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Nuclear Fuel Cycle Risk Assessment: Survey and Computer Compilation of Risk-Related Literature

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Pacific Northwest Laboratory
Operated by
Battelle Memorial Institute

Prepared for
U.S. Nuclear Regulatory
Commission

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FOREWARD
BY THE
NUCLEAR REGULATORY COMMISSION

Considerable attention has been focused on the use of risk assessment ^(a) in the regulation of nuclear power. The Advisory Committee on Reactor Safeguard (ACRS), the Commission (NRC) and the Lewis Committee (risk assessment review group to the NRC's Reactor Safety Study) have strongly recommended that risk assessment be used in the NRC regulatory and licensing processes. Therefore, the Division of Risk Analysis (DRA) of the Office of Nuclear Regulatory Research (RES) has placed major emphasis on the development of risk assessment methods and the application of these methods to provide useful information in regulating and licensing nuclear activities. The Reactor Safety Study, conducted in the early 1970's was a significant advance in the state-of-the-art for conducting risk assessment for light water reactors (LWR). Currently, research programs are underway or planned by the NRC and the utilities to further refine and develop LWR risk assessment methods, to perform plant specific risk assessment studies, and to utilize the risk assessment results in fulfilling the NRC's mission to protect the health and safety of both the public and the workers in the nuclear industry. The development and application of LWR risk assessment methods has now reached a point where the potential use of risk assessment in the NRC decisionmaking processes is being given serious consideration.

The NRC has expended comparatively little effort in developing and applying risk assessment methods to other elements of the nuclear fuel cycle. Consequently, the state-of-the-art for risk assessment of fuel cycle facilities is not as advanced as for reactors. There have been some safety and risk assessment studies performed on the fuel cycle facilities but they differ significantly in the level of analysis, kinds of methods used and the degree of confidence that could be placed in the results. Therefore, RES, with the endorsement of the NRC's Office of Nuclear Material Safety and Safeguards (NMSS), has initiated this Nuclear Fuel Cycle Risk Assessment Program to (1) determine the types of risk that dominate the nuclear fuel cycle; (2) develop and apply risk assessment methods and associated computer codes; (3) provide insights for using risk assessment in licensing and regulatory decisionmaking; (4) determine the sources of major contributors to the risk; (5) develop in-house expertise in the application of risk assessment methods and computer codes for use in the regulatory process; and (6) respond to criticism that non-reactor fuel cycle risks have not been adequately considered in evaluating the potential risk to the public from nuclear power generation.

(a) Synonymous with risk analysis

If the above goals are achieved, this program can provide (1) risk assessment methods for consistent and improved safety evaluation of fuel cycle facility designs and operations; (2) a rational basis for the development of standards and guides on design criteria, accident evaluation, siting, emergency planning, and safety classification of structures, systems and components; and (3) rationale for setting priorities on NRC research by identifying the major contributors to risk and associated uncertainties.

This multi-year program was initiated in late 1981. A research team from several sources has been assembled to provide technical strengths and expertise in the many areas involved in the program. The prime contractor is Battelle Pacific Northwest Laboratory ^(b) and the principal subcontractor is Battelle Columbus Laboratories. Contributions have also been made by staff at other research organizations.

The initial step in this program consisted on the establishment of the reference fuel cycles and the descriptions of the fuel cycle elements as documented in NUREG/CR 2873. The various sources of available information on design, safety and risk have been located, reviewed and computerized. The available information, as of September 1982, is documented in this report. This information has been screened for use in subsequent program activities which are the ranking of the fuel cycle elements according to their risks (using available information and supplementing the work where necessary) and the assessment of the applicability of existing risk assessment methods to fuel cycle elements and their use in the regulatory process. Based on the result of the risk ranking and methods assessment activities, existing methods will be improved or new risk assessment methods developed as appropriate. The use of these methods and associated computer codes will then be demonstrated by performing risk assessment case studies. The last part of the program will consist of the transfer of these risk assessment methods and computer codes to the NRC staff for their application to the regulatory process.

For more information on the program of this report, please write to:

Director, Division of Risk Analysis
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

^(b) Operated for the U.S. Department of Energy by the Pacific Northwest Laboratory of Battelle Memorial Institute.

ABSTRACT

The U.S. Nuclear Regulatory Commission has initiated the Fuel Cycle Risk Assessment Program to provide risk assessment methods for assistance in the regulatory process for nuclear fuel cycle facilities other than reactors. Both the once-through cycle and plutonium recycle are being considered. A previous report generated by this program defines and describes fuel cycle facilities, or elements, considered in the program. This report, the second from the program, describes the survey and computer compilation of fuel cycle risk-related literature. Sources of available information on the design, safety, and risk associated with the defined set of fuel cycle elements were searched and documents obtained were catalogued and characterized with respect to fuel cycle elements and specific risk/safety information. Both U.S. and foreign surveys were conducted. Battelle's computer-based BASIS information management system was used to facilitate the establishment of the literature compilation. A complete listing of the literature compilation and several useful indexes are included. Future updates of the literature compilation will be published periodically.

TABLE OF CONTENTS

1.0	INTRODUCTION	1.1
2.0	FUEL CYCLE RISK-RELATED LITERATURE CHARACTERIZATION AND COMPUTER COMPILATION	2.1
3.0	LITERATURE COMPILATION USE	3.1
	REFERENCES	3.1
4.0	FUEL CYCLE RISK ASSESSMENT LITERATURE COMPILATION AND INDEXES	4.1
4.1	LITERATURE COMPILATION	1
4.2	PERSONAL & CORPORATE AUTHOR	342
4.3	FUEL CYCLE ELEMENT	410
4.4	RISK ELEMENT	416
4.5	RISK CATEGORY	425

FIGURES

2.1	Document Review Matrix	2.4
2.2	Illustration of Document Review Matrix Use	2.6
2.3	Literature Compilation Samples	2.8

1.0 INTRODUCTION

The U.S. Nuclear Regulatory Commission has been placing increased emphasis on the development of probabilistic risk assessment (PRA) methods and the application of these methods to provide information for use in regulating and licensing nuclear activities. The emphasis to date has been to develop PRA methods for light water reactors (LWR). Comparatively little effort has been expended to develop methods applicable to fuel cycle facilities. The Division of Risk Analysis in NRC's Office of Nuclear Regulatory Research has initiated the Fuel Cycle Risk Assessment Program at the Pacific Northwest Laboratory to develop needed PRA methods for fuel cycle facilities. The objectives of this program are: (1) to identify the risks and develop a consistent comparison of the risks from different parts of the nuclear fuel cycle, (2) to develop comprehensive risk assessment methods that can be used to provide information for use in regulating and licensing the elements of the fuel cycle, (3) to demonstrate the use of these methods, and (4) to assist the NRC staff in developing expertise in the application of the methods and evaluation of risk assessments performed using these or similar methods.

In order to accomplish the objectives set forth above in an orderly manner, it was first necessary to define and describe a set of representative non-reactor fuel cycle facilities and to survey and develop a compilation of fuel cycle risk-related literature. The description of the representative non-reactor fuel cycle facilities has been recently completed (Schneider, et al., 1982). It covers all major commercial-scale elements, for the once-through fuel cycle and for plutonium recycle, from uranium mining to waste storage and disposal, including the transportation of radioactive materials. The survey and development of a compilation of fuel cycle risk-related literature was conducted concurrent with the fuel cycle facility description. Sources of available information on the design, safety, and risk associated with the defined set of fuel cycle elements were searched and documents obtained were catalogued and characterized with respect to fuel cycle element and specific risk/safety information. Manual and computer assisted searches of both U.S. and foreign literature were conducted. It quickly became clear that the most effective method of coordinating the cataloging and characterization of the many documents was through the use of a computerized cataloging system. The Battelle Columbus BASIS Information Management System was selected for use. BASIS provides for the collection, manipulation, and retrieval of bibliographic information in a flexible and cost-effective manner.

2.0 FUEL CYCLE RISK-RELATED LITERATURE CHARACTERIZATION AND COMPUTER COMPILATION

The Fuel Cycle Risk Assessment Program requires that information be sorted and categorized according to "fuel cycle elements", "risk elements", and "risk categories". Each of these items will be defined and discussed below.

Fuel Cycle elements defined for this program are:

- C. Methods
- D. Uranium Mining
- E. Uranium Milling
- F. Uranium Refining & Conversion
- G. Uranium Enrichment
- H. Fuel Fabrication (Fresh U Fuel)
- I. Fuel Refabrication (MOX* Fuel)
- J. Fuel Reprocessing
- K. HLW*/TRU* Storage (Near Surface)
- L. HLW/TRU/SF* Disposal (Geologic Repository)
- M. SF Storage (AFR*, MRS*, etc.)
- N. LL* and IL* Waste Storage and Disposal
- O. Transportation
- P. Other.

The fuel cycle element titles are generally self-explanatory. An attempt was made to categorize each document with respect to one of the well-defined fuel cycle elements, but this was not always possible. The fuel cycle element "Methods" was included because a variety of documents were identified which discussed mathematical techniques useful in risk assessments but which did not provide specific analysis of the risk/safety associated with any of the well defined fuel cycle elements. Including "Methods" as a fuel cycle element also enabled these documents to be characterized with respect to various risk elements which are discussed below. Similarly, "Other" was included because documents were identified which discussed the risk associated with the fuel cycle as a whole, which lumped several fuel cycle elements together, or which dealt with topics not specifically addressed by the remaining fuel cycle elements. When the study began, there were two additional elements (A and B). These were found to be unnecessary and were subsequently combined into "Methods" (element C) and "Others" (element P).

Risk elements are topics typically addressed in a risk assessment or safety analysis study. Risk elements accompanied by a brief description include:

* MOX = Mixed Oxide; HLW = High Level Waste; TRU = Transuranic Waste; SF = Spent Fuel; AFR = Away From Reactor Storage; MRS = Monitored Retrievable Storage; LL = Low Level Waste; IL = Intermediate Level Waste.

1. System Description
 - Details of system design and operation under both normal and accident conditions
2. Scenario Analysis
 - Identification of potential accidents and hazards including definition and description of event sequences
3. Probabilistic Modeling
 - Evaluation of event probabilities using a variety of mathematical techniques
4. In-Plant Consequences
 - Description of the chemical, physical, and nuclear processes which occur within a plant to disperse, transport, and deposit hazardous materials throughout the plant and plant site resulting from both normal and accident conditions; also the assessment of health effects to plant workers and damage to plant property out to the site boundary
5. Ex-Plant Consequences
 - Description of processes originating within the site boundary to disperse, transport, and deposit hazardous materials beyond the site boundary to the environment and the public resulting from both normal and accident conditions; also the assessment of public health effects, property damage, and environmental insult
6. Human Factors
 - Assessment of the impact of human action (errors of omission or commission, corrective action) on event probabilities and consequences
7. External Events
 - Impact on risk (both probabilities and consequences) of events which occur outside the primary containment systems of a plant. Such events include fires, floods, earthquakes, tornados, hurricanes, aircraft, meteors, etc.
8. Uncertainty/Sensitivity Analysis
 - Determination of the uncertainty of the risk estimates and their sensitivity to data, models, and assumptions used in the risk calculations
9. Data
 - Collection, evaluation, and manipulation of the data used in the quantification of consequences and probabilities

10. Results

- Calculation, evaluation, and presentation of risk results in forms useful to the NRC for licensing/regulatory purposes and for public information.

Finally, it is important to the Fuel Cycle Risk Assessment Program to categorize risks as radiation or non-radiation related, as affecting the public or the plant operating staff, as resulting from accidents or routine operations, and as occurring during the normal operating period⁺ or the decommissioning period of the facility. Combining these parameters, the following sixteen risk categories were defined:

- A. Oper* - Rad* - Acc* - Worker*
- B. Oper - Rad - Acc - Public*
- C. Oper - Rad - Routine - Worker
- D. Oper - Rad - Routine - Public
- E. Oper - Non Rad* - Acc - Worker
- F. Oper - Non Rad - Acc - Public
- G. Oper - Non Rad - Routine - Worker
- H. Oper - Non Rad - Routine - Public
- I. Decom* - Rad - Acc - Worker
- J. Decom - Rad - Acc - Public
- K. Decom - Rad - Routine - Worker
- L. Decom - Rad - Routine - Public
- M. Decom - Non Rad - Acc - Worker
- N. Decom - Non Rad - Acc - Public
- O. Decom - Non Rad - Routine - Worker
- P. Decom - Non Rad - Routine - Public.

The purpose of the literature survey and compilation was to locate documents containing risk-related information for each of the fuel cycle elements. Each document obtained was reviewed to determine if it contained information related to the fuel cycle elements, risk elements, and risk categories denoted above. A matrix, shown in Figure 2.1, was developed to assist in the document review.

⁺ The construction period is not included in this program. Construction risks are independent of whether the activity is directed toward building a fuel cycle facility or any other industrial construction project.

^{*} Oper = Operating Period; Rad = Radiation-Related Hazard; Acc = Accident; Worker = Plant Staff; Public = General Offsite Population; Non Rad = Non-Radiation-Related Hazard; Decom = Decommissioning Period.

Fuel Cycle Elements	Risk Elements	Systems Desc.	Scenario Anal.	Prob. Modeling	In-Plant Conseq.	Ex-Plant Conseq.	Human Factors	External Events	Uncert. Anal.	Sensit. Anal.	Data	Results
		1	2	3	4	5	6	7	8	9	0	
Methods	C											
U Mining	D											
U Milling	E											
U Refining & Conv.	F											
U Enrich.	G											
Fuel Fab.	H											
Fuel Refab.	I											
Fuel Reprocess.	J											
HL & TRU Waste Stor.	K											
HLW, TRU, & SF Disp.	L											
Spent Fuel Stor.	M											
ILW, LLW Stor/Disp.	N											
Transport.	O											
Other	P											

RISK CATEGORIES

A	Oper.	Rad.	Acc.	Worker
B	Oper.	Rad.	Acc.	Public
C	Oper.	Rad.	Routine	Worker
D	Oper.	Rad.	Routine	Public
E	Oper.	Non-Rad.	Acc.	Worker
F	Oper.	Non-Rad.	Acc.	Public
G	Oper.	Non-Rad.	Routine	Worker
H	Oper.	Non-Rad.	Routine	Public
I	Decom.	Rad.	Acc.	Worker
J	Decom.	Rad.	Acc.	Public
K	Decom.	Rad.	Routine	Worker
L	Decom.	Rad.	Routine	Public
M	Decom.	Non-Rad.	Acc.	Worker
N	Decom.	Non-Rad.	Acc.	Public
O	Decom.	Non-Rad.	Routine	Worker
P	Decom.	Non-Rad.	Routine	Public

FIGURE 2.1. DOCUMENT REVIEW MATRIX

Author

Document No.

Date

Reviewer Lab.

Date:

The document review matrix indicates the type of risk assessment information contained in a document dealing with one or more fuel cycle elements. The matrix is completed as follows:

- if a document contains risk element information for a specific fuel cycle element but no risk category information, a check (✓) is entered in the box, or boxes, which denotes the intersection of each fuel cycle element and risk element. For example, the two checks (✓) in Figure 2.2 indicate that a document on uranium enrichment contained human factors and external event information. A shorthand notation for these matrix relationships is G,6; G,7. Each string of identifying letters or numbers is separated by a semi-colon.
- if, in addition, risk category information is available for a risk element, the letter designator of the risk category is entered into the box instead of a check. For example, Figure 2.2 shows that the document on uranium enrichment also contained in-plant consequence information for risk category A (Oper-Rad-Acc-Worker) and ex-plant consequence information for risk category B (Oper-Rad-Acc-Public). A shorthand notation for these matrix relationships is G,4,A; G,5,B.
- if several risk categories apply to a given risk element, then each risk category letter is entered into the appropriate box. For example, Figure 2.2 also illustrates the method of characterizing a document describing external events effects at a re-processing plant for risk categories A, B, E, and F. A short notation for these matrix relationships is J,7,A; J,7,B; J,7,E; J,7,F.

Any combination of fuel cycle elements, risk elements, and risk categories can be described using the shorthand notation described above. It should be noted that if a risk category is not specifically identified in the shorthand notation, then the document did not contain risk category information.

The document review was not without problems. Since many persons were utilized to conduct the document review, consistency of review was of concern. Reviewers were carefully instructed in the definitions of the fuel cycle elements, risk elements, and risk categories. Periodically, the same report was submitted to two different people. These spot checks indicated that a given report may be categorized somewhat differently by one reviewer versus another. If this occurred, the results of the two document characterizations were combined, if appropriate. Effort has been made to provide uniformity in document characterization.

Risk Elements		Systems Desc.	Scenario Anal.	Prob. Modeling	In-Plant Conseq.	Ex-Plant Conseq.	Human Factors	External Events	Uncert. Anal.	Sensit. Anal.	Data	Results
Fuel Cycle Elements		1	2	3	4	5	6	7	8	9	0	
Methods	C											
U Mining	D											
U Milling	E											
U Refining & Conv.	F											
U Enrich.	G				A	B	✓	✓				
Fuel Fab.	H											
Fuel Refab.	I											
Fuel Reprocess.	J							A,B, E,F				
HL & TRU Waste Stor.	K											
HLW, TRU, & SF Disp.	L											
Spent Fuel Stor.	M											
ILW, LLW Stor/Disp.	N											
Transport.	O											
Other	P											

RISK CATEGORIES

A	Oper.	Rad.	Acc.	Worker
B	Oper.	Rad.	Acc.	Public
C	Oper.	Rad.	Routine	Worker
D	Oper.	Rad.	Routine	Public
E	Oper.	Non-Rad.	Acc.	Worker
F	Oper.	Non-Rad.	Acc.	Public
G	Oper.	Non-Rad.	Routine	Worker
H	Oper.	Non-Rad.	Routine	Public
I	Decom.	Rad.	Acc.	Worker
J	Decom.	Rad.	Acc.	Public
K	Decom.	Rad.	Routine	Worker
L	Decom.	Rad.	Routine	Public
M	Decom.	Non-Rad.	Acc.	Worker
N	Decom.	Non-Rad.	Acc.	Public
O	Decom.	Non-Rad.	Routine	Worker
P	Decom.	Non-Rad.	Routine	Public

FIGURE 2.2. ILLUSTRATION OF DOCUMENT REVIEW MATRIX USE

Author

Document No.

Date

Reviewer Lab.

Date:

Document review information is important to subsequent tasks in the Fuel Cycle Risk Assessment Program. Task 4 is concerned with a scoping analysis of fuel cycle risks based on existing information and Task 5 is a review of risk assessment methods which have previously been used for fuel cycle facilities. Therefore, document reviews aid in providing document sets for each fuel cycle element, for each risk element, and for each risk category.

Document characterization information and bibliographic information is input and stored as a computerized compilation of risk-related literature using the following fields:

- ACN - accession number; a computer assigned sequential number which identifies a document in the literature compilation
- TI - title
- RPTNO - report number
- AU - authors
- DOCDAT - document date (year, month, day)
- PUB - publisher
- AFFIL - affiliation
- LOC - physical location of report
- CJT - conference/journal title
- CAT - categories (document review shorthand notation)
- SYNOP - synopsis (abstract)
- ORDAT - order date (for internal use only)
- ENTDAT - entry date (computer assigned date for initial information entry).

Two sample document records, as input to the literature compilation, are shown in Figure 2.3. The first illustrates a laboratory report and the second illustrates a conference paper.

Section 4.0 contains a complete listing of the literature compilation. The information is in the order of the fields given above.

Presently, 705 documents have been reviewed and the bibliographic and characterization information entered into the compilation. A tabulation of the number of documents containing information relevant to each fuel cycle element, risk element, and risk category follows:

ACN	38
TI	SAFETY ANALYSIS REPORT FOR PACKAGING: NEUTRON SHIPPING CASK,
	MODEL 4T
RPTNO	UCRL-52232
AU	PETERSON, R.T.
DOCDAT	770101
PUB	LAWRENCE LIVERMORE LABORATORY, LIVERMORE, CA. 121 P.
AFFIL	LAWRENCE LIVERMORE LABORATORY
CAT	0,1;0,2;0,9;0,0;P,9
SYNOPSIS	THIS SAFETY ANALYSIS REPORT FOR PACKAGING DEMONSTRATES THAT THE NEUTRON SHIPPING CASK CAN SAFELY TRANSPORT, IN SOLID OR POWDER FORM, ALL ISOTOPES OF U, PU, AM, CM, BK, CF, ES, AND FM. THE REPORT DESCRIBES THE CASK AND ITS CONTENTS. IT ALSO EVALUATES TRANSPORT CONDITIONS, STRUCTURAL PARAMETERS (E.G., LOAD RESISTANCE, PRESSURE AND IMPACT EFFECTS, LIFTING AND TIEDOWN DEVICES), AND SHIELDING. FINALLY IT DISCUSSES COMPLIANCE WITH CHAPTER 0929 OF THE ERDA MANUAL, SAFETY STANDARDS FOR THE PACKAGING OF FISSILE AND OTHER RADIOACTIVE MATERIALS.

ACN	51
TI	DEVELOPMENT AND TESTING OF LONG-TERM SAFETY ASSESSMENT
	METHODOLOGY FOR GEOLOGIC WASTE REPOSITORIES
RPTNO	CONF-791103
AU	BRANDSTETTER, A.
DOCDAT	791101
PUB	AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
AFFIL	PNL
CJT	TRANS. AM. NUCL. SOC. 33:140.
CAT	0,2;C,5;C,6;C,7;L,2;L,5,8;L,6;L,7;L,9
SYNOPSIS	THE REPORT FORM OF THIS PAPER IS PNL-SA-7872. IN THE PAST THREE YRS, THE WASTE ISOLATION ASSESSMENT PROGRAM (WISAP) HAS BEEN DEVELOPING METHODOLOGY FOR THE ASSESSMENT OF THE LONG-TERM SAFETY OF NUCLEAR WASTE STORAGE IN GEOLOGIC FORMATIONS. THE WORK IS BEING PERFORMED IN FOUR TECHNICAL TASKS: (1) RELEASE SCENARIO ANALYSIS, (2) WASTE FORM RELEASE RATE ANALYSIS, (3) RELEASE CONSEQUENCE ANALYSIS, (4) SORPTION/DESORPTION ANALYSIS. THIS YR, THE METHODOLOGY DEVELOPED BY ALL FOUR TASKS IS BEING TESTED WITH ACTUAL FIELD DATA FROM FOUR REFERENCE SITES INVOLVING DIFFERENT GEOLOGIES: THE WASTE ISOLATION PILOT PLANT (WIPP) BEDDED SALT SITE NEAR CARLSBAD, NM; A REFERENCE BEDDED SALT SITE IN THE PARADOX BASIN IN SOUTHEASTERN UTAH; A REFERENCE SALT DOME SITE NEAR HAINESVILLE IN NORTHEASTERN TEXAS; AND A REFERENCE BASALT SITE IN THE COLUMBIA PLATEAU IN EASTERN WASHINGTON. THE OVERALL OBJECTIVE OF THESE REFERENCE SITE INITIAL ANALYSES IS TO TEST THE METHODOLOGY FOR DIFFERENT GEOLOGIES AND TO IMPROVE THE EFFICIENCY, DEFENSIBILITY, AND CREDIBILITY OF THE METHODOLOGY. THIS WILL ASSURE THAT MORE COMPLETE SITE-SPECIFIC ANALYSES CAN BE PERFORMED TO THE DEPTH REQUIRED WHEN NEEDED FOR SITE SELECTION AND LICENSING.

FIGURE 2.3. LITERATURE COMPILATION SAMPLES

Fuel Cycle Element*	Number of Documents	Percentage (Excluding C & P)
C (Methods)	269	-
D (U Mining)	44	4.1
E (U Milling)	50	4.7
F (U Refining and Conversion)	21	2.0
G (U Enrichment)	23	2.2
H (Fuel Fab)	23	2.2
I (Fuel Refab)	59	5.5
J (Reprocessing)	89	8.3
K (HLW/TRU Storage)	91	8.5
L (HLW/TRU/SF Disposal)	273	25.6
M (SF Storage)	67	6.3
N (LL and IL Storage or Disposal)	143	13.4
O (Transportation)	184	17.2
P (Other)	102	-

Risk Elements	Number of Documents	Percentage
1. (Sys Descrip)	512	18.2
2. (Scenario Anal)	355	12.6
3. (Prob. Modeling)	322	11.5
4. (In-Plant Conseq.)	213	7.6
5. (Ex-Plant Conseq.)	442	15.7
6. (Human Factors)	95	3.3
7. (External Events)	210	7.5
8. (Uncer/Sen. Anal.)	147	5.2
9. (Data)	309	11.0
0. (Results)	205	7.3

Risk Category	Number of Documents	Percentage
A	96	13.1
B	213	29.1
C	82	11.2
D	167	22.8
E	25	3.4
F	23	3.1
G	15	2.1
H	18	2.5
I	8	1.1
J	27	3.7
K	8	1.1
L	39	5.2
M	2	0.3
N	5	0.7
O	2	0.3
P	1	0.1

* The total obtained by adding the number of documents providing information on each of the above fuel cycle elements exceeds the 705 entered into the compilation. This is because some documents apply to more than one fuel cycle element.

It is obvious from the tabulation that many documents contain information for more than one fuel cycle element and for more than one risk element. The tabulation also indicates that risk assessment efforts have been concentrated on the transportation and waste disposal or storage fuel cycle elements. With respect to the risk elements, only human factors seemed to receive less attention than other risk elements. The majority of risk category information is for radiation-related risk, to the public or plant workers, during the operational period of a facility (Risk Categories A, B, C, D).

3.0 LITERATURE COMPILATION USE

The computerized compilation of risk-related literature is intended primarily for the Fuel Cycle Risk Assessment Program. However, other NRC programs may find the literature compilation useful. The remainder of this report contains a complete listing of the literature compilation (in order of accession number) and several indexes which will be useful in locating documents containing certain types of information. An author index, with listings of accession number and titles for each major author is first. It is followed by three indexes which list the accession numbers of documents applicable to each specific fuel cycle element, risk element, and risk category, respectively.

In addition to the indexes provided in this report, much more detailed searches of the literature compilation can be made. Searches can be made for documents containing information on any combination of fuel cycle element and/or risk element and/or risk category. All bibliographic information is completely indexed within the computer, enabling searches to be made by individual or combined title words, publisher name, author affiliations, or report number.

The fuel cycle risk-related literature compilation presented in this report is merely the status of the compilation at this point in time. As the Fuel Cycle Risk Assessment Program continues, the literature compilation will continue to be expanded and updated periodically.

REFERENCES

Schneider, K. J. 1982. Pacific Northwest Laboratory. "Nuclear Fuel Cycle Risk Assessment: Descriptions of Representative Non-Reactor Facilities". U.S. NRC Report NUREG/CR-2873. 1982. Available for purchase from National Technical Information Service, Springfield, Virginia 22161.

4.0 FUEL CYCLE RISK ASSESSMENT LITERATURE COMPILATION AND INDEXES

4.1 LITERATURE COMPILATION

2

PACIFIC NORTHWEST LABORATORY SPENT FUEL TRANSPORTATION AND
HANDLING FACILITY MODELS

PNL-3105

ANDREWS, W.B.; BOWEN, J.C.; BURNETT, R.A.; ENGEL, R.L.; ROLAND,
C.W.

790101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 62 P.

PACIFIC NORTHWEST LABORATORY

M,1;M,2;M,8;M,9;M,0;O,1;O,2;O,8;O,9;O,0;P,9

A SPENT FUEL LOGISTICS STUDY BY PNL HAS BEEN CONDUCTED IN
SUPPORT OF DOE'S PROGRAM TO DESIGN, LICENSE AND CONSTRUCT
FACILITIES TO PREPARE SPENT UNREPROCESSED FUEL FROM COMMERCIAL
LIGHT-WATER REACTORS FOR EVENTUAL STORAGE IN GEOLOGICAL
REPOSITORIES. THE OBJECTIVES OF THIS LOGISTICS STUDY WERE (1) TO
PROVIDE QUANTITATIVE INFORMATION ON EXISTING AND REQUIRED
TRANSPORTATION SYSTEMS TO ASSIST IN SITING AND DESIGNING SPENT
FUEL STORAGE AND/OR HANDLING AND PACKAGING FACILITIES AND (2) TO
DEVELOP A METHODOLOGY TO EVALUATE ALTERNATIVE SPENT FUEL STORAGE
AND HANDLING POLICIES. TWO COMPUTERIZED LOGISTICS MODELS HAVE
BEEN DEVELOPED FOR USE IN THESE STUDIES. PNL HAS DEVELOPED
ANALYTICAL TOOLS AND INFORMATION TO ASSESS SPENT FUEL SHIPPING
SYSTEM REQUIREMENTS FOR ALTERNATIVES IN REACTOR STORAGE
STRATEGIES, FUEL MANAGEMENT POLICY AND FUEL STORAGE FACILITY
LOCATIONS AND DESIGN. THIS REPORT DESCRIBES THESE TOOLS AND
DISCUSSES COMPLETED PARAMETRIC STUDIES.

3

PROCEDURES, LICENSE AND SAFETY ANALYSIS REPORT FOR
CHEM-NUCLEAR SYSTEMS, INC. CNSI 1600 TYPE B RADWASTE
SHIPPING CASK (USA/9091B)

NONE

CHEM-NUCLEAR SYSTEMS, INC.

780101

CHEM-NUCLEAR SYSTEMS, INC., BELLEVUE, WA. 93 P.

CHEM-NUCLEAR SYSTEMS, INC.

O,1;O,2;O,9;O,0

ESTABLISHED PROCEDURES FOR ROUTINE HANDLING, LOADING, AND
UNLOADING OF CNSI CASK 1-13C (MODEL NUMBER CNS 1600) ARE GIVEN
IN THIS DOCUMENT.

4

PROCEDURES, LICENSE AND SAFETY ANALYSIS REPORT FOR
CHEM-NUCLEAR SYSTEMS, INC. CNSI 14-195H TYPE A
RADWASTE SHIPPING CASK (USA/9094/A)

NONE

CHEM-NUCLEAR SYSTEMS, INC.

000101

CHEM-NUCLEAR SYSTEMS, INC., BELLEVUE, WA. 127 P.

CHEM-NUCLEAR SYSTEMS, INC.

0,1;0,2;0,9;0,0

ESTABLISHED PROCEDURES FOR ROUTINE HANDLING, LOADING, AND UNLOADING OF CNSI CASK MODEL NUMBER CNS 14-195H ARE GIVEN IN THIS DOCUMENT.

5

SEVERITIES OF TRANSPORTATION ACCIDENTS. VOLS. I-IV. SUMMARY, CARGO AIRCRAFT, MOTOR CARRIERS, TRAIN

SLA-74-0001

CLARKE, R.K.; FOLEY, J.T.; HARTMAN, W.F.; LARSON, D.W.

760101

SANDIA LABORATORIES, ALBUQUERQUE, NM. 320 P.

SANDIA LABORATORIES

0,1;0,2;0,3;0,8;0,9;0,0

QUANTITATIVE DESCRIPTIONS OF THE SEVERITIES OF TRANSPORTATION ACCIDENTS ARE GIVEN IN THIS STUDY TO AID IN ASSESSING BOTH THE RISK OF RADIOACTIVE AND HAZARDOUS MATERIAL SHIPMENTS AND THE ADEQUACY OF THE PROTECTION PROVIDED BY THE SHIPPING CONTAINERS DESIGNED SPECIFICALLY FOR SUCH SHIPMENTS. IN VOL. I, SIGNIFICANT RESULTS OF THE STUDY ARE SUMMARIZED; IN VOL. II, PHYSICAL PARAMETERS OF AIRCRAFT ACCIDENT ENVIRONMENTS ARE DISCUSSED; AND IN VOLS. III AND IV, TRUCK AND TRAIN ACCIDENTS ARE EXAMINED.

6

SEVERITIES OF TRANSPORTATION ACCIDENTS INVOLVING LARGE PACKAGES

SAND77-0001

DENNIS, A.W.; FOLEY, J.T.; HARTMAN, W.F.; LARSON, D.W.

760101

SANDIA LABORATORIES, ALBUQUERQUE, NM. 158 P.

SANDIA LABORATORIES

0,1;0,2;0,3;0,8;0,9;0,0

THIS STUDY WAS UNDERTAKEN TO DEFINE IN A QUANTITATIVE NONJUDGMENTAL TECHNICAL MANNER THE ABNORMAL ENVIRONMENTS TO WHICH A LARGE PACKAGE (TOTAL WEIGHT OVER 2 TONS) WOULD BE SUBJECTED AS THE RESULT OF A TRANSPORTATION ACCIDENT. BECAUSE OF THIS PACKAGE WEIGHT, AIR SHIPMENT WAS NOT CONSIDERED AS A NORMAL TRANSPORTATION MODE AND WAS NOT INCLUDED IN THE STUDY. THE ABNORMAL TRANSPORTATION ENVIRONMENTS FOR SHIPMENT BY MOTOR CARRIER (PART II) AND TRAIN (PART III) WERE DETERMINED AND QUANTIFIED. IN ALL CASES THE PACKAGE WAS ASSUMED TO BE TRANSPORTED ON AN OPEN FLAT-BED TRUCK OR AN OPEN FLAT-BED RAILCAR. IN AN EARLIER STUDY, REFERRED TO IN THIS REPORT AS SLA-74-0001, THE SMALL-PACKAGE ENVIRONMENTS WERE INVESTIGATED. THE PRIMARY PURPOSE OF SLA-74-0001 WAS TO QUANTIFY THE ABNORMAL ENVIRONMENT TO WHICH A SMALL PACKAGE (TOTAL WEIGHT UNDER 2 TONS) WOULD BE SUBJECTED AS THE RESULT OF A TRANSPORTATION ACCIDENT. A THIRD TRANSPORTATION STUDY RELATED TO THE ABNORMAL ENVIRONMENT INVOLVING WATERWAYS TRANSPORTATION, IS NOW UNDER WAY AT SANDIA

AND SHOULD COMPLETE THE DESCRIPTION OF ABNORMAL TRANSPORTATION ENVIRONMENTS. THIS REPORT IS NOT INTENDED TO BE AN EVALUATION OF CURRENT RADIOACTIVE MATERIAL SHIPPING PRACTICES, PACKAGE DESIGN, OR REGULATORY STANDARDS. IT IS INTENDED, RATHER, TO SERVE AS ONE OF THE PRINCIPAL STEPS IN DETERMINING THE RISK TO THE PUBLIC ASSOCIATED WITH THE LAND TRANSPORTATION OF HAZARDOUS MATERIALS. THIS REPORT PROVIDES ONE OF THE VARIABLES NECESSARY TO DEFINE THE CONDITION OF EXPOSURE FOR LARGE SHIPPING CONTAINERS; NAMELY, A TECHNICAL DESCRIPTION OF THE LAND TRANSPORTATION ACCIDENT ENVIRONMENT. OTHER VARIABLES THAT MUST BE CONSIDERED INCLUDE THE RESPONSE OF THE PACKAGE TO THE ACCIDENT CONDITIONS (DAMAGE), THE QUANTITY OF HAZARDOUS MATERIAL RELEASED (IF ANY), THE RADIUS OF EFFECT OF ANY RELEASE, THE NUMBER OF PEOPLE EXPOSED TO THE HAZARD DUE TO ANY RELEASE, AND THE INTENSITY OF EXPOSURE. A DETAILED DEFINITION OF EXPOSURE WOULD ENTAIL THESE AND OTHER FACTORS; HENCE, IT IS NOT FEASIBLE TO ATTEMPT TO ESTABLISH PACKAGE SPECIFICATIONS SOLELY ON THE BASIS OF THE INFORMATION CONTAINED IN THIS REPORT.

7

NATIONAL WASTE TERMINAL STORAGE PROGRAM: POTENTIAL PROBLEMS IN THE WASTE TRANSPORTATION SYSTEM

PNL-2444

DESTEESE, J.G.; RHODES, R.E.

770101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 20 P.

PACIFIC NORTHWEST LABORATORY

O,1

POTENTIAL PROBLEMS ARE IDENTIFIED WHICH MAY IMPACT THE PLANNING, ORGANIZATION AND OPERATION OF NUCLEAR WASTE TRANSPORTATION SYSTEMS SERVING FEDERAL REPOSITORIES. THESE SYSTEM-LEVEL PROBLEMS HAVE THE POTENTIAL OF SERIOUSLY INTERFERING WITH THE OVERALL UWI TRANSPORTATION/LOGISTICS STUDY OBJECTIVE OF HAVING A VIABLE NUCLEAR WASTE TRANSPORTATION SYSTEM IN 1985. THIS REPORT INCLUDES RECOMMENDED ACTION AND PRIORITY JUDGMENTS TO ADDRESS THESE PROBLEMS AND MINIMIZE THEIR IMPACT. POTENTIAL PROBLEMS ASSOCIATED WITH EQUIPMENT AND HARDWARE ARE NOT COVERED. THE POTENTIAL PROBLEMS IDENTIFIED AS MOST IMPORTANT HAVE CONSEQUENCES WHICH MAY IMPACT THE OVERALL STATE OF FUTURE PREPAREDNESS FOR TRANSPORTING NUCLEAR WASTE. OTHER IMPORTANT CONCERNS RELATE TO THE IMPOSITION OF UNNECESSARILY SEVERE AND COSTLY RESTRICTIONS ON NUCLEAR WASTE TRANSPORTATION, PUBLIC AND CARRIER ACCEPTANCE, AND THE INVOLVEMENT OF INTERESTED PARTIES IN PLANNING AND DECISION-MAKING. THE MAJOR RECOMMENDATION OF THIS REPORT IS THAT THE PLANNING AND DEVELOPMENT OF THE WASTE TRANSPORTATION SYSTEM SHOULD BE CONTROLLED BY A CENTRAL PLANNING ACTIVITY WHICH ANTICIPATES THE IMPACT OF UNCERTAINTIES AND UNDESIRABLE EVENTS.

EVALUATION OF IMPROVED POTENTIAL FOR SPENT FUEL CASK
HANDLING

PNL-3722; TTC-0192

FRANKLIN, A.L.

810101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 57 P.

PACIFIC NORTHWEST LABORATORY

C,3;C,8;D,1;D,2;D,3;C,0,4;C,0,6;D,8;C,0,9;D,0,C

THE QUANTITATIVE ANALYSIS OF OPPORTUNITIES TO IMPROVE THE LOADING/UNLOADING OPERATIONS FOR SPENT FUEL SHIPPING CASKS ARE DESCRIBED. THE IMPROVEMENT POTENTIAL IS DEFINED AS A REDUCTION IN THE TIME FOR COMPLETION OR WORKER EXPOSURE FOR THE COMPLETE HANDLING OPERATIONS. TWO CASKS HAVE BEEN CHOSEN AS REPRESENTATIVE OF PRESENTLY AVAILABLE SHIPPING CASKS. THESE ARE THE NAC-1/NFS-4 LEGAL WEIGHT TRUCK CASK AND THE IF-300 RAIL CASK. THE HANDLING OPERATIONS FOR EACH OF THESE CASKS ARE BROKEN DOWN INTO A SERIES OF SEQUENTIAL STEPS. THE TIME FOR COMPLETION AND WORKER EXPOSURE IS DESCRIBED BY A PROBABILITY DENSITY FUNCTION FOR EACH STEP. THESE STEP DESCRIPTIONS ARE THEN COMBINED TO FORM A BASE CASE DESCRIPTION OF THE TOTAL LOADING/UNLOADING OPERATION. POTENTIAL IMPROVEMENT OPPORTUNITIES ARE EVALUATED BY MODIFYING THE APPROPRIATE PROBABILITY DENSITY FUNCTION DESCRIPTORS THEN RECOMBINING THE STEPS TO FORM A PROBABILISTIC DESCRIPTION OF THE MODIFIED OPERATION.

9

AN ANALYSIS OF THE RISK OF TRANSPORTING SPENT NUCLEAR FUEL
BY TRAIN

PNL-268; TTC-0145

ELDER, H.K.

810101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 248 P.

PACIFIC NORTHWEST LABORATORY

C,1;C,2;C,3;B;C,4;B;C,5;B;C,9;D,1;D,2;D,3;B;D,4;B;D,5;B;D,6;D,8,
B;D,9; D,0,B

RISK ANALYSES ARE USED TO ANALYZE THE SAFETY OF TRANSPORTING SPENT NUCLEAR FUEL FOR COMMERCIAL RAIL SHIPPING SYSTEMS. THE RAIL SYSTEMS ANALYZED ARE THOSE EXPECTED TO BE USED IN THE U.S. WHEN THE TOTAL ELECTRICITY-GENERATING CAPACITY BY NUCLEAR REACTORS IS 100 GW IN THE LATE 1980S. RISK AS USED IN THIS REPORT IS THE PRODUCT OF THE PROBABILITY OF A RELEASE OF MATERIAL TO THE ENVIRONMENT AND THE CONSEQUENCES RESULTING FROM THE RELEASE. THE ANALYSIS INCLUDES RISKS IN TERMS OF EXPECTED FATALITIES FROM RELEASE OF RADIOACTIVE MATERIALS DUE TO TRANSPORTATION ACCIDENTS INVOLVING PWR SPENT FUEL SHIPPED IN RAIL CASKS. THE EXPECTED TOTAL RISK FROM SUCH SHIPMENTS IS 1.3×10^{-4} FATALITIES PER YEAR. RISK SPECTRUMS ARE DEVELOPED FOR SHIPMENTS OF SPENT FUEL THAT ARE 180 DAYS AND 4 YRS OUT-OF-REACTOR. THE RISK FROM TRANSPORTING SPENT FUEL BY TRAIN IS MUCH LESS (BY 2 TO 4 ORDERS OF MAGNITUDE) THAN THE RISK TO SOCIETY FROM OTHER MAN-CAUSED EVENTS SUCH AS DAM FAILURE AND

INFREQUENT NATURAL EVENTS SUCH AS METEORITES.

10

AN ASSESSMENT OF THE RISK OF TRANSPORTING SPENT NUCLEAR
FUEL BY TRUCK

PNL-2588

ELDER, H.K.; ANDREWS, W.B.; FRILEY, J.R.; JOHNSON, J.F.; MCCANN,
R.A.; RHODES, R.E.

780101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 280 P.
PACIFIC NORTHWEST LABORATORY

C,1;C,2;C,3,B;C,4,B;C,5,B;C,9;O,1;O,2;O,3,B;O,4,B;O,5,B;O,6;O,8,
B; O,9;O,0,B

THE ASSESSMENT INCLUDES THE RISKS FROM RELEASE OF SPENT
FUEL MATERIALS AND RADIOACTIVE CASK CAVITY COOLING WATER DUE TO
TRANSPORTATION ACCIDENTS. THE CONTRIBUTION TO THE RISK OF
PACKAGE MISCLOSEURE AND DEGRADATION DURING NORMAL TRANSPORT WAS
ALSO CONSIDERED. THE RESULTS OF THE RISK ASSESSMENT HAVE BEEN
RELATED TO A TIME IN THE MID 1980S, WHEN IT IS PROJECTED THAT
NUCLEAR PLANTS WITH AN ELECTRICAL GENERATING CAPACITY OF 100 GW
WILL BE OPERATING IN THE U.S. FOR SHIPMENTS FROM REACTORS TO
INTERIM STORAGE FACILITIES, IT IS ESTIMATED THAT A TRUCK
CARRYING SPENT FUEL WILL BE INVOLVED IN AN ACCIDENT THAT WOULD
NOT BE SEVERE ENOUGH TO RESULT IN A RELEASE OF SPENT FUEL
MATERIAL ABOUT ONCE IN 1,1 YRS. IT WAS ESTIMATED THAT AN
ACCIDENT THAT COULD RESULT IN A SMALL RELEASE OF RADIOACTIVE
MATERIAL (PRIMARILY CONTAMINATED COOLING WATER) WOULD OCCUR ONCE
IN ABOUT 40 YRS. THE FREQUENCY OF AN ACCIDENT RESULTING IN ONE
OR MORE LATENT CANCER FATALITIES FROM RELEASE OF RADIOACTIVE
MATERIALS DURING A TRUCK SHIPMENT OF SPENT FUEL TO INTERIM
STORAGE WAS ESTIMATED TO BE ONCE IN 41,000 YRS. NO ACCIDENTS
WERE FOUND THAT WOULD RESULT IN ACUTE FATALITIES FROM RELEASES
OF RADIOACTIVE MATERIAL. THE RISK FOR SPENT FUEL SHIPMENTS FROM
REACTORS TO REPROCESSING PLANTS WAS FOUND TO BE ABOUT 20% LESS
THAN THE RISK FOR SHIPMENTS TO INTERIM STORAGE. ALTHOUGH THE
AVERAGE SHIPMENT DISTANCE FOR THE REPROCESSING CASE IS LARGER,
THE RISK IS SOMEWHAT LOWER BECAUSE THE SHIPPING ROUTES, ON
AVERAGE, ARE THROUGH LESS POPULATED SECTIONS OF THE COUNTRY. THE
TOTAL RISK FROM TRANSPORTING 180-DAY COOLED SPENT FUEL BY TRUCK
IN THE REFERENCE YR IS 4.5 E-5 FATALITIES. AN INDIVIDUAL IN THE
POPULATION AT RISK WOULD HAVE ONE CHANCE IN 6 E+11 OF SUFFERING
A LATENT CANCER FATALITY FROM A RELEASE OF RADIOACTIVE MATERIAL
FROM A TRUCK CARRYING SPENT FUEL IN THE REFERENCE YR.

11

PLUTONIUM TRANSPORT PACKAGE CLOSURE SURVEY

BNAL-2288

HEABERLIN, S.W.

780101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 25 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES
0,1;0,3;0,9;0,0

IN THE FALL OF 1976, BNWL CONDUCTED A SURVEY OF EIGHT FACILITIES RECEIVING PU SHIPMENTS TO DETERMINE THE CONDITION OF PU SHIPPING PACKAGES DURING SHIPMENT. THIS SURVEY FOLLOWED A SIMILAR SURVEY CONDUCTED BY BNWL IN EARLY 1974. THE PACKAGE TYPES CONSIDERED WERE THE L-10, 6M AND LLD-1 PACKAGES. A TOTAL OF 6,700 PACKAGES WERE INCLUDED IN THE SURVEY. COMPARED TO THE EARLIER SURVEY, A MARKED REDUCTION WAS OBSERVED IN NONSTANDARD PACKAGE CLOSURE CONDITIONS. ONE EXCEPTION WAS AN INCREASE IN THE OCCURRENCE OF EXTREMELY TIGHT PIPE PLUGS IN THE 2R INNER CONTAINER FOR THE 6M PACKAGE. THIS IS NOT FELT TO BE A SIGNIFICANT SAFETY PROBLEM. THE REDUCTION IN NONSTANDARD PACKAGE CLOSURE CONDITIONS WAS APPARENTLY DUE TO THE IMPROVED QUALITY ASSURANCE IN PACKING PROCEDURES.

12
CONSEQUENCES OF POSTULATED LOSSES OF LWR SPENT FUEL AND
PLUTONIUM SHIPPING PACKAGES AT SEA

PNL-2093

HEABERLIN, S.W.

770101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 89 P.

PACIFIC NORTHWEST LABORATORY

C,5,8;0,1;0,2;0,4,8;0,5,6;0,9;0,0,6

AS THE USE OF NUCLEAR POWER EXPANDS THROUGHOUT THE WORLD, THE NUMBER OF SHIPMENTS OF RADIOACTIVE MATERIALS CARRIED IN OCEAN TRANSPORT WILL INCREASE. THE SAFETY OF OCEAN TRANSPORT OF RADIOACTIVE MATERIALS HAS NOT BEEN SYSTEMATICALLY EVALUATED. HOWEVER, ACCIDENTS INVOLVING CARGO VESSELS CAN BE POSTULATED THAT RESULT IN THE LOSS OF PACKAGES CONTAINING RADIOACTIVE MATERIAL INTO THE SEA. THIS STUDY PROVIDES A PRELIMINARY ASSESSMENT OF THE POTENTIAL CONSEQUENCES OF SOME SPECIFIC LOSS SCENARIOS INVOLVING A LARGE LIGHT WATER REACTOR SPENT FUEL CASK AND A PLUTONIUM SHIPPING PACKAGE. IN GENERAL, THE POTENTIAL CONSEQUENCES OF THE LOSS OF ONE OF THESE PACKAGES INTO THE OCEAN ARE DEPENDENT ON THE DAMAGE THAT THE PACKAGE SUSTAINS IN THE ACCIDENT PRIOR TO THE LOSS. TWO CASES HAVE BEEN CHOSEN FOR DETAILED CONSIDERATION - UNDAMAGED PACKAGES AND PACKAGES DAMAGED BY FIRE. THESE CASES WERE CHOSEN TO PROVIDE INFORMATION ON A WIDE RANGE OF POTENTIAL CONSEQUENCES. OTHER TYPES OF PRELOSS DAMAGE WERE NOT CONSIDERED.

13
ASSESSMENT OF ENVIRONMENTAL IMPACT OF PROPOSED RULE MAKING
AFFECTING THE CONDITIONS OF TRANSPORT OF RADIOACTIVE
MATERIALS ON AIRCRAFT

BNWL-B-421

HALL, R.J.; HENDRICKSON, P.L.; KING, J.C.; MCSWENEY, T.J.;
SHIPLEY, D.B.; BROWN, C.L.; DAVIS, D.K.; WATSON, E.C.

750101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 155 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

C,4,A;C,4,C;C,4,D;O,1;O,2;O,3;O,4,A;O,4,C;O,4,D;O,5,B;O,8,A;O,8,
B;O,8,C; O,8,D;O,9;O,0,A;O,0,B;O,0,C;O,0,D;P,9

RADIOACTIVE MATERIALS ARE USED AT TENS OF THOUSANDS OF LOCATIONS THROUGHOUT THE U.S. FOR MEDICAL, RESEARCH, AND INDUSTRIAL PURPOSES. TO SUPPLY THE NEEDS OF THESE USERS ABOUT THREE QUARTERS OF A MILLION PACKAGES OF RADIOACTIVE MATERIAL ARE SHIPPED ANNUALLY IN THE COUNTRY. THE MAJORITY OF THESE PACKAGES ARE SHIPPED BY PASSENGER AND CARGO-ONLY AIRCRAFT. SEVERAL FEDERAL AND STATE AGENCIES ENSURE THE SAFETY OF RADIOACTIVE MATERIAL TRANSPORTATION THROUGH REGULATION OF THE PACKAGING AND THE CONDITIONS OF TRANSPORT. THE FEDERAL AVIATION ADMINISTRATION (FAA) REGULATES THE TRANSPORT OF RADIOACTIVE MATERIAL BY COMMERCIAL AIRCRAFT. THE FAA HAS ISSUED A NOTICE OF PROPOSED RULE MAKING WHICH INCLUDES CHANGES IN THE CONDITIONS OF TRANSPORTING RADIOACTIVE MATERIAL ON COMMERCIAL AIRCRAFT. THESE PROPOSED AMENDMENTS ARE REPRODUCED AS APPENDIX A. THIS DRAFT ENVIRONMENTAL IMPACT STATEMENT EXAMINES THE POTENTIAL EFFECTS OF ENACTING THOSE PORTIONS OF THE NOTICE OF PROPOSED RULE MAKING (NPRM) WHICH AFFECT THE CARRIAGE OF RADIOACTIVE MATERIALS ON COMMERCIAL AIRCRAFT. THE STATEMENT IS PRESENTED IN 10 SECTIONS AND 5 APPENDICES OF THIS DOCUMENT. A GLOSSARY OF TERMS AND A LIST OF ACRONYMS FOLLOW THE APPENDICES. SECTIONS IV AND IX ARE OF NECESSITY SOMEWHAT DETAILED AND LENGTHY. FOR EASE OF REFERENCE, SUMMARIES ARE GIVEN AT THE BEGINNING OF THESE TWO SECTIONS.

14

RISK ASSESSMENT FOR THE TRANSPORTATION OF PUC2, UF6, AND SPENT FUEL ON ROADS IN THE FEDERAL REPUBLIC OF GERMANY

CONF-B01115

HARTWIG, S.; FLOTHMANN, D.; HEUDORFER, W.; KRIEGER, E.; ROOS, G.;
SCHNATZ, G.; WUERDEMANN, G.

B01101

K.O. SIORCK & CO., HAMBURG

BATTELLE-INSTITUT E.V., FRANKFURT

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIAL. PROC. 6TH
INT. SYMP. PP. 410-418.

O,1;O,3;O,9;O,0

THE PURPOSE OF THIS INVESTIGATION WAS TO EVALUATE THE RISK ARISING DURING TRANSPORTATION OF SPENT FUEL, PUC2 AND UF6 ON THE ROADS OF THE FEDERAL REPUBLIC. IN ORDER TO ASSESS THIS RISK, THE RADIOACTIVE MATERIAL HAS TO BE ASCERTAINED. THE QUANTITIES AND COMBINATIONS OF RADIOACTIVE MATERIAL THAT MAY BE RELEASED DURING AN ACCIDENT THEN HAVE TO BE ESTIMATED. FINALLY, THE CONSEQUENCES (ACUTE FATALITIES) OF SUCH A RELEASE HAVE TO BE CALCULATED TAKING INTO CONSIDERATION THE DENSITY OF POPULATION AND THE ACTUAL METEOROLOGICAL SITUATION. USING THE TOOLS PRESENTED IN THIS PAPER, THE ESSENTIAL FACTORS AFFECTING THE TOTAL RISK MAY

BE RECOGNIZED. IT IS THEN POSSIBLE TO INTRODUCE IMPROVEMENTS AND PREVENTIVE MEASURES. ABOVE ALL THE TRAFFIC ROUTE SELECTED FROM ALL POSSIBLE ROUTES SHOULD BE ASSOCIATED WITH THE SMALLEST POSSIBLE RISK. FROM THIS INVESTIGATION, THE RELATIONSHIP BETWEEN THE RISK CONNECTED WITH TRANSPORTATION, THE OTHER RISKS ASSOCIATED WITH THE NUCLEAR FUEL CYCLE, AND THE GENERAL TECHNICAL RISK MAY BE DEDUCED. NEVERTHELESS, THE ASSESSMENT OF THE RELEVANCE OF THIS RISK WITH A VIEW TO A GENERAL RISK STRATEGY REMAINS A POLITICAL MATTER WHICH IS BEYOND THE SCOPE OF THIS INVESTIGATION.

15

SAFETY ANALYSIS REPORT FOR PACKAGING (SARP): ATMX-500
RAILCAR NUCLEAR PACKAGING

MLM-2145

GRIFFIN, J.F.; PETERSON, J.B.; EDLING, D.A.; RODRIGUEZ, L.F.
740101

MOUND LABORATORY, MIAMISBURG, OH, 72 P.
MOUND LABORATORY

0,1;0,2;0,9;0,0

THIS SAFETY ANALYSIS REPORT FOR PACKAGING (SARP) IS TO MAKE AVAILABLE TO ALL POTENTIAL USERS THE TECHNICAL INFORMATION AND LIMITS PERTINENT TO THE MODIFICATION AND USE OF THE ATMX RAILCARS FOR WHICH THE DEPARTMENT OF TRANSPORTATION HAS ISSUED SPECIAL PERMIT NO. 5948. THIS SARP INCLUDES DISCUSSIONS OF STRUCTURAL INTEGRITY, THERMAL RESISTANCE, RADIATION SHIELDING AND RADIOLOGICAL SAFETY, NUCLEAR CRITICALITY SAFETY, AND QUALITY CONTROL. MUCH OF THE INFORMATION WAS PREVIOUSLY PUBLISHED IN A SIMILAR REPORT. A COMPLETE PHYSICAL AND TECHNICAL DESCRIPTION OF THE PACKAGE IS PRESENTED. THE PACKAGING CONSISTS OF A SPECIALLY MODIFIED ATMX SERIES 500 RAILCAR LOADED WITH DOT SPECIFICATION STEEL DRUMS OR WOODEN CRATES. A NUCLEAR CRITICALITY SAFETY ANALYSIS WHICH WAS INITIALLY CONDUCTED FOR DOT-SF-6000 CONTAINERS,

IN 15-, 30- AND 55-GAL SIZES, IS APPLICABLE (EXCEPT FOR THE 15-GAL SIZE) TO PACKAGING AND SHIPMENT OF FISSILE WASTE MATERIAL IN THE ATMX RAILCARS AND IS INCLUDED. THE RESULTS OF THE ANALYSIS PROVIDE THE MAXIMUM QUANTITIES OF EACH FISSILE ISOTOPE WHICH MAY BE SHIPPED AS FISSILE CLASS I IN 30- AND 55- GAL DRUMS. A LIMIT OF 5G/FT(3) WAS ESTABLISHED FOR WOODEN CRATES. DESIGN AND DEVELOPMENT CONSIDERATIONS REGARDING THE PACKAGING CONCEPT AND MODIFICATION OF THE ATMX-500 RAILCAR ARE PRESENTED. TABLES, DIMENSIONAL SKETCHES, SEQUENTIAL PHOTOGRAPHS OF THE STRUCTURAL MODIFICATIONS, TECHNICAL REFERENCES, LOADING AND SHIPPING GUIDELINES, MOUND'S EXPERIENCE IN USING THIS CONTAINER, AND A COPY OF PERMIT DOT-SF-5948 ARE INCLUDED. AN INTERNAL REVIEW OF THIS SARP HAS BEEN PERFORMED IN COMPLIANCE WITH THE REQUIREMENTS OF AECM 5201-PART V.

16

AN ASSESSMENT OF RISK OF TRANSPORTING PLUTONIUM DIOXIDE AND

LIQUID PLUTONIUM NITRATE BY TRAIN

BNWL-1996

HALL, R.J.

770101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 224 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

C,1;C,2;C,3,B;C,4,B;C,5,B;C,8,B;C,9;O,1;O,2;O,3,B;O,4,B;O,5,B;O,6; O,8,B;O,9;O,0,B

THE RISK ANALYSIS MODEL IS APPLIED TO THE ASSESSMENT OF THE RISK OF PU RELEASES DUE TO TRANSPORTATION ACCIDENTS AND PACKAGE MISCLASURE AND DEGRADATION. THE TRANSPORT SYSTEM AND ACCIDENT ENVIRONMENT ARE DESCRIBED AND RELEASE SEQUENCES POSTULATED. RESULTS ARE RELATED TO THE EARLY 1960S, WHEN PU SHIPMENTS ARE EXPECTED TO BE MORE FREQUENT (18 METRIC TONS PU SHIPPED BY RAIL PER YR, AVERAGE SHIPMENT DISTANCE OF 1530 MILES, REGULATIONS AND SHIPPING SYSTEMS SAME AS IN 1974, PUO2 SHIPPED IN 6M CONTAINERS AND LIQUID PU(NO3)4 IN L-10 CONTAINERS, WITH 230 KG IN A 90-CONTAINER 6M SHIPMENT AND 136 KG IN A 60-CONTAINER L-10 SHIPMENT). IT IS ESTIMATED THAT PUO2 SHIPMENTS WILL BE INVOLVED IN AN ACCIDENT EVERY 6 YRS AND PU(NO3)4 SHIPMENTS EVERY 3.5 YRS. CONSEQUENCES ARE EXPRESSED AS RISK SPECTRA. LOSS OF THERMAL INSULATION FOLLOWED BY EXPOSURE TO A FIRE WAS FOUND TO BE THE MOST SIGNIFICANT RISK CONTRIBUTOR FOR THE LIQUID SHIPMENTS. RISK IN RAIL SHIPMENT OF PU WAS FOUND TO BE SIMILAR TO THAT IN TRUCK SHIPMENT, ALTHOUGH FOR THE LIQUID SHIPMENTS, THERE IS A DIFFERENCE IN THE IMPORTANCE OF FACTORS CONTRIBUTING TO THE RISK.

17

AN ANALYSIS OF THE RISK OF TRANSPORTING URANIUM ORE

CONCENTRATES BY TRUCK

PNL-3463; TTC-0146

GEFFEN, C.A.

810101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 75 P.

PACIFIC NORTHWEST LABORATORY

O,1;O,2;O,3,B;O,4,B;O,5,B;O,8,B;O,9;O,0,B

THE RISK INVOLVED WITH SHIPPING U ORE CONCENTRATES BY TRUCK IN AN ATTEMPT TO PROVIDE SOME PERSPECTIVE ON THE SYSTEM SAFETY ISSUES IS EVALUATED. THE BASIC PROBABILISTIC RISK EVALUATION METHODOLOGY USED IN THIS STUDY IS SIMILAR TO THAT EMPLOYED BY PNL IN A SERIES OF RISK ANALYSES ON THE TRANSPORTATION OF POTENTIALLY HAZARDOUS ENERGY MATERIALS. THE RISK MODEL HAS BEEN CONSTRUCTED AS A SERIES OF SEPARATE ANALYSIS STEPS TO ALLOW THE SYSTEM RISK TO BE READILY REEVALUATED AS ADDITIONAL DATA BECOME AVAILABLE OR AS POSTULATED SYSTEM CHARACTERISTICS CHANGE. THE RESULTS OF THIS ANALYSIS SHOW THAT THE RISKS TO THE PUBLIC HEALTH AND SAFETY FROM YELLOWCAKE RELEASES DURING A TRANSPORTATION ACCIDENT ARE INSIGNIFICANT. ACCIDENTS INVOLVING TRUCK SHIPMENTS OF YELLOWCAKE ARE EXPECTED TO OCCUR AT A RATE OF ABOUT TEN A YR. HOWEVER, ONLY ONE-FIFTH OF THESE ACCIDENTS, OR ABOUT TWO A YR, ARE EXPECTED TO CAUSE A RELEASE OF YELLOWCAKE TO

THE ENVIRONMENT. NONE OF THESE ACCIDENTS WAS ESTIMATED TO PRODUCE ANY POTENTIAL FATALITIES. THE LOW CONCENTRATION OF RADIOACTIVITY DISTRIBUTED THROUGHOUT THE MATERIAL RESULTED IN NO SIGNIFICANT INCREASE IN RADIATION DOSES ABOVE NORMAL BACKGROUND LEVELS TO MEMBERS OF THE GENERAL PUBLIC.

18

TRANSPORTATION CONSIDERATIONS RELATED TO WASTE FORMS AND
CANISTERS FOR DEFENSE TRU WASTES

PNL-3841; TTC-0241

SCHNEIDER, K.J.; ANDREWS, W.B.; SCHREIBER, A.M.; ROSENTHAL, L.J.;
ODLE, C.J.

810101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 107 P.
PACIFIC NORTHWEST LABORATORY

O,1;O,2;O,9,O,0;P,9

THE CONSIDERATIONS IMPOSED BY TRANSPORTATION ON WASTE FORMS AND CANISTERS FOR CONTACT-HANDLED, SOLID TRANSURANIC WASTES FROM THE DOE ACTIVITIES ARE IDENTIFIED AND DISCUSSED. THE REPORT REVIEWED (1) THE EXISTING RAW WASTE FORMS AND POTENTIAL IMMOBILIZED WASTE FORMS, (2) THE EXISTING AND POTENTIAL FUTURE DOE WASTE CANISTERS AND SHIPPING CONTAINERS, (3) REGULATIONS AND REGULATORY TRENDS FOR TRANSPORTING COMMERCIAL TRANSURANIC WASTES ON THE ISA, (4) TRUCK AND RAIL CARRIER REQUIREMENTS AND PREFERENCES FOR TRANSPORTING THE WASTES, AND (5) CURRENT AND PROPOSED TYPE B EXTERNAL PACKAGINGS.

19

TRANSPORTATION OF NUCLEAR SPENT FUEL. 2ND REV. ED.

NONE

SOUTHERN INTERSTATE NUCLEAR BOARD

750101

SOUTHERN INTERSTATE NUCLEAR BOARD, ATLANTA, GA. 127 P.
SOUTHERN INTERSTATE NUCLEAR BOARD

O,1;O,2;O,9;P,9

THIS REPORT CONTAINS INFORMATIVE DATA ON THE OPERATIONAL AND REGULATORY ASPECTS OF TRANSPORTING NUCLEAR SPENT FUEL FROM THE REACTOR, FROM WHICH IT WAS REMOVED, TO THE REPROCESSING PLANT WHERE THE UNUSED FUEL IS RECOVERED FOR RE-USE. NUCLEAR POWER PLANTS WHICH ARE NOW OPERATING OR ON ORDER ARE LISTED. TRANSPORTATION REQUIREMENTS ARE PROJECTED FOR THE NEXT TEN YEARS IN TERMS OF TONS OF RADIOACTIVE CARGO TO BE SHIPPED FROM A REACTOR TO A REPROCESSING PLANT. NUCLEAR FUEL CHARACTERISTICS AND TYPICAL FUEL ASSEMBLIES FOR PRESENT-DAY REACTORS ARE DESCRIBED. APPLICABLE FEDERAL AND STATE REGULATIONS AND REGULATORY AGENCIES ARE LISTED. THE VARIOUS TRANSPORTATION MODES--HIGHWAY, RAIL AND WATER--THAT ARE AVAILABLE FOR SPENT FUEL SHIPMENT ARE DISCUSSED, ALONG WITH THEIR LIMITATIONS. TYPICAL SHIPPING CONTAINERS FOR SPENT FUEL ASSEMBLIES ARE DESCRIBED AND THE AEC LICENSING REQUIREMENTS ARE LISTED. FINALLY,

THE REPORT CONCLUDES WITH A DISCUSSION OF SAFETY CONSIDERATIONS.

20

RADIOACTIVE MATERIALS PACKAGES AND THE BRITISH RAILWAY
ACCIDENT ENVIRONMENT

CONF-801115

TAIG, A.R.

801101

K.O. STORCK & CO., HAMBURG

UKAEA, WARRINGTON

PACKAGING AND TRANSPORTATION OF NUCLEAR MATERIALS, PROC. 6TH
INT. SYMP. PP. 428-435.

U,2;O,3;O,9;O,0

THE PLACE OF ACCIDENT STATISTICS ANALYSIS IN THE SRD
PROGRAMS OF RESEARCH INTO RISKS DUE TO TRANSPORT OF RADIOACTIVE
MATERIALS IS DESCRIBED. AN OUTLINE IS GIVEN OF RESEARCH INTO THE
BRITISH RAILWAY ACCIDENT ENVIRONMENT, AND THE PARAMETERS
AFFECTING SEVERITY AND FREQUENCY ARE DISCUSSED, WITH THE AID OF
ACCIDENT DATA SUPPLIED BY OFFICIAL UK BODIES, QUANTITATIVE
INFORMATION ON THE INCIDENCE OF DIFFERENT CATEGORIES OF ACCIDENT
HAS BEEN OBTAINED. SOME OF THE RESULTS DESCRIBING INCIDENCE OF
DERAILMENTS, COLLISIONS AND FIRES DURING A SAMPLE PERIOD ARE
PRESENTED, AND FURTHER EFFORT NECESSARY TO SUPPLY THE REQUIRED
DATA FOR TRANSPORT RA IS DISCUSSED.

21

RADIOACTIVE WASTE TRANSPORTATION RISK

CONF-801115

TVETEN, U.

801101

K.O. STORCK & CO., HAMBURG

INSTITUTE FOR ENERGY TECHNOLOGY, NORWAY

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS, PROC. 6TH
INT. SYMP. PP. 169-179.

K,1;K,2;K,4,B;K,5,B;K,7;K,9;K,0,B;O,1;O,2;O,3,B;O,4,B;O,5,B;O,9;
O,0,B

THE WORK PRESENTED IN THIS PAPER IS PERFORMED AS PART OF A
NORDIC PROJECT FUNDED BY THE NORDIC COUNCIL OF MINISTERS. IN A
JOINT NORDIC PROJECT A REFERENCE WASTE HANDLING SYSTEM IS
ANALYZED IN ORDER TO SHOW THE INTERRELATION BETWEEN THE VARIOUS
STEPS: TEMPORARY STORAGE, TRANSPORTATION, AND DISPOSAL, TO
CORRELATE THEM WITH THE NECESSARY WASTE PRODUCT SPECIFICATIONS,
AND TO SHOW HOW POSSIBLE RADIATION DOSES TO HUMANS CAN BE
ASSESSED. CALCULATIONS OF RISK ARE USED AS A TOOL FOR PLANNING
OVERALL WASTE HANDLING SYSTEMS OR JUDGING ACCEPTABILITY OF
PROPOSED SOLUTIONS. THE NORWEGIAN WASTE WILL BE TRANSPORTED IN
DRUMS WITH RESIN INCORPORATED IN CONCRETE OR BITUMEN. RESULTS
FROM DOSE CALCULATIONS PERFORMED FOR SPECIFIC WEATHER CONDITIONS
ARE GIVEN. THE ISOTOPES CONSIDERED ARE SR-90, CS-137, CO-60 AND
CS-134. THREE RISK CURVES SHOW CALCULATIONS FOR RELEASE DURING

TRANSPORTATION AND STORAGE.

22

ENVIRONMENTAL SURVEY OF TRANSPORTATION OF RADIOACTIVE
MATERIALS TO AND FROM NUCLEAR POWER PLANTS

WASH-1238

U.S. AEC

721201

U.S. AEC, DIRECTORATE OF REGULATORY STANDARDS, WASHINGTON, DC.
120 P.

U.S. AEC, DIRECTORATE OF REGULATORY STANDARDS

O,1;O,2;O,3;O,4,A;O,4,C;O,5,B;O,5,D;O,6;O,9,A;O,9,B;O,9,C;O,9,D;
O,0,A;O,0,B;O,0,C;O,0,D

THIS REPORT IS A REISSUANCE OF AN AEC STAFF ANALYSIS OF THE ENVIRONMENTAL IMPACT OF THE TRANSPORTATION OF RADIOACTIVE MATERIALS TO AND FROM NUCLEAR POWER PLANTS. IT CONTAINS ESTIMATES OF THE POTENTIAL EXPOSURES TO TRANSPORT WORKERS AND THE GENERAL PUBLIC UNDER NORMAL CONDITIONS OF TRANSPORT AND THE PROBABILITIES OF OCCURRENCE AND THE POTENTIAL CONSEQUENCES OF ACCIDENTS IN TRANSPORTATION. UNDER NORMAL CONDITIONS OF TRANSPORT, THE RADIATION DOSE TO THE INDIVIDUAL RECEIVING THE HIGHEST EXPOSURE IS UNLIKELY TO BE MORE THAN 500 MREM/YR; THE AVERAGE DOSE TO INDIVIDUALS IN THE HIGHEST EXPOSED GROUP IS ABOUT 100 MREM/YR. WHEN BOTH THE PROBABILITY OF OCCURRENCE AND THE EXTENT OF THE POTENTIAL CONSEQUENCES ARE TAKEN INTO ACCOUNT, THE RISK TO THE ENVIRONMENT FROM THE RADIOLOGICAL EFFECTS OF TRANSPORTATION ACCIDENTS IS SMALL.

23

ENVIRONMENTAL SURVEY OF TRANSPORTATION OF RADIOACTIVE
MATERIALS TO AND FROM NUCLEAR POWER PLANTS. SUPPL. 1

NUREG-75/038

U.S. NRC

750101

U.S. NRC, WASHINGTON, DC. 13 P.

U.S. NRC

O,1;O,9,A;O,9,B;O,9,C;O,9,D;O,0,A;O,0,B;O,0,C;O,0,D

THIS SUPPLEMENT TO WASH-1238 PRESENTS DATA AND IDENTIFIES METHODS USED TO DERIVE THE ENVIRONMENTAL IMPACT AND RISK VALUES USED FOR THE ENVIRONMENTAL IMPACT OF TRANSPORTATION OF FUEL AND WASTE TO AND FROM ONE LIGHT-WATER-COOLED NUCLEAR POWER REACTOR. THE VALUES AND CALCULATIVE METHODS, ASSUMPTIONS AND PARAMETERS USED ARE DESCRIBED IN DETAIL IN WASH-1238. THIS DOCUMENT PROVIDES A SUMMARY OF THE RESULTANT ENVIRONMENTAL IMPACT VALUES.

24

POTENTIAL RELEASE OF CESIUM FROM IRRADIATED FUEL IN A
TRANSPORTATION ACCIDENT. SUPPL. 2 TO WASH-1238.
ENVIRONMENTAL SURVEY OF TRANSPORTATION OF RADIOACTIVE

MATERIALS TO AND FROM NUCLEAR POWER PLANTS

NUREG-0069

U.S. NRC

760101

U.S. NRC, WASHINGTON, DC, 22 P.

U.S. NRC

O,1;O,2;O,3,A;O,3,B;O,5;O,9;O,0,A;O,0,B

THIS REPORT WAS PREPARED TO PRESENT THE INFORMATION AVAILABLE AT THIS TIME ON CS RELEASES FROM IRRADIATED FUEL IN A TRANSPORTATION ACCIDENT. A MODEL FOR CALCULATING RADIOCESIUM RELEASE FROM IRRADIATED NUCLEAR FUEL THAT HAS BEEN RUPTURED AND PERFORATED IN A TRANSPORTATION ACCIDENT AND ITS BASIS ARE PRESENTED. USING THIS MODEL, THE POTENTIAL RADIOCESIUM RELEASE TO THE ENVIRONMENT IS CALCULATED TO BE NO MORE THAN A SMALL FRACTION OF 150 CURIES. VOLATILE FISSION PRODUCTS SUCH AS RU, TE AND SR WOULD NOT BE EXPECTED TO OCCUR.

25

FINAL ENVIRONMENTAL STATEMENT ON THE TRANSPORTATION OF
RADIOACTIVE MATERIALS BY AIR AND OTHER MODES

NUREG-0170

U.S. NRC

770101

U.S. NRC, OFFICE OF STANDARDS DEVELOPMENT, WASHINGTON, DC, 872 P.

U.S. NRC

C,4,A;C,4,B;C,4,C;C,4,D;C,4,E;C,4,F;C,5,B;C,5,D;C,5,E;C,5,F;O,1;
O,2;O,3,A;O,3,B;O,3,E;O,3,F;O,4,A;O,4,B;C,4,C;O,4,D;O,4,E;O,
4,F;O,5,B;O,5,D;O,5,F;O,6;O,7;C,8,A;C,8,B;C,8,C;O,8,D;O,8,E;
O,8,F;O,9;O,0,A;O,0,B; O,0,C;O,0,D;O,0,E;O,0,F;P,9

THE PURPOSE OF THIS ES IS TO ASSESS THE IMPACT UPON THE ENVIRONMENT RESULTING FROM THE TRANSPORTATION OF RADIOACTIVE MATERIALS WITHIN THE U.S. AND FROM EXPORT AND IMPORT SHIPMENTS OF SUCH MATERIALS. THE RADIOLOGICAL IMPACTS OF TRANSPORTATION ACCIDENTS INVOLVING RADIOACTIVE MATERIALS ARE EVALUATED FROM A RISK POINT OF VIEW, ALTHOUGH THE CONSEQUENCES OF CERTAIN "WORST-CASE" ACCIDENTS ARE ALSO EVALUATED. THE DATA BASE FOR THIS ASSESSMENT IS THE 1975 SURVEY OF RADIOACTIVE MATERIAL SHIPMENTS IN THE UNITED STATES. ALL SHIPMENTS EXCLUSIVE OF WEAPONS, WEAPON COMPONENTS, AND SHIPMENTS IN MILITARY VEHICLES ARE CONSIDERED. FUEL CYCLE SHIPMENTS, SHIPMENTS OF MEDICAL- AND INDUSTRIAL-USE ISOTOPES, AND WASTE SHIPMENTS ARE SPECIFICALLY INCLUDED. THE EXPECTED RADIOLOGICAL IMPACTS IN 1985 ARE ALSO EVALUATED IN TERMS OF PROJECTIONS OF THE 1975 SHIPMENT DATA UNDER CERTAIN GROWTH ASSUMPTIONS.

26

SPENT FUEL TRANSPORTATION ON HIGHWAYS - THE RADIOACTIVE
DOSE TO THE TRAFFIC

YADIGARCGLU, G.

750101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
UNIV. OF CALIFORNIA, BERKELEY
NUCL. TECHNOL. 27:258-266.

C,5,B;C,5,D;O,1;O,5,B;O,5,D;O,0,B;O,0,D

THE RADIOACTIVE EXPOSURE OF THE TRAFFIC MOVING ON THE SAME HIGHWAY AS SPENT FUEL SHIPMENTS HAS BEEN NEGLECTED IN THE PAST. METHODS DEVELOPED FOR CALCULATING PEAK EXPOSURES, THE NUMBER OF INDIVIDUALS RECEIVING A DOSE IN EXCESS OF A CERTAIN LIMITING VALUE, AND THE CUMULATIVE POPULATION DOSES FOR THE OCCUPANTS OF THE VEHICLES UNDER A VARIETY OF HIGHWAY AND ACCIDENT CONDITIONS ALLOW COMPARISONS TO THE CORRESPONDING STATIONARY-POPULATION DOSES. CONSIDERATION OF BOTH ROUTINE DIRECT-RADIATION EXPOSURES AND ACCIDENTAL RELEASES INDICATE THAT THE TRAFFIC DOSES CAN BE OF EQUAL OR GREATER IMPORTANCE THAN THE STATIONARY-POPULATION DOSES.

27

A RISK ASSESSMENT FOR THE TRANSPORTATION OF RADIOACTIVE
ZEOLITE LINERS

PNL-4032

GALLUCCI, R.H.V.

820101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 135 P.

PACIFIC NORTHWEST LABORATORY

C,3,B;O,1;O,2;O,3,B;O,4,B;O,5,B;O,6,B;O,9;O,0,B;P,2;P,9;P,0

THE RISK IS ESTIMATED FOR THE SHIPMENT OF RADIOACTIVE ZEOLITE LINERS IN SUPPORT OF THE ZEOLITE VITRIFICATION DEMONSTRATION PROGRAM CURRENTLY UNDERWAY AT PNL UNDER THE SPONSORSHIP OF THE U.S. DOE. THIS PROGRAM WILL ESTABLISH THE FEASIBILITY OF ZEOLITE VITRIFICATION AS AN EFFECTIVE MEANS OF IMMOBILIZING HIGH-SPECIFIC-ACTIVITY WASTES. IN THIS RA, IT IS ASSUMED THAT TWO ZEOLITE LINERS, EACH LOADED AROUND JULY 1, 1981 TO 60,000 CI, WILL BE SHIPPED BY TRUCK AROUND JANUARY 1, 1982. IT IS CONCLUDED THAT THE TRANSPORT OF THE RADIOACTIVE ZEOLITE LINERS FROM IMI TO PNL BY TRUCK CAN BE CONDUCTED AT AN INSIGNIFICANT LEVEL OF RISK TO THE PUBLIC.

28

AN ASSESSMENT OF THE RISK OF TRANSPORTING URANIUM
HEXAFLUORIDE BY TRUCK AND TRAIN

PNL-2211

GEFFEN, C.A.; JOHNSON, J.F.; DAVIS, D.K.; FRILEY, J.R.; ROSS,
B.A.

760101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 169 P.

PACIFIC NORTHWEST LABORATORY

C,1;C,2;C,3,B;C,4,B;C,5,B;C,9;O,1;O,2;O,3,B;C,4,B;O,5,B;O,6;O,6,
B;O,9;O,0,B

THIS REPORT IS THE FIFTH IN A SERIES OF STUDIES OF THE RISK

OF TRANSPORTING POTENTIALLY HAZARDOUS ENERGY MATERIALS. THE REPORT PRESENTS AN ASSESSMENT OF THE RISK OF SHIPPING UF₆ BY TRUCK AND RAIL. THE GENERAL RA METHODOLOGY SUMMARIZED IN SECTION 3 USED IN THIS STUDY IS THAT DEVELOPED FOR THE FIRST STUDY IN THIS SERIES. THE ASSESSMENT INCLUDES THE RISKS FROM RELEASE OF URANIUM HEXAFLUORIDE DURING TRUCK OR RAIL TRANSPORT DUE TO TRANSPORTATION ACCIDENTS. THE CONTRIBUTION TO THE RISK OF DETERIORATED OR FAULTY PACKAGING DURING NORMAL TRANSPORT WAS ALSO CONSIDERED. THE REPORT IS SECTIONED TO CORRESPOND TO THE SPECIFIC ANALYSIS STEPS OF THE RA MODEL. THE TRANSPORTATION SYSTEM AND ACCIDENT ENVIRONMENT ARE DESCRIBED IN SECTIONS 4 AND 5. CALCULATION OF THE RESPONSE OF THE SHIPPING SYSTEM TO FORCES PRODUCED IN TRANSPORTATION ACCIDENTS ARE PRESENTED IN SECTION 6 AND THE RESULTS OF A SURVEY TO DETERMINE THE CONDITION OF THE PACKAGE DURING TRANSPORT ARE PRESENTED IN SECTION 7. SEQUENCES OF EVENTS THAT COULD LEAD TO A RELEASE OF RADIOACTIVE MATERIAL FROM THE SHIPPING CASK DURING TRANSPORTATION ARE POSTULATED IN SECTION 8 USING FAULT TREE ANALYSIS. THESE RELEASE SEQUENCES ARE EVALUATED IN SECTIONS 9 THROUGH 11 TO DETERMINE BOTH THE LIKELIHOOD AND THE POSSIBLE CONSEQUENCES OF EACH RELEASE. SUPPORTIVE DATA AND ANALYSES ARE GIVEN IN THE APPENDICES. THE RESULTS OF THE RA HAVE BEEN RELATED TO THE YR 1985, WHEN IT IS PROJECTED THAT 100 GW OF ELECTRIC POWER WILL BE GENERATED ANNUALLY BY NUCLEAR POWER PLANTS. IT WAS ESTIMATED THAT APPROXIMATELY 46,000 METRIC TONS OF NATURAL UF₆ AND 14,600 MT OF ENRICHED UF₆ WOULD BE SHIPPED IN THE REFERENCE YR.

29

THE CONSEQUENCES OF ACCIDENTAL RELEASE OF RADIOACTIVE
CERIUM DURING SHIPMENT. REV. 1

HW-72163, REV. 1

JUNKINS, R.L.; REID, D.L.; WATSON, E.C.; ZAHN, L.L.

640101

HANFORD ATOMIC PRODUCTS OPERATION, RICHLAND, WA. 35 P.

HANFORD ATOMIC PRODUCTS OPERATION

0,1;0,2;0,4,5;0,5,8;0,9;0,0,8

THE SHIPMENT OFF SITE OF LARGE QUANTITIES OF RADIONUCLIDES FROM THE HANFORD ATOMIC PRODUCTS OPERATION INVOLVES THE REMOTE POSSIBILITY OF AN ACCIDENTAL RELEASE OF THESE MATERIALS. THE CONSEQUENCES OF SUCH A RELEASE OF CE-144 FROM THE HAPD-1B CASK ARE THE SUBJECT OF THIS REPORT. THE METHODS OF ANALYSIS OF THIS PROBLEM AND THE NECESSARY ASSUMPTIONS ARE COMPARABLE TO THOSE OF SIMILAR STUDIES OF THE SHIPMENT OF RADIOACTIVE STRONTIUM. THERE ARE SIGNIFICANT DIFFERENCES IN THE DAMAGE ESTIMATES BECAUSE OF THE NATURE OF THE MATERIALS INVOLVED.

30

LEGAL, INSTITUTIONAL AND POLITICAL ISSUES IN TRANSPORTATION
OF NUCLEAR MATERIALS AT THE BACK END OF THE LWR
NUCLEAR FUEL CYCLE

PNL-2457

LIPPEK, H.E.; SCHULLER, C.R.

770101

BATTELLE, SEATTLE RESEARCH CENTER, SEATTLE, WA. 259 P.

BATTELLE, SEATTLE RESEARCH CENTER

O,1;O,2;O,9;O,0,B,D

THIS REPORT IDENTIFIES MAJOR LEGAL AND INSTITUTIONAL PROBLEMS THAT COULD FRUSTRATE THE ESTABLISHMENT OF A TRANSPORTATION SYSTEM FOR SPENT FUEL AND OTHER RADIOACTIVE MATERIALS AT THE BACK END OF THE FUEL CYCLE; IT THEN EVALUATES POSSIBLE SOLUTIONS TO THESE PROBLEMS.

31

STATISTICAL ANALYSIS OF THE FREQUENCY AND SEVERITY OF ACCIDENTS TO POTENTIAL HIGHWAY CARRIERS OF HIGHLY RADIOACTIVE MATERIALS

NYO-9771

LEIMKUHLER, F.F.; KARSON, M.J.; THOMPSON, J.I.

610101

U.S. DEPT. OF COMMERCE, OFFICE OF TECHNICAL SERVICES, WASHINGTON, DC. 187 P.

JOHNS HOPKINS UNIV.

O,9

THE PROBABILITY OF ACCIDENTS TO TRACTOR SEMITRAILERS IS DEVELOPED THROUGH ANALYSIS OF ACCIDENT FREQUENCY DATA IN RELATION TO SEASON; GEOGRAPHICAL FACTORS; ROAD TYPE, TRAFFIC AND POPULATION DENSITY; AND TYPE OF CARRIER BUSINESS. MAXIMUM LIKELIHOOD RATES ARE DEVELOPED FOR THE POTENTIAL CARRIERS OF RADIOACTIVITY. IMPACT CHARACTERISTICS OF ACCIDENTS ARE STUDIED THROUGH THE ANALYSIS OF MASS, SPEED, AND ENERGY RELATIONS AND THE EFFECT OF THESE ON VEHICLE AND CARGO DAMAGES ARE EXPLORED.

32

AN ASSESSMENT OF THE RISK OF TRANSPORTING PLUTONIUM OXIDE AND LIQUID PLUTONIUM NITRATE BY TRUCK

BN-L-1846

MCSWEENEY, T.I.; HALL, R.J.

750101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 277 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

C,1;C,2;C,3,B;C,4,B;C,5,B;C,8,B;C,9;O,1;O,2;O,3,B;O,4,B;O,5,B;O,6;O,8,B;O,9;O,0,B

BOTH A METHODOLOGY FOR ASSESSING THE RISK IN TRANSPORTING RADIOACTIVE MATERIALS AND THE RESULTS OF THE INITIAL APPLICATION OF THE METHODOLOGY TO SHIPMENT OF PU BY TRUCK ARE PRESENTED. THE RA METHODOLOGY IS MANIFESTED IN A MODEL THAT RELATES THE FUNCTIONAL STEPS IN THE ASSESSMENT. DATA NEEDS AND ANALYSIS PROCEDURES ARE EXPLICITLY DEFINED IN THE MODEL. THE MODEL IS CONSTRUCTED FOR EASE OF PERIODIC UPDATING OF THE DATA BASE TO MAINTAIN THE RA AS ADDITIONAL DATA BECOME AVAILABLE. THE

REMAINDER OF THE REPORT TREATS THE APPLICATION OF THE MODEL TO RA OF THE TRUCK SHIPMENT OF PU IN TWO FORMS: LIQUID NITRATE AND OXIDE POWDER. THE SCOPE OF THE ASSESSMENT ENCOMPASSES THE RISK OF PU RELEASES DUE TO TRANSPORTATION ACCIDENTS AND PACKAGE MISUSE AND DEGRADATION. RA RESULTS HAVE BEEN RELATED TO FUTURE TIME IN THE 1980S. SENSITIVITY STUDIES WERE PERFORMED TO DETERMINE THE MOST IMPORTANT CONTRIBUTORS TO THE RISK. LOSS OF THERMAL INSULATION FOLLOWED BY EXPOSURE TO A FIRE WAS FOUND TO BE THE MOST SIGNIFICANT RISK CONTRIBUTOR FOR THE LIQUID PU NITRATE SHIPMENTS. A RISK CURVE DEVELOPED ASSUMING STABILIZED VERMICULATE INSULATION IS INCLUDED TO SHOW THE IMPORTANCE OF THE INSULATION.

33

SOME EXPERIMENTAL MEASUREMENTS OF AIRBORNE URANIUM
(REPRESENTING PLUTONIUM) IN TRANSPORTATION ACCIDENTS

BNWL-1732

MISHIMA, J.; SCHWENDIMAN, L.C.

730101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 75 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

O,9,A;O,9,B;O,0,A;O,0,B

EXPERIMENTS WERE PERFORMED TO MEASURE THE FRACTIONAL RELEASE OF U COMPOUNDS WHEN THESE MATERIALS ARE INVOLVED IN GASOLINE FIRES. U WAS USED AS A REASONABLE STAND-IN FOR PU. IN THE EXPERIMENTS REPORTED UO₂ PARTICLES OR URANIUM NITRATE IN SOLUTION WAS DEPOSITED ON VARIOUS MATERIALS RANGING FROM A SMOOTH METAL SURFACE TO SOIL. GASOLINE WAS ADDED TO THESE MATERIALS, THEN IGNITED. AIRBORNE PARTICLES WERE COLLECTED AT POINTS DOWNSTREAM IN THE DUCT IN WHICH THE COMBUSTION TRAY WAS LOCATED. VARIOUS AIR FLOW AND BURNING CONDITIONS WERE USED. IN THE BURNING EXPERIMENTS IN WHICH A URANYL NITRATE SOLUTION WAS DEPOSITED ON A STAINLESS STEEL PLATE, 11% WAS MADE AIRBORNE WITH AN AIR FLOW OF 23 MPH. THIS RELEASE WAS THE LARGEST FOR THE BURNING EXPERIMENTS; HOWEVER, AS MUCH AS 24% OF UO₂ POWDER WAS AERODYNAMICALLY ENTRAINED FROM DRY, SANDY SOIL BY AIR AT A VELOCITY OF 20 MPH. NO SINGLE VARIABLE OF THE CONDITIONS IMPOSED IN 40 EXPERIMENTS COULD BE IDENTIFIED AS HAVING AN OVER-RIDING INFLUENCE ON THE RELEASES OF U WITHIN THE RANGE OF VARIABLES INCLUDED IN THESE EXPERIMENTS. A GASOLINE FIRE IN WHICH 500 GAL WERE DUMPED AND BURNED, AFFIRMED THAT THE SMALLER SCALED EXPERIMENTS WERE REASONABLY REPRESENTATIVE OF ACTUAL FIRES.

34

AN ASSESSMENT OF THE RISK OF TRANSPORTING PLUTONIUM DIOXIDE
BY CARGO AIRCRAFT

BNWL-2030

MCSWEENEY, T.I.; JOHNSON, J.F.

770101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 155 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

C,1;C,2;C,3,B;C,4,B;C,5,B;C,9;O,1;O,2;O,3,B;O,4,B;O,5,B;O,6;O,8,
B;O,9;O,0,B

THIS REPORT IS THE THIRD OF A SERIES OF REPORTS EVALUATING THE RISK OF TRANSPORTING PU BY VARIOUS MODES. THE FIRST REPORT PRESENTED A METHODOLOGY FOR ASSESSING THE RISK OF TRANSPORTING RADIOACTIVE MATERIALS AND APPLIED THE METHODOLOGY TO THE SHIPMENT OF PU BY TRUCK. THE SECOND REPORT APPLIED THE METHODOLOGY TO THE SHIPMENT OF PU BY RAIL. THIS REPORT PRESENTS THE RESULTS FOR SHIPMENT OF PU BY CARGO AIRCRAFT. TO ENABLE EASY COMPARISON, ALL THE PU SHIPPING EVALUATIONS HAVE USED THE SAME BASES. IN EACH, THE RESULTS HAVE BEEN RELATED TO A FUTURE TIME--THE EARLY 1980S--WHEN PU SHIPMENTS ARE EXPECTED TO BE MORE FREQUENT.

35

SAFETY ANALYSIS REPORT FOR PACKAGING KRYPTON SHIPPING
CONTAINER USA/5956/BL(ERDA-ID)

ICP-1077

NEILSEN, C.W.

750101

ALLIED CHEMICAL CORP., IDAHO FALLS, ID. 70 P.

ALLIED CHEMICAL CORP., IDAHO FALLS

O,1;O,4;O,5,A;O,5,B;O,9;O,0,A;O,0,B

A SAFETY REVIEW OF POSSIBLE HAZARDS ASSOCIATED WITH SHIPMENT OF RADIOACTIVE KR-85 GAS IN THE KR SHIPPING CONTAINER WAS COMPLETED. THE CASK IS DESCRIBED, AND TRANSFER PROCEDURES AND CONTROL METHODS ARE DISCUSSED. A SAFETY ANALYSIS COVERING THE CREDIBLE CONSEQUENCES OF RADIATION EXPOSURES, CONTAMINATION, AND FIRE AND EXPLOSION IS PRESENTED. CRITICALITY WAS NOT EVALUATED, BECAUSE FISSIONABLE MATERIALS ARE EXCLUDED FROM THIS CASK. THE SAFETY ANALYSIS INDICATES THAT THE KRYPTON SHIPPING CONTAINER MAY BE USED WITHIN CONDITIONS SPECIFIED IN AECM 0529 WITHOUT UNDUE HAZARDS.

36

SPECIAL CLOSURE FOR RADIOACTIVE SHIPPING CONTAINERS

SAND75-0517

OTTS, J.V.

750101

SANDIA LABORATORIES, ALBUQUERQUE, NM. 52 P.

SANDIA LABORATORIES

O,1;O,9

THE OBJECTIVE OF THIS PROGRAM WAS TO DEVELOP A SPECIAL LID CLOSURE FOR RADIOACTIVE MATERIAL SHIPPING CONTAINERS, TYPICALLY STEEL DRUMS. THREE CLOSURE TECHNIQUES WERE DESIGNED, FABRICATED, AND PROVEN TO BE STRUCTURALLY ADEQUATE TO PROTECT 1000 LB WHEN DROPPED 30 FT. THE THREE DESIGNS WERE (1) A 6-IN LID EXTENSION (SKIRT), (2) A 6-IN INNER LID, AND (3) C-CLAMPS USED AT THE CONTAINER/LID INTERFACE. BASED UPON STRUCTURAL INTEGRITY,

ECONOMIC IMPACT AND MINIMAL DESIGN CHANGE, THE 6-IN LID EXTENSION IS RECOMMENDED.

37

CONCEPTUAL DESIGN OF A SHIPPING CONTAINER FOR TRANSPORTING HIGH-LEVEL WASTE BY RAILROAD

PNL-2244

PETERSON, P.L.; RHOADS, R.E.

780101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 65 P.

PACIFIC NORTHWEST LABORATORY

0,1;0,2;0,8;0,9;0,0

THE RESULTS OF A STUDY TO DEVELOP A CONCEPTUAL DESIGN FOR A RAIL CASK FOR TRANSPORTING SOLIDIFIED HIGH-LEVEL WASTES (SHLW) AND TO CONSTRUCT SCALE MODELS OF THE CONCEPTUAL CASK WITH ACCOMPANYING GRAPHICS FOR USE AT TECHNICAL MEETINGS AND IN PUBLIC INFORMATION DISPLAYS ARE GIVEN. TWO 1/10 SCALE MODELS OF THE CONCEPTUAL CASK AND TWO HO GAUGE (1/87 SCALE) MODELS OF THE CASK/RAILCAR SYSTEM HAVE BEEN CONSTRUCTED. A DESCRIPTION OF THE MODELS AND ACCOMPANYING GRAPHICS IS PRESENTED IN APPENDIX A. THE PRIMARY PURPOSE OF THIS DOCUMENT IS TO PRESENT THE INFORMATION DEVELOPED FOR THE CONCEPTUAL CASK DESIGN DISPLAYED IN THE MODELS. BECAUSE OF THE SIMILARITIES IN THE HEAT GENERATION AND RADIATION PROPERTIES OF SHLW AND SPENT REACTOR FUEL, THE CONCEPTUAL DESIGN PRESENTED IS SIMILAR IN MANY RESPECTS TO THE DESIGN OF SPENT FUEL CASKS CURRENTLY IN USE. IN THE PROCESS OF DEVELOPING THIS CONCEPTUAL DESIGN, IT HAS BECOME APPARENT THAT CERTAIN KEY PARAMETERS WILL CONTROL THE FINAL DESIGN OF A SHLW SHIPPING CASK. IT MAY ALSO BE BENEFICIAL TO BUILD A CASK SYSTEM THAT PROVIDES SOME FLEXIBILITY IN THE CONTENTS THAT CAN BE SHIPPED. THESE INSIGHTS AND OTHERS THAT HAVE EVOLVED IN DEVELOPING THE CONCEPTUAL SHLW SHIPPING CASK DESIGN ARE PRESENTED IN SECTION 4.0.

38

SAFETY ANALYSIS REPORT FOR PACKAGING: NEUTRON SHIPPING CASK, MODEL 4T

UCRL-52232

PETERSON, R.T.

770101

LAWRENCE LIVERMORE LABORATORY, LIVERMORE, CA. 121 P.

LAWRENCE LIVERMORE LABORATORY

0,1;0,2;0,9;0,0;P,9

THIS SAFETY ANALYSIS REPORT FOR PACKAGING DEMONSTRATES THAT THE NEUTRON SHIPPING CASK CAN SAFELY TRANSPORT, IN SOLID OR POWDER FORM, ALL ISOTOPES OF U, PU, AM, CM, BK, CF, ES, AND FM. THE REPORT DESCRIBES THE CASK AND ITS CONTENTS. IT ALSO EVALUATES TRANSPORT CONDITIONS, STRUCTURAL PARAMETERS (E.G., LOAD RESISTANCE, PRESSURE AND IMPACT EFFECTS, LIFTING AND TIEDOWN DEVICES), AND SHIELDING. FINALLY IT DISCUSSES COMPLIANCE

WITH CHAPTER 0529 OF THE ERDA MANUAL, SAFETY STANDARDS FOR THE PACKAGING OF FISSILE AND OTHER RADIOACTIVE MATERIALS.

39

AN OVERVIEW OF TRANSPORTATION IN THE NUCLEAR FUEL CYCLE

BNWL-2066

RHOADS, R.E.

770101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 51 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

D,9;E,9;F,9;G,9;H,9;I,9;J,9;L,9;N,9;O,1;O,2;C,9;O,0;P,9

A REVIEW OF CURRENT TRANSPORTATION REGULATIONS, A DESCRIPTION OF TRANSPORTATION SYSTEMS CURRENTLY IN USE, A DISCUSSION OF SYSTEMS THAT ARE ANTICIPATED TO BE DEVELOPED IN THE FUTURE AND THE PROTECTION OF SHIPMENTS AND SHIPPING DISTANCES ARE GIVEN THROUGH THE YR 2000.

40

RISK ASSESSMENT OF ENERGY MATERIAL TRANSPORTATION SYSTEMS

PNL-SA-7230

RHOADS, R.E.; GEFEN, C.A.

780101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 17 P.

PACIFIC NORTHWEST LABORATORY

C,1;C,2;C,3,B;C,5,B;C,9;C,0,B;O,1;O,2;O,3,B;C,5,B;O,9;O,0,B

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE DOE 1978 ENVIRONMENTAL CONTROL SYMPOSIUM. THE TRANSPORTATION SAFETY STUDIES PROJECT BEING CONDUCTED FOR DOE BY PNL HAS DEVELOPED A STATE-OF-THE-ART TRANSPORTATION RISK ASSESSMENT METHODOLOGY AND APPLIED THIS METHODOLOGY TO QUANTIFY THE LEVEL OF PROTECTION PROVIDED BY ENVIRONMENTAL CONTROL SYSTEMS CURRENTLY IN USE ON SEVERAL ENERGY MATERIAL TRANSPORTATION SYSTEMS. THIS PAPER REVIEWS THE METHODOLOGY THAT HAS BEEN DEVELOPED, SUMMARIZES THE RESULTS OF STUDIES COMPLETED TO DATE AND DESCRIBES OTHER POTENTIAL USES FOR RISK ASSESSMENT TECHNIQUES IN DEVELOPING AND EVALUATING ENVIRONMENTAL CONTROL TECHNOLOGIES. THE RESULTS TO DATE INDICATE THAT THE ENVIRONMENTAL CONTROL TECHNOLOGIES MANDATED FOR THESE SYSTEMS BY DOT AND NRC REGULATIONS COUPLED WITH THE PRUDENT DESIGN AND OPERATING PRACTICES OF THE ENERGY MATERIAL TRANSPORTATION INDUSTRY HAVE RESULTED IN SYSTEMS THAT EXPOSE SOCIETY TO RISK LEVELS THAT ARE SIGNIFICANTLY LOWER THAN OTHER COMMONLY-ACCEPTED RISKS. THESE STUDIES HAVE SUGGESTED POTENTIAL METHODS FOR IMPROVING SYSTEMS SAFETY, IF THAT IS JUDGED TO BE NECESSARY, AND HAVE IDENTIFIED AREAS REQUIRING FURTHER R&D TO IMPROVE THE KNOWLEDGE OF THE SAFETY OF THE SYSTEM. THE ANALYSIS TECHNIQUES THAT HAVE BEEN USED ARE VERY FLEXIBLE AND COULD BE APPLIED TO OTHER CURRENT TRANSPORTATION SYSTEMS OR TO SYSTEMS BEING PROPOSED FOR FUTURE USE. THE METHODS HAVE POTENTIAL APPLICATIONS IN EVALUATING THE SAFETY IMPLICATIONS OF PROPOSED REGULATORY OR POLICY CHANGES, AND COULD

BE USED IN DEVELOPING R&D PROJECTS TO SATISFY SAFETY INFORMATION NEEDS BY DETERMINING PERMISSIBLE UNCERTAINTY BANDS ON THE DATA TO PRODUCE AN OVERALL SAFETY ANALYSIS WITH AN ACCEPTABLE DEGREE OF CONFIDENCE IN THE RESULTS.

41

A SAFETY AND ECONOMIC STUDY OF SPECIAL TRAINS FOR SHIPMENT OF SPENT FUEL

BNWL-2263

RHOADS, R.E.

770101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 66 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

O,1;O,2;O,3;O,8;O,0;P,9

TO PROVIDE CONTROL OVER THE TRANSPORTATION ENVIRONMENT, THE ASSOCIATION OF AMERICAN RAILROADS HAS PROPOSED THAT ALL SPENT NUCLEAR FUEL BE HANDLED IN SPECIAL TRAIN SERVICE. A SET OF OPERATING PRACTICES FOR SPENT FUEL SPECIAL TRAINS HAS BEEN PROPOSED THAT INCLUDES A 35 MPH MAXIMUM SPEED RESTRICTION, A PASSING RESTRICTION AND A NO-OTHER-FREIGHT RESTRICTION. THE PURPOSE OF THIS STUDY WAS TO EVALUATE THE POTENTIAL EFFECTS OF THESE RESTRICTIONS ON THE SAFETY AND COST OF SHIPPING SPENT FUEL BY TRAIN. THE ANALYSIS IS BASED ON ESTIMATED QUANTITIES OF SPENT FUEL TRANSPORTED IN 1986.

42

RISK IN TRANSPORTING MATERIALS FOR VARIOUS ENERGY INDUSTRIES

RHOADS, R.E.; JOHNSON, J.F.

780101

U.S. DOE

PACIFIC NORTHWEST LABORATORY

NUCL. SAF. 19(2):135-149.

C,1;C,2;C,3;C,5;C,8;C,9;O,1;O,2;O,5;C,9;O,0;B

THE REPORT FORM OF THIS PAPER IS BNWL-SA-6547. PNL IS CURRENTLY CONDUCTING A RESEARCH PROGRAM SPONSORED BY DOE TO ASSESS THE RISKS IN TRANSPORTING ENERGY MATERIALS. THE OBJECTIVE OF THIS PROGRAM IS TO USE A CONSISTENT METHODOLOGY TO ASSESS THE RISKS OF TRANSPORTING MATERIALS FOR ENERGY SYSTEMS THAT ARE IN USE, BEING DEVELOPED OR BEING PLANNED FOR THE FUTURE. THIS ARTICLE BRIEFLY REVIEWS THE BACKGROUND OF RA, DESCRIBES THE RA METHODOLOGY USED IN PNL'S TRANSPORTATION SAFETY STUDIES PROGRAM, SUMMARIZES THE WORK TO DATE AND OUTLINES FUTURE PROGRAMS.

43

ENVIRONMENTAL IMPACT OF PLUTONIUM TRANSPORT IN THE EVENT OF ACCIDENTS WITHIN THE EUROPEAN COMMUNITY - ESTIMATION OF POTENTIAL RELEASES

CONF-801115

SCHNEIDER, K.J.; ANSPACH, W.
801101

K.O. STORCK & CO., HAMBURG
TRANSNUCLEAR GMBH, GERMANY

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROC. 6TH
INT. SYMP. PP. 401-409.

0,1;0,2;0,3,B;0,4,B;0,8,B;0,0,B

THIS STUDY WAS CARRIED OUT WITHIN THE FRAMEWORK OF A
RESEARCH AND DEVELOPMENT PROGRAM OF THE EUROPEAN COMMUNITIES ON
PU RECYCLING IN LIGHT WATER REACTORS. THE PAPER ASSESSES THE
RELEASE OF RADIOACTIVE MATERIAL DUE TO ACCIDENTS DURING
TRANSPORTATION. IN EACH CASE THE LIMIT OF THE SYSTEM IS THE
CONTAINER SURFACE. THE QUANTITY OF RELEASED MATERIAL IS
INDICATED AS BEING APPROPRIATE FOR THE TRANSPORT BY AIRBORNE
PATHWAY. THUS INITIAL DATA FOR CALCULATING THE ENVIRONMENTAL
BURDEN UNDER ACCIDENT CONDITIONS ARE DERIVED. THE GREATEST PART
OF THE RELEASE RISK IS FORMED BY THE TRANSPORT OF SPENT MOX FUEL
ELEMENTS.

44

ATMX-600 RAILCAR SAFETY ANALYSIS REPORT FOR PACKAGING (SARP)
RFP-2244

ADCOCK, F.E.; MCCARTY, J.D.
740101

DOX CHEMICAL CO., ROCKY FLATS, ID. 34 P.
DOX CHEMICAL CO., ROCKY FLATS

0,1;0,2;0,9

THE ATMX-600 SERIES RAIL CAR IS USED BY ROCKWELL
INTERNATIONAL, ROCKY FLATS PLANT, FOR SHIPPING LOW-LEVEL
RADIOACTIVE WASTE UNDER THE PROVISIONS OF DOT SPECIAL PERMIT
5948. FISSION CLASS I-SHIPMENTS ARE AUTHORIZED WITH THE CAR
LOADED TO CAPACITY WITH DRUMS CONTAINING UP TO 200 GMS OF
PU-239. INNER PACKAGING MAY BE POLYETHYLENE-LINED STEEL DRUMS OR
FIBERGLASS-COATED PLYWOOD CRATES. THESE MASSIVE DOUBLE-WALLED
STEEL CARS PROVIDE THE EQUIVALENT PROTECTION OF A TYPE B
PACKAGE. RAPID LOADING AND UNLOADING OF THE 9- X 9- X 50-FT
CARGO SPACE IS ACCOMPLISHED BY PREPACKAGING THE WASTE IN
STANDARD 20-FT STEEL CARGO CONTAINERS. THE ATMX-600 RAIL CAR
WILL HOLD TWO CARGO CONTAINERS, EACH CARRYING SEVENTY 55-GAL
DRUMS AND UP TO 44,800 LBS GROSS WT. THIS REPORT IS A REVISION
OF AN EARLIER DOCUMENT AND DESCRIBES IMPROVEMENTS TO INNER
PACKAGING. IT ALSO REFLECTS CURRENT SHIPPING PRACTICES.

45

TRECII: A COMPUTER PROGRAM FOR TRANSPORTATION RISK
ASSESSMENT

PNL-3208; TTC-0116
FRANKLIN, A.L.

800101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 74 P.

PACIFIC NORTHWEST LABORATORY

C,3,B;C,4,B;C,5,B;C,9;0,3,B;0,4,B;0,5,B;0,9

A RISK-BASED FAULT TREE ANALYSIS METHOD HAS BEEN DEVELOPED AT PNL FOR ANALYSIS OF NUCLEAR FUEL CYCLE OPERATIONS. THIS METHODOLOGY WAS DEVELOPED FOR DOE AS A RISK ANALYSIS TOOL FOR EVALUATING HIGH LEVEL WASTE MANAGEMENT SYSTEMS. A COMPUTER PACKAGE CONSISTING OF THREE PROGRAMS WAS WRITTEN AT THAT TIME TO ASSIST IN THE PERFORMANCE OF RA: ACORN (DRAWS FAULT TREES), MFAULT (ANALYZES FAULT TREES), AND RAFT (CALCULATES RISK). THIS METHODOLOGY EVALUATES RELEASE CONSEQUENCES AND ESTIMATES THE FREQUENCY OF OCCURRENCE OF THESE CONSEQUENCES. THIS DOCUMENT DESCRIBES AN ADDITIONAL RISK CALCULATING CODE WHICH CAN BE USED IN CONJUNCTION WITH TWO OF THE THREE CODES FOR TRANSPORTATION RA. TRECII MODIFIES THE DEFINITION OF RISK USED IN RAFT (PROB. X RELEASE) TO ACCOMMODATE RELEASE CONSEQUENCES IN TERMS OF FATALITIES. THROUGHOUT THIS REPORT RISK SHALL BE DEFINED AS PROBABILITY TIMES CONSEQUENCES (FATALITIES ARE ONE POSSIBLE HEALTH EFFECT CONSEQUENCE). THIS METHODOLOGY HAS BEEN APPLIED TO A VARIETY OF ENERGY MATERIAL TRANSPORTATION SYSTEMS. TYPICALLY THE MATERIAL SHIPPED HAS BEEN RADIOACTIVE, ALTHOUGH SOME ADAPTATION TO FOSSIL FUELS HAS OCCURRED. THE APPROACH IS NORMALLY APPLIED TO TRUCK OR TRAIN TRANSPORT SYSTEMS WITH SOME ADAPTATION TO PIPELINES AND AIRCRAFT. TRECII IS DESIGNED TO BE USED PRIMARILY IN CONJUNCTION WITH MFAULT; HOWEVER, WITH A MODERATE AMOUNT OF EFFORT BY THE USER, IT CAN BE IMPLEMENTED INDEPENDENT OF THE RISK ANALYSIS PACKAGE DEVELOPED AT PNL. CODE DESCRIPTION AND USER INSTRUCTIONS NECESSARY FOR THE IMPLEMENTATION OF THE TRECII PROGRAM ARE PROVIDED.

46

APPLICATION OF ALARA PRINCIPLES TO THE SHIPMENT OF SPENT NUCLEAR FUEL

PNL-3261; TTC-0073

GREENBERG, J.; BRACKENBUSH, L.W.; MURPHY, D.W.; BURNETT, R.A.; LEWIS, J.R.

800101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 73 P.

PACIFIC NORTHWEST LABORATORY

M,9;0,1;0,2;0,3;0,4,C;0,5,D;0,9;0,0,C;0,0,D;P,9

RADIATION EXPOSURE FROM SHIPMENTS OF SPENT FUEL WILL COMPRISE ONLY A SMALL AMOUNT OF THE TOTAL EXPOSURE EXPERIENCED IN THE U.S. IF CURRENT SHIPPING PRACTICES ARE FOLLOWED, SPENT FUEL SHIPMENTS WILL RESULT IN ABOUT 100 MAN-REM/YR OF RADIATION EXPOSURE DURING THE PERIOD 1980 TO 1990. THIS EXPOSURE CAN BE COMPARED TO THE 40 MILLION MAN-REM OF RADIATION EXPOSURE RECEIVED ANNUALLY BY THE U.S. POPULATION FROM NATURAL SOURCES, MEDICAL EXAMINATION, TELEVISION AND AIR TRAVEL. OF THE 100 ADDITIONAL MAN-REM GENERATED BY SPENT FUEL SHIPMENTS, LESS THAN 10 MAN-REM WILL BE RECEIVED BY THE GENERAL POPULATION. THE BALANCE WILL BE RECEIVED BY WORKERS IN THE NUCLEAR AND TRANSPORTATION INDUSTRIES. ALTHOUGH THE SPENT FUEL SHIPMENT DOSE

IS SMALL, THERE IS INCENTIVE TO REDUCE THIS EXPOSURE, PARTICULARLY THE OCCUPATIONAL DOSE. WITH THIS GOAL IN MIND, THE ALTERNATIVES FOR DOSE REDUCTION ESTIMATED IN THIS STUDY INCLUDE: SHIPPING SCHEDULE CHANGES (A FUNCTION OF REACTION PLANT SPENT FUEL STORAGE CAPACITY), SHIPMENT MODES (RAIL AND TRUCK), FUEL AGE, CASK DESIGN AND ALTERNATE ROUTINGS.

47

RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT : FINAL
PHASE 02 REPORT ON ACCIDENT REVIEW

RA-02-2-18

PHILLIPS, E.; OLSEN, L.

720101

AMERICAN ASSOCIATION OF RAILROADS, CHICAGO, 250 P.

AMERICAN ASSOCIATION OF RAILROADS

0,3;0,4;0,9;0,0

THIS REPORT SUMMARIZES THE ACTIVITIES UNDER PHASE 02 OF THE RPI-AAR RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 02 WAS CONCERNED WITH THE ANALYSIS OF TANK CAR ACCIDENTS TO DETERMINE THE PROBABILITY OF LADING LOSS FROM TANK CARS INVOLVED IN ACCIDENTS AND THE POTENTIAL VALUE OF VARIOUS DESIGN CONCEPTS THAT WOULD REDUCE THE PROBABILITY OF LADING LOSS. THIS REPORT SUMMARIZES THE INCIDENTS OF LADING LOSS FROM TANK CARS DUE TO MECHANICAL DAMAGE INCURRED IN ACCIDENTS IN THE PERIOD 1965 THROUGH 1970, THE AVAILABLE INFORMATION ON TANK CAR UTILIZATION DURING THIS SAME PERIOD, AND THE VARIOUS STATISTICS ON RISK LEVELS AND LOSS EXPERIENCE THAT WERE DERIVED FROM THIS DATA. THE VALUES OF VARIOUS DESIGN CONCEPTS ARE PRESENTED, AND AN ANALYSIS IS MADE OF THE EFFECT OF OVERLAPPING EFFECTS WHICH WOULD RESULT FROM THE IMPLEMENTATION OF MORE THAN ONE OF THE CONCEPTS.

48

SOME DATA ON THE RELIABILITY OF INSTRUMENTS IN THE CHEMICAL
PLANT ENVIRONMENT

ANYAKORA, S.N.; ENGLE, G.F.M.; LEES, F.P.

711101

INSTITUTION OF CHEMICAL ENGINEERS

LEICESTER UNIV. OF TECHNOLOGY

CHEM. ENG. (NOV.):390-402.

C,1;C,9;P,1;P,9

THE APPLICATION OF THE TECHNIQUES OF RELIABILITY ENGINEERING TO CHEMICAL PROCESS INSTRUMENT AND CONTROL SYSTEMS REQUIRES DATA ON THE FAILURE RATES OF THE INSTRUMENTS IN THE PLANT ENVIRONMENT. FAILURE RATE DATA ARE GIVEN FOR SOME 9500 INSTRUMENTS IN CHEMICAL WORKS. FAILURES ARE VERY DEPENDENT ON ENVIRONMENT, THE BEST ENVIRONMENT BEING LOCATION IN THE CONTROL ROOM AND THE WORST LOCATION ON THE PLANT IN DIRECT CONTACT WITH AGGRESSIVE PROCESS MATERIALS. FAILURE RATES FOR INSTRUMENTS IN

THESE TWO EXTREMES OF ENVIRONMENT APPEAR TO DIFFER BY A FACTOR OF ABOUT FOUR.

49

MONTE CARLO SIMULATION OF TURBULENT ATMOSPHERIC TRANSPORT
AND COMPARISONS WITH EXPERIMENTAL DATA

ALSMILLER, F.S.; ALSMILLER, R.G., JR.; BERTINI, H.W.; BEGOVICH,
C.L.

790101

AMERICAN METEOROLOGICAL SOCIETY

OAK RIDGE NATIONAL LABORATORY

J. APPL. METEOROL. 18(1):17-26.

C,5

IN A PREVIOUS PAPER PETERSON PRESENTED MEASUREMENTS OF AR-41 BEING EMITTED CONTINUOUSLY INTO THE ATMOSPHERE FROM A REACTOR AT THE BROOKHAVEN NATIONAL LABORATORY. HERE, CALCULATED RESULTS OBTAINED WITH THE MONTE CARLO ATMOSPHERIC TRANSPORT MODEL OF WATSON AND BARR ARE PRESENTED AND COMPARED WITH THE EXPERIMENTAL DATA. THE MEASURED QUANTITIES WITH WHICH COMPARISONS ARE MADE ARE (1) THE POSITION NORTH OF BROOKHAVEN WHERE THE MAXIMUM AR-41 CONCENTRATION OCCURRED FOR SPECIFIC VALUES OF X (EAST OF BROOKHAVEN) AND T (TIME); (2) THE STANDARD DEVIATION OF THE AR-41 CONCENTRATION FOR SPECIFIC VALUES OF X AND T; AND (3) A QUANTITY THAT IS PROPORTIONAL TO THE MAXIMUM AR-41 CONCENTRATION FOR SPECIFIC VALUES OF X AND T. THE CALCULATED RESULTS ARE IN MODERATELY GOOD AGREEMENT WITH THE EXPERIMENTAL DATA AT MOST DISTANCES AND MOST TIMES FOR WHICH DATA ARE AVAILABLE.

50

AN OVERVIEW OF WASTE ISOLATION SAFETY ASSESSMENT METHODS
CONF-791103

BARTLETT, J.W.

791101

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ANALYTIC SCIENCES CORP.

TRANS. AM. NUCL. SOC. 33:380.

C,1;C,3;C,5;L,3;L,5

THIS SYMPOSIUM ON WASTE ISOLATION SAFETY EVALUATION METHODS ADDRESSES ONLY THE METHODS FOR ESTIMATING GEOLOGICAL DISPOSAL RISKS. THE PRESENT OBJECTIVE IS TO DESCRIBE THE CONCEPTS AND CONTENT INVOLVED IN THE METHOD DEVELOPMENT EFFORTS CURRENTLY UNDER WAY. THE PAPERS IN THIS SYMPOSIUM SHOULD THEREBY PROVIDE DESCRIPTIVE INFORMATION, A BASIS FOR COMPARATIVE ASSESSMENT OF THE ALTERNATIVE METHODS, AND A BASIS FOR INFORMED PARTICIPATION IN FUTURE ACTIVITIES CONCERNING IMPLEMENTATION OF THESE METHODS. AS BACKGROUND FOR THE PRESENTATIONS THAT FOLLOW, THIS PAPER PRESENTS A GENERIC DESCRIPTION OF THE TECHNICAL FACTORS TO BE CONSIDERED. IT ALSO PROVIDES A DESCRIPTION OF THE FUNCTIONAL

ROLE OF THE VARIOUS ELEMENTS OF THE MODELS. FINALLY, A CHECKLIST OF FACTORS RELEVANT TO EVALUATING THE CONTENT AND FUNCTIONAL CAPABILITY OF THE MODELS IS PROVIDED.

51

DEVELOPMENT AND TESTING OF LONG-TERM SAFETY ASSESSMENT
METHODOLOGY FOR GEOLOGIC WASTE REPOSITORIES

CONF-791103

BRANDSTETTER, A.

791101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

PACIFIC NORTHWEST LABORATORY

TRANS. AM. NUCL. SOC. 33:140.

C,2;C,5;C,6;C,7;L,2;L,5,8;L,6;L,7;L,9

THE REPORT FORM OF THIS PAPER IS PNL-SA-7872. IN THE PAST THREE YRS, THE WASTE ISOLATION ASSESSMENT PROGRAM (WISAP) HAS BEEN DEVELOPING METHODOLOGY FOR THE ASSESSMENT OF THE LONG-TERM SAFETY OF NUCLEAR WASTE STORAGE IN GEOLOGIC FORMATIONS. THE WORK IS BEING PERFORMED IN FOUR TECHNICAL TASKS: (1) RELEASE SCENARIO ANALYSIS, (2) WASTE FORM RELEASE RATE ANALYSIS, (3) RELEASE CONSEQUENCE ANALYSIS, (4) SORPTION/DESORPTION ANALYSIS. THIS YR, THE METHODOLOGY DEVELOPED BY ALL FOUR TASKS IS BEING TESTED WITH ACTUAL FIELD DATA FROM FOUR REFERENCE SITES INVOLVING DIFFERENT GEOLOGIES: THE WASTE ISOLATION PILOT PLANT (WIPP) BEDDED SALT SITE NEAR CARLSBAD, NM; A REFERENCE BEDDED SALT SITE IN THE PARADOX BASIN IN SOUTHEASTERN UTAH; A REFERENCE SALT DOME SITE NEAR HAINESVILLE IN NORTHEASTERN TEXAS; AND A REFERENCE BASALT SITE IN THE COLUMBIA PLATEAU IN EASTERN WASHINGTON. THE OVERALL OBJECTIVE OF THESE REFERENCE SITE INITIAL ANALYSES IS TO TEST THE METHODOLOGY FOR DIFFERENT GEOLOGIES AND TO IMPROVE THE EFFICIENCY, DEFENSIBILITY, AND CREDIBILITY OF THE METHODOLOGY. THIS WILL ASSURE THAT MORE COMPLETE SITE-SPECIFIC ANALYSES CAN BE PERFORMED TO THE DEPTH REQUIRED WHEN NEEDED FOR SITE SELECTION AND LICENSING.

52

CONTRIBUTIONS TO THE RISK EVALUATION OF A HIGH-LEVEL WASTE
SOLIDIFICATION PLANT

BRUECHER, H.

770601

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

KFA-JUELICH

TRANS. AM. NUCL. SOC. 26:270-271.

L,1;L,5,B;L,5,D;L,6;L,7;L,0,B;L,0,D

IN THE RANGE OF THE SYSTEM STUDY "RADIOACTIVE WASTE IN THE FEDERAL REPUBLIC OF GERMANY," AN ANALYSIS WAS MADE DEALING WITH THE RISK OF A PLANT FOR VITRIFICATION OF HIGH-LEVEL LIQUID WASTE CONCENTRATE. THE ANALYSIS IS PART OF A COMPREHENSIVE RISK-ANALYTICAL INVESTIGATION OF IMPORTANT POINTS OF THE WASTE

MANAGEMENT SYSTEM. THE RESULTS SHOW THAT RISK ANALYSIS IS ALREADY EFFECTIVELY APPLICABLE IN THE PLANNING PHASE: ERRORS IN DESIGN CAN BE AVOIDED AND GREATER RISKS CAN BE REDUCED BY APPROPRIATE COUNTERMEASURES.

53
CONTRIBUTIONS TO THE RISK EVALUATION OF A HIGH-LEVEL WASTE
SOLIDIFICATION PLANT

BRUECHER, H.
780101
AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
KFA-JUELICH
NUCL. TECHNOL. 39:25-29.
C,2;L,2;L,3;L,4,A;L,4,C;L,5,B;L,5,D;L,6

AN ANALYSIS HAS BEEN MADE DEALING WITH THE EVALUATION OF RISK OF A HIGH-LEVEL WASTE SOLIDIFICATION PLANT. FAULT-TREE METHODOLOGY WAS USED TO IDENTIFY ALL POSSIBLE ACCIDENTS AND TO EVALUATE THEIR PROBABILITY OF OCCURRENCE. THE ANALYSIS SHOWS THAT WITH REGARD TO RISK, THE MOST IMPORTANT ACCIDENTS OCCUR DURING OFF-GAS CLEANING. FURTHERMORE, THE ROUTINE RISK IS OF THE SAME ORDER OF MAGNITUDE OR GREATER THAN MOST IMPORTANT ACCIDENT RISKS.

54
REVIEW OF ISSUES RELEVANT TO ACCEPTABLE RISK CRITERIA FOR
NUCLEAR WASTE MANAGEMENT

CONF-780316
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LAWRENCE LIVERMORE LABORATORY
WASTE MANAGEMENT FUEL CYCLES '78, PP. 175-187.
L,3;L,4;L,5;L,8;N,3;N,4;N,5;N,8

THE REPORT FORM OF THIS PAPER IS UCRL-80793. DEVELOPMENT OF ACCEPTABLE RISK CRITERIA FOR NUCLEAR WASTE MANAGEMENT REQUIRES THE TRANSLATION OF PUBLICLY DETERMINED GOALS AND OBJECTIVES INTO DEFINITIVE ISSUES WHICH, IN TURN, REQUIRE RESOLUTION. SINCE THESE ISSUES ARE LARGELY OF A SUBJECTIVE NATURE, THEY CANNOT BE RESOLVED BY TECHNOLOGICAL METHODS. DEVELOPMENT OF ACCEPTABLE RISK CRITERIA MIGHT BEST BE ACCOMPLISHED BY APPLICATION OF A SYSTEMATIC METHODOLOGY FOR THE OPTIMAL IMPLEMENTATION OF SUBJECTIVE VALUES. MULTI-ATTRIBUTE DECISION ANALYSIS IS WELL SUITED FOR THIS PURPOSE.

55
ANALYSIS, CRITIQUE, AND REEVALUATION OF HIGH-LEVEL WASTE
REPOSITORY WATER INTRUSION SCENARIO STUDIES

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NUCL. TECHNOL. 48:63-69.

L,5,B

THE SEVERAL WATER INTRUSION SCENARIO STUDIES IN THE RECENT LITERATURE ARE ALL QUITE SIMILAR AND MAY BE EASILY UNDERSTOOD IF USED TO ESTIMATE THE TOTAL NUMBER OF EVENTUAL CANCERS PER UNIT OF ENERGY GENERATED. HOWEVER, THESE STUDIES ARE GROSSLY OVER PESSIMISTIC IN SEVERAL ASPECTS OF THE PROBLEM, ESPECIALLY IN USING LEACH RATE DATA FROM HIGHLY UNREALISTIC EXPERIMENTAL SITUATIONS, AND IN IGNORING GEOCHEMICAL CONSIDERATIONS IN BOTH LEACHING AND TRANSPORT. IT IS CONCLUDED THAT IT IS REASONABLE TO EXPECT REMOVAL AND TRANSPORT FOR AN ATOM OF BURIED WASTE TO BE SIMILAR TO THAT FOR AN ATOM OF AVERAGE ROCK. UNDER THAT ASSUMPTION, THE LEACH RATE CAN BE ESTIMATED FROM THE CHEMICAL COMPOSITIONS OF ROCK AND OF GROUNDWATER, COUPLED WITH THE WATER FLOW THROUGH AQUIFERS. THE RESULT (EXCLUDING U-238) IS 0.0008 EVENTUAL CANCER/GW(ELECTRIC)-YR. THIS TREATMENT WOULD BE INVALIDATED IF THE WASTE WERE RELEASED THROUGH FRACTURES IN THE ROCK INDUCED BY THE EMPLACEMENT OPERATIONS OR BY HEAT. IF SUCH FRACTURES CANNOT BE DISCOUNTED, TOTAL RELIANCE MUST BE ON LEACH RESISTANCE.

56

A GENERIC HAZARD EVALUATION OF LOW-LEVEL WASTE BURIAL
GROUNDS

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NUCL. TECHNOL. 41:380-388.

N,3,B;N,5,B;N,6

THE HAZARDS FROM BURIED LOW-LEVEL RADIOACTIVE WASTE ARE GENERICALLY EVALUATED UNDER CONSERVATIVE ASSUMPTIONS. IT IS ASSUMED THAT TRANSPORT MECHANISMS DISPERSE THE MATERIAL RANDOMLY THROUGH THE SOIL AT AN EARLY TIME, THUS BYPASSING ALL QUESTIONS OF TRANSPORT THROUGH SOIL, HYDROLOGY, HOLDUP PROCESSES, ETC. IN CONVENTIONAL EVALUATIONS. THE TRANSFER RATE FROM SOIL TO HUMAN INGESTION IS TAKEN TO BE EQUAL TO THAT RATE FOR NATURALLY OCCURRING ISOTOPES OF THE SAME ELEMENT, OBTAINED FROM THE DAILY INGESTION INTAKES OF REFERENCE MAN AND GEOCHEMICAL ABUNDANCES IN SEDIMENTS. DATA ARE CONVERTED INTO THE EXPECTED NUMBER OF CANCERS BY USE OF THE BEIR REPORT. THE INHALATION PATHWAY IS TREATED BY ASSUMING THE COMPOSITION OF AIRBORNE DUST TO BE THE SAME AS THAT OF THE SOIL, INCLUDING THE RANDOMLY DISPERSED RADIOACTIVE MATERIAL. THE EFFECTS OF A POSSIBLE RELEASE INTO RIVERS ARE ESTIMATED BY ASSUMING THAT THE PROBABILITY OF RADIOACTIVE MATERIAL GETTING INTO DRINKING WATER IS EQUAL TO

THAT FOR OTHER MATERIALS IN RIVERS. WHEN THE RESULTS ARE APPLIED TO THE INVENTORY AT THE MAXY FLATS BURIAL GROUND AND REASONABLE ASSUMPTIONS ARE MADE ABOUT POORLY IDENTIFIED MATERIALS, IT IS FOUND THAT THE TOTAL NUMBER OF EVENTUAL CANCERS EXPECTED OVER THE NEXT 10 MILLION YRS IS LESS THAN ONE.

57

FAULT TREE ANALYSIS WITH PROBABILITY EVALUATION

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IEEE TRANS. NUCL. SCI. NS18:465-471.

C,2;C,3

RELIABILITY ANALYSIS IS PLAYING AN INCREASINGLY IMPORTANT ROLE IN QUANTITATIVE ASSESSMENT OF SYSTEM PERFORMANCE FOR ASSURING NUCLEAR SAFETY, IMPROVING PLANT PERFORMANCE PLANT LIFE, AND REDUCING PLANT OPERATING COSTS. IN PARTICULAR, FAULT TREE ANALYSIS WITH PROBABILITY EVALUATION PROVIDES AN ALL INCLUSIVE, VERSATILE MATHEMATICAL TOOL FOR ANALYZING COMPLEX SYSTEMS. ITS APPLICATION CAN INCLUDE A COMPLETE PLANT AS WELL AS ANY OF THE SYSTEMS AND SUBSYSTEMS. FAULT TREE ANALYSIS PROVIDES AN OBJECTIVE BASIS FOR ANALYZING SYSTEM DESIGN, PERFORMING TRADE-OFF STUDIES, ANALYZING COMMON MODE FAILURES, DEMONSTRATING COMPLIANCE WITH AEC REQUIREMENTS, AND JUSTIFYING SYSTEM CHANGES OR ADDITIONS. THE LOGIC OF THE APPROACH MAKES IT READILY UNDERSTANDABLE, AND IT THEREFORE SERVES AS AN EFFECTIVE VISIBILITY TOOL FOR BOTH ENGINEERING AND MANAGEMENT.

59

THE ASSESSMENT OF RISK - ITS VALUE AND LIMITATIONS

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HEALTH AND SAFETY EXECUTIVE, LONDON

NUCL. ENG. INT. 24(289):23-25.

C,3;C,4;C,5

QUANTITATIVE RA MAY, IN THE SHORT TERM, MAKE PUBLIC ACCEPTANCE OF CERTAIN NUCLEAR INSTALLATIONS MORE DIFFICULT TO ACHIEVE. IT IS BELIEVED THAT IN THE LONG TERM, HOWEVER, SUCH ASSESSMENTS WILL ENCOURAGE PUBLIC ACCEPTANCE. INDUSTRY SHOULD DO MORE TO DEFEND ITS OWN SAFETY STANDARDS, WHILE AVOIDING OVER-CONFIDENCE.

60

ENVIRONMENTAL ASPECTS OF HIGH-LEVEL RADIOACTIVE WASTE
DISPOSAL IN DEEP GEOLOGIC FORMATIONS

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TRANS. AM. NUC. SOC. 28:81-82.

L,1;L,4;L,5;L,6;L,7

THE DEVELOPMENT OF A WASTE REPOSITORY WILL INEVITABLY RESULT IN SOME ENVIRONMENTAL IMPACTS. THE NATURE AND MAGNITUDE OF THESE IMPACTS WILL DEPEND ON THE SPECIFIC USES TO BE MADE OF THE REPOSITORY, THE DESIGN FEATURES OF THE FACILITY, AND THE NATURAL SETTING OF THE SITE AND SURROUNDING AREA. IN ITS MOST SIMPLISTIC REPRESENTATION, A REPOSITORY WILL POSE IMPACTS TYPICAL OF A SIZEABLE DEEP-MINE-TYPE COMPLEX. ITS PLACEMENT AND OPERATION WILL INVOLVE AN ACCOMMODATION BY THE ABSORBING COMMUNITY'S HUMAN AND INDUSTRIAL ACTIVITIES. LOCAL NATURAL AND HUMAN RESOURCES WILL BE DRAWN ON TO CREATE AND OPERATE THE NEW ENTITY. BOTH THE ECONOMIC AND SOCIAL ENVIRONMENTS OF THE LOCALE OF THE REPOSITORY WILL BE AFFECTED. TO A LESSER EXTENT, REGIONAL INFLUENCES MAY BE FELT. THE EXTENT OF THESE SOCIOECONOMIC EFFECTS WILL DEPEND GREATLY ON EXISTING CONDITIONS IN THE AREA WHERE A REPOSITORY IS LOCATED. ONE OF THE MANY DIFFICULTIES IMPOSED ON MAKING SUCH ASSESSMENTS REALISTIC IS THE UNKNOWN NATURE OF FUTURE POPULATION DISTRIBUTIONS AND HABITS (E.G., WITH RESPECT TO FOOD AND WATER PRODUCTION, PROCESSING AND DISTRIBUTION, BIOMEDICAL TECHNOLOGY, ETC.). AN APPROACH IS TO CONSIDER A RANGE OF IMPACTS BY USING CURRENT DEMOGRAPHIC DATA AS A REFERENCE OF BASE CASE AND IMPOSING A RANGE OF ALTERNATIVE FUTURE HUMAN CONDITIONS TO ESTIMATE THE VARIATIONS THAT MIGHT RESULT.

61

RISK OF SHIPPING SPENT FUEL IN THE U.S.

CONF-7811109

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TRANS. AM. NUCL. SOC. 30:319-320.

C,1;C,2;C,3,B;C,4,B;C,5,B;C,9;O,1;O,2;O,3,B;O,4,B;O,5,B;O,6;O,8,
B;C,9;O,0,B

SPENT NUCLEAR FUEL WILL BE SHIPPED FROM LWRs TO STORAGE FACILITIES AT AN INCREASING RATE STARTING IN THE 1980'S. THIS PAPER PRESENTS PRELIMINARY RESULTS OF STUDIES PERFORMED AT PNL TO ASSESS THE RISK OF TRANSPORTING SPENT FUEL BY TRUCK AND TRAIN. THE RA METHODOLOGY DEVELOPED IN THIS PROGRAM WAS ORIGINALLY APPLIED TO THE TRANSPORTATION OF PU BY TRUCK AND HAS SUBSEQUENTLY BEEN APPLIED TO OTHER ENERGY MATERIALS. THE RA METHODOLOGY CONSISTS OF 4 BASIC STEPS: (1) A DESCRIPTION OF THE SYSTEM BEING ANALYZED, (2) IDENTIFICATION OF SEQUENCES OF EVENTS THAT COULD LEAD TO A RELEASE OF MATERIAL DURING TRANSPORTATION,

(3) EVALUATION OF THE PROBABILITY AND CONSEQUENCE OF EACH RELEASE SEQUENCE, AND (4) ASSESSMENT OF THE RISK AND EVALUATION OF THE RESULTS. SEE ALSO PNL-2588 AND PNL-2682 (ACN=9 AND 10).

62

PROBABILISTIC SAFETY ANALYSIS OF FUEL CYCLE

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TRANS. AM. NUCL. SOC. 22:797.
C,1;C,2;C,3;C,4;C,5;C,7

THE INTENT OF THIS REVIEW IS TO INDICATE HOW THE METHODS OF PROBABILISTIC SAFETY CAN BE APPLIED TO THE ANALYSIS OF POTENTIAL ACCIDENTS IN THE NUCLEAR FUEL CYCLE, EXCLUDING REACTORS. THERE HAS BEEN CONSIDERABLE EFFORT SPENT IN ANALYZING SELECTED ASPECTS OF THE FUEL CYCLE FROM A PROBABILITY VIEWPOINT, BUT THERE HAS BEEN LITTLE WORK DONE TO ANALYZE THE COMPLETE CYCLE WITH THE INTENT OF EITHER BALANCING THE RISKS FROM THE VARIOUS COMPONENTS OR QUANTIFYING THE TOTAL RISK. NUCLEAR REACTORS CONTAIN LARGE AMOUNTS OF STORED ENERGY WHICH, IF UNCONTROLLED, DRIVES THE ACCIDENT AND PROVIDES THE DISPERSAL MECHANISM IN THE MUCH-STUDIED BLOWDOWN ACCIDENTS. THE OTHER PARTS OF THE FUEL CYCLE DO NOT HAVE THIS STORED ENERGY, AND OTHER MECHANISMS SUCH AS CRITICALITY, FIRE, UNCONTROLLED CHEMICAL REACTIONS, TRANSPORTATION COLLISIONS, AND LONG-TERM FISSION PRODUCT MOTION REQUIRE CAREFUL INVESTIGATION. FROM THE STUDIES DONE TO DATE, IT APPEARS THAT THE FUEL CYCLE CAN AND IS BEING DEVELOPED IN A SAFE WAY. HOWEVER, IT IS UNCLEAR AT PRESENT HOW THE DOMINANT CONTRIBUTORS TO FUEL CYCLE RISK ARE DISTRIBUTED AMONG THE CONSTITUENT PARTS.

63

PRELIMINARY ACCIDENT RADIOLOGICAL RISK ASSESMENT OF A
LARGE COMMERCIAL MOX FUEL FABRICATION PLANT

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TRANS. AM. NUCL. SOC. 26:268.
1,3;1,4,A;1,5,B;1,7;1,0,A;1,0,B

A CONSIDERATION IN IMPLEMENTING THE MIXED-OXIDE (MOX) FUEL CYCLE IS THE INCREMENTAL PUBLIC RISK IT IMPOSES. AN IMPORTANT STEP IN THIS CYCLE IS THE FABRICATION OF THE FUEL. THE REFERENCE PLANT SELECTED FOR A RA IS THE WESTINGHOUSE ANDERSON PLANT IN LICENCE REVIEW. WHEN OPERATIONAL, THIS PLANT WILL HAVE A CAPACITY OF 200 MT/YR AND FEATURES REMOTE OPERATION THROUGH THE EXTENSIVE USE OF AIR TRANSFER OF POWDERS AND CONVEYOR-BELT BOAT

TRANSFERS,

64

LONG-TERM RISK ASSESSMENT OF RADIOACTIVE WASTE DISPOSAL IN
GEOLOGICAL FORMATIONS

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TRANS. AM. NUCL. SOC. 26:275-277.

C,1;C,2;C,3;C,5;L,1,B;L,2,B;L,3,B;L,5,B

METHODS FOR LONG TERM SAFETY ANALYSIS OF WASTE FROM NUCLEAR
POWER PRODUCTION IN THE EUROPEAN COMMUNITY ARE UNDER STUDY. THE
METHODOLOGY IS BASED ON THE ASSESSMENT OF THE QUANTITATIVE VALUE
OF A SYSTEM OF BARRIERS WHICH MAY BE INTERPOSED BETWEEN WASTE
AND MAN. THE RESULTS OBTAINED, ALTHOUGH OF NO VALUE FOR DIRECT
RISK EVALUATION, SINCE THEY WERE OBTAINED ON IDEALIZED
SITUATIONS, HAVE ALLOWED THE IDENTIFICATION OF VARIOUS AREAