery vibration sources were verified and RLI system output file formats were verified to be compatible with commercial computer programs used for vibration monitoring and trend analysis. The RLI was also observed to be less subject to electromagnetic interference (EMI) and more capable at very low frequencies.

NUREG/CR-6313 V02: ROBUST, ACCURATE, AND NON-CONTACTING VIBRATION MEASUREMENT SYSTEMS.Supplemental Appendices Presenting Comparison Measurements Of The Robust Laser Interferometer And Typical Accelerometer Systems. GOODENOW,T.C.; SHIPMAN,R.L.; HOLLAND,H.M. Epoch Engineering, Inc. June 1995. 200pp. 9507200236. 84750:092.

See NUREG/CR-6313,V01 abstract.

NUREG/CR-6323: RELATIVE RISK ANALYSIS IN REGULATING THE USE OF RADIATION-EMITTING MEDICAL DEVICES.A Preliminary Application. JONES,E.D.; BANKS,W.W.; ALTENBACH,T.J.; et al. Lawrence Livermore National Laboratory. September 1995. 181pp. 9510060245. UCRL-ID-120051. 85746:001.

This report describes a preliminary application of an analysis approach for assessing relative risks in the use of radiation-emitting medical devices. Results are presented on human-initiated actions and failure modes that are most likely to occur in the use of the Gamma Knife, a gamma irradiation therapy device. This effort represents an initial step in a U.S. Nuclear Regulatory Commission (NRC) plan to evaluate the potential role of risk analysis in regulating the use of nuclear medical devices. For this preliminary application of risk assessment, the focus was to develop a basic process using existing techniques for identifying the most likely risk contributors and their relative importance. The approach taken developed relative risk rankings and profiles that incorporated the type and quality of data available and could present results in an easily understood form. This work was performed by the Lawrence Livermore National Laboratory for the NRC.

NUREG/CR-6324: QUALITY ASSURANCE FOR GAMMA KNIVES. JONES,E.D.; BANKS,W.W.; FISCHER,L.E. Lawrence Livermore National Laboratory. September 1995. 146pp. 9510060248. UCRL-ID-120056. 85745:121.

This report describes and summarizes the results of a quality assurance (QA) study of the Gamma Knife, a nuclear medical device used for the gamma irradiation of intracranial lesions. The study's focus was on the physical aspects of QA and did not address issues that are essentially medical, such as patient selection or prescription of dose. A risk-based QA assessment approach was used. In this report, sample programs for quality control and assurance are included. The use of the Gamma Knife was found to conform to existing standards and guidelines concerning radiation safety and quality control of external beam therapies (shielding, safety reviews, radiation surveys, interlock systems, exposure monitoring, good medical physics practices, etc.) and to be compliant with NRC teletherapy regulations. There are, however, current practices for the Gamma Knife not covered by existing, formalized regulations, standards, or guidelines. These practices have been adopted by Gamma Knife users and continue to be developed with further experience. Some of these have appeared in publications or presentations and are slowly finding their way into recommendations of professional organizations.

NUREG/CR-6325: AN IMPLICIT STEADY-STATE INITIALIZATION PACKAGE FOR THE RELAP5 COMPUTER CODE. PAULSEN,M.P.; PETERSON,C.E. Computer Simulation & Analysis, Inc. August 1995. 142pp. 9509130168. 85433:001.

A direct steady-state initialization (DSSI) method has been developed and implemented in the RELAP5 hydrodynamic analysis program. It provides a means for users to specify a small set of initial conditions which are then propagated through the remainder of the system. The DSSI scheme utilizes the steady-state form of the RELAP5 balance equations for nonequilibrium two-phase flow. It also employs the RELAP5 component models and constitutive model packages for wall- to-phase and interphase momentum and heat exchange. A fully implicit solution of the linearized hydrodynamic equations is implemented. An implicit coupling scheme is used to augment the standard steady-

state heat conduction solution for steam generator use. It solves the primary-side tube region energy equations, heat conduction equations, wall heat flux boundary conditions, and overall energy balance equations as a coupled system of equations and improves convergence. The DSSI methods for initializing RELAP5 problems to steady-state conditions has been compared with the transient solution scheme using a suite of test problems including; adiabatic single-phase liquid and vapor flow through channels with and without heating and area changes; a heated two-phase test bundle representative of BWR core conditions; and a single-loop PWR model.

NUREG/CR-6328: ADEQUACY OF THE 123-GROUP CROSS-SECTION LIBRARY FOR CRITICALITY ANALYSES OF WATER-MODERATED URANIUM SYSTEMS. PARKS,C.V.; WRIGHT,R.Q.; JORDAN,W.C. Oak Ridge National Laboratory. August 1995. 29pp. 9508300310. ORNL/TM-12970. 85287:291.

In a recent criticality analysis for an array of water-moderated packages containing high-enriched uranium, the 123-group cross-section library in the SCALE system was observed to have a nonconservative discrepancy of approximately 3 to 3.5% when compared to more recently developed libraries. A simple representative system of UO(2)F(2) • H(2)O was used to identify that the problem results from a lack of resonance data for (235)U. Only a single set of self-shielded cross sections, most likely corresponding to a water-moderated infinite dilute system, was provided with the original data. The UO(2)F(2) • H(2)O study indicates that this limitation may cause nonconservative discrepancies as high as 5.5% for some water-moderated, high-enriched uranium systems. Characteristics of the systems where the discrepancy is evident are identified and discussed.

NUREG/CR-6333: BREATH VERSION 1.1 - COUPLED FLOW AND ENERGY TRANSPORT IN POROUS MEDIA.Simulator Description And User Guide. STOTHOFF,S.A. Southwest Research Institute. July 1995. 93pp. 9509200049. CNWRA94-020. 85539:001.

This document describes the BREATH computer code, including the mathematical and numerical formulation for the simulator, usage description, and sample input files with corresponding output files. The BREATH computer code is designed to simulate one-dimensional flow of a liquid phase and dispersive transport of the corresponding vapor species, coupled with energy transfer, in a heterogeneous porous medium. The BREATH code is organized into a flow equation simulator and an energy equation simulator, which can be coupled or used independently. Both simulators use linear finite element basis functions. A modified Picard iteration scheme is used to solve the nonlinear sets of equations. Heuristic algorithms are available to control time stepping and the active solution domain. The BREATH simulator has been developed for use in auxiliary analyses which are a part of the Nuclear Regulatory Commission Iterative Performance Assessment program. The simulator was developed in response to the observation from Total System Performance Assessments by both the Nuclear Regulatory Commission and the U.S. Department of Energy that total-system performance at the Yucca Mountain site in Nevada is highly sensitive to the infiltration rate. Accordingly, this first version of the code is primarily intended to simulate processes important to infiltration and evaporation in climatic and hydrologic near-surface environments representative of the Yucca Mountain site.

NUREG/CR-6334: NEW SENSOR FOR MEASUREMENT OF LOW AIR FLOW VELOCITY.Phase I Final Report. HASHEMIAN,H.M.; HASHEMIAN,M.; RIGGSBEE,E.T. Analysis & Measurement Services Corp. August 1995. 145pp. 9508230253. 85120:001.

This is the report of a six-month feasibility study of a new sensor to measure ambient air flow velocity and direction for health physics applications in nuclear facilities. The information from this sensor is to be used to determine where to place air samplers to sample airborne radioactive material that is representative of the air inhaled by radiation workers. A new sensor was developed in this project and successfully tested in the AMS laboratory for measurement of low flow rates of air. The sensor uses a conventional thermocouple as its sensing element and is therefore referred to as a "thermocouple flow sensor". The dynamic response of the thermocouple is measured using an in-situ response time testing method. The response time information is then converted to a flow signal using predetermined response time-versus-flow correlation for the thermocouple. The thermocouple flow sensor has the potential to aid in determining in-door air flow patterns. This may be accomplished by using multiple thermocouples to measure air flow velocities in several locations in the room and use the velocity information with computational fluid dynamics or neural network models to establish air flow patterns.

NUREG/CR-6335: FATIGUE STRAIN-LIFE BEHAVIOR OF CARBON AND LOW-ALLOY STEELS, AUSTENITIC STAINLESS STEELS, AND ALLOY 600 IN LWR ENVIRONMENTS. KEISLER,J.; CHOPRA,O.K.; SHACK,W.J. Argonne National Laboratory. August 1995. 82pp. 9508300329. ANL-95/15. 85288:221.

The existing fatigue strain vs. life (S-N) data, foreign and domestic, for carbon and low-alloy steels, austenitic stainless steels, and Alloy 600 used in the construction of nuclear power plant components have been compiled and categorized according to material, loading, and environmental conditions. Statistical models have been developed for estimating the effects of the various service conditions on the fatigue life of these materials. The results of a rigorous statistical analysis have been used to estimate the probability of initiating a fatigue crack. Data in the literature were reviewed to evaluate the effects of size, geometry, and surface finish of a component on its fatigue life. The fatigue S-N curves for components have been determined by adjusting the probability distribution curves for smooth test specimens for the effect of mean stress and applying design margins to account for the uncertainties due to component size/geometry and surface finish. The significance of the effect of environment on the current Code design curve and on the proposed interim design curves published in NUREG/CR-5999 is discussed. Estimations of the probability of fatigue cracking in sample components from BWRs and PWRs are presented.

NUREG/CR-6347: MULTI-PHASE REACTIVE TRANSPORT THEORY. LICHTNER,P.C. Southwest Research Institute. LICHTNER,P.C. Center for Nuclear Waste Regulatory Analyses. July 1995. 102pp. 9508090044. CNWRA94-018. 84963:087.

Physicochemical processes in the near-field region of a high-level waste repository may involve a diverse set of phenomena including flow of liquid and gas, gaseous diffusion, and chemical reaction of the host rock with aqueous solutions at elevated temperatures. This report develops some of the formalism for describing simultaneous multicomponent solute and heat transport in a two-phase system for partially saturated porous media. Diffusion of gaseous species is described using the Dusty Gas Model which provides for simultaneous Knudsen and Fickian diffusion in addition to Darcy flow. A new form of the Dusty Gas Model equations is derived for binary diffusion which separates the total diffusive flux into segregative and nonsegregative components. Migration of a wetting front is analyzed using the quasi-stationary state approximation to the Richards' equation. Heat-pipe phenomena are investigated for both gravity- and capillary-driven reflux of liquid water. An expression for the burnout permeability is derived for a gravity-driven heat-pipe. Finally an estimate is given for the change in porosity and permeability due to mineral dissolution which could occur in the region of condensate formation in a heat-pipe.

NUREG/CR-6351: REVIEW OF SCENARIO SELECTION APPROACHES FOR PERFORMANCE ASSESSMENT OF HIGH-LEVEL WASTE REPOSITORIES AND RELATED ISSUES. BONANO,E.J. Southwest Research Institute. BACA,R.G. Beta Corp, International. August 1995. 78pp. 9509070092. CNWRA 94-002. 85401:230.

The selection of scenarios representing plausible realizations of the future conditions-with associated probabilities of occurrence-that can affect the long-term performance of a high-level radioactive waste (HLW) repository is the commonly used method for treating the uncertainty in the prediction of the future states of the system. This method, conventionally referred to as the "scenario approach," while common is not the only method to deal with this uncertainty; other methods, such as the environmental simulation approach (ESA), have also been proposed. Two of the difficulties with the scenario approach are the lack of uniqueness in the definition of the term "scenario" and the lack of uniqueness in the approach to formulate scenarios, which relies considerably on subjective judgments. Consequently, it is difficult to assure that a complete and unique set of scenarios can be defined for use in a performance assessment. Because scenarios are key to the determination of the long-term performance of the repository system, this lack of uniqueness can present a considerable challenge when attempting to reconcile the set of scenarios, and their level of detail, obtained using different approaches, particularly among proponents and regulators of a HLW repository.

NUREG/CR-6354 DRF FC: PERFORMANCE TESTING OF ELECTRONIC PERSONAL DOSIMETERS.Draft Report For Comment. SWINTH,K.L.; MCDONALD,J.C.; SISK,D.R.; et al. Battelle Memorial Institute, Pacific Northwest Laboratory. August 1995. 172pp. 9508230227. PNL-10560. 85127:119.

In radiation protection, incremental control of worker radiation exposures is important to ensure that periodic dose limits are not exceeded. Electronic personal dosimeters, EPDs, are widely used for this application. As their reliability has improved users have shown an interest in their use for both incremental control and as the primary dosimeter to track the dose of record for the worker. In this application they would replace the traditional film or thermoluminescent dosimeter whose performance is thoroughly understood. The EPD brings with it some of the problems of instruments which are not seen with the traditional dosimeters. The report contains results of a survey of users and a survey of vendor literature that highlight some of the limitations and problems of EPDs. The radiation protection community is concerned that the reliability and accuracy of the data from the EPD be comparable to traditional methods if they assume this additional role. The report lists type tests, test methods and calibration methods intended to ensure the required reliability.

NUREG/CR-6356: HYDRAULIC CHARACTERIZATION OF HYDROTHERMALLY ALTERED NOPAL TUFF. GREEN,R.T.; MEYER-JAMES,K.A. Southwest Research Institute. RICE,G. George Rice & Associates. July 1995. 69pp. 9509150281. CNWRA 94-027. 85521:001.

Understanding the mechanics of variably saturated flow in fractured-porous media is of fundamental importance to evaluating the isolation performance of the proposed high-level radioactive waste repository for the Yucca Mountain site. Developing that understanding must be founded on the analysis and interpretation of laboratory and field data. This report presents an analysis of the unsaturated hydraulic properties of tuff cores from the Pena Blanca natural analog site in Mexico. The basic intent of the analysis was to examine possible trends and relationships between the hydraulic properties and the degree of hydrothermal alteration exhibited by the tuff samples. These data were used in flow simulations to evaluate the significance of a particular conceptual (composite) model and of distinct hydraulic properties on the rate and nature of water flow.

Secondary Report Number Index

This index lists, in alphabetical order, the performing organization-issued report codes for the NRC contractor and international agreement reports in this compilation. Each code is cross-referenced to the NUREG number for the report and to the 10-digit NRC Document Control System accession number.

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BIENNIAL	NUREG-1363 V06
BNL-NUREG-51581	NUREG/CR-2907 V13
BNL-NUREG-52332	NUREG/CR-6002
BNL-NUREG-52431	NUREG/CR-6265
BNL-NUREG-52446	NUREG/CR-6305
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CNWRA 94-002	NUREG/CR-6351
CNWRA 94-027	NUREG/CR-6356
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CNWRA94-020	NUREG/CR-6333
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EGG-2720	NUREG/CR-6150 V02
EGG-2720	NUREG/CR-6150 V03
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SAND93-2440	NUREG/CR-6143 V01
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Personal Author Index

This index lists the personal authors of NRC staff, contractor, and international agreement reports in alphabetical order. Each name is followed by the NUREG number and the title of the report(s) prepared by the author. If further information is needed, refer to the main citation by the NUREG number.

Subject Index

This index was developed from keywords and word strings in titles and abstracts. During this development period, there will be some redundancy, which will be removed later when a reasonable thesaurus has been developed through experience. Suggestions for improvements are welcome.

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NRC Originating Organization Index (Staff Reports)

This index lists those NRC organizations that have published staff reports. The index is arranged alphabetically by major NRC organizations (e.g., program offices) and then by subsections of these (e.g., divisions, branches) where appropriate. Each entry is followed by a NUREG number and title of the report(s). If further information is needed, refer to the main citation by NUREG number.

ADVISORY COMMITTEE(S)
ADVISORY COMMITTEE ON NUCLEAR WASTE
NUREG-1423 V05: A COMPILATION OF REPORTS OF THE ADVISORY COMMITTEE ON NUC EAR WASTE.July 1993 - June 1995.

ATOMIC SAFETY BOARD(S) & PANEL(S)
ATOMIC SAFETY & LICENSING BOARD PANEL
NUREG-1363 V06: ATOMIC SAFETY AND LICENSING BOARD PANEL BIENNIAL REPORT. Fiscal Years 1993 - 1994.

OFFICE OF EXECUTIVE DIRECTOR FOR OPERATIONS (EDO)
REGION 1 (POST 820201)
NUREG-0837 V15 N02: NRC TLD DIRECT RADIATION MONITORING NETWORK.Progress Report,April-June 1995.
OFC OF ENFORCEMENT (POST 870413)
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NRC Originating Organization Index (International Agreements)

This index lists those NRC organizations that have published international agreement reports. The index is arranged alphabetically by major NRC organizations (e.g., program offices) and then by subsections of these (e.g., divisions, branches) where appropriate. Each entry is followed by a NUREG number and title of the report(s). If further information is needed, refer to the main citation by NUREG number.

There were no NUREG/IA reports published during this quarter.

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NRC Contract Sponsor Index (Contractor Reports)

This index lists the NRC organizations that sponsored the contractor reports listed in this compilation. It is arranged alphabetically by major NRC organization (e.g., program office) and then by subsections of these (e.g., divisions) where appropriate. The sponsor organization is followed by the NUREG/CR number and title of the report(s) prepared by that organization. If further information is needed, refer to the main citation by the NUREG/CR number.

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NUREG/CR-6333: BREATH VERSION 1.1 - COUPLED FLOW AND ENERGY TRANSPORT IN POROUS MEDIA.Simulator Description And User Guide.

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NUREG/CR-6277 V01: HUMAN FACTORS EVALUATION OF TELETHERAPY: Identification Of Problems And Alternative Approaches.

NUREG/CR-6277 V02: HUMAN FACTORS EVALUATION OF TELETHERAPY.Function And Task Analysis.

NUREG/CR-6277 V03: HUMAN FACTORS EVALUATION OF TELETHERAPY: Human-System Interfaces And Procedures.

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Contractor Index

This index lists, in alphabetical order, the contractors that prepared the NUREG/CR reports listed in this compilation. Listed below each contractor are the NUREG/CR numbers and titles of their reports. If further information is needed, refer to the main citation by the NUREG/CR number.

International Organization Index

This index lists, in alphabetical order, the countries and performing organizations that prepared the NUREG/IA reports listed in this compilation. Listed below each country and performing organization are the NUREG/IA numbers and titles of their reports. If further information is needed, refer to the main citation by the NUREG/IA number.

There were no NUREG/IA reports published during this quarter.

Licensed Facility Index

This index lists the facilities that were the subject of NRC staff or contractor reports. The facility names are arranged in alphabetical order. They are preceded by their Docket number and followed by the report number. If further information is needed, refer to the main citation by the NUREG number.

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11. ABSTRACT (200 words or less)

This journal includes all formal reports in the NUREG series prepared by the NRC staff and contractors; proceedings of conferences and workshops; as well as international agreement reports. The entries in this compilation are indexed for access by title and abstract, secondary report number, personal author, subject, NRC organization for staff and international agreements, contractor, international organization, and licensed facility.

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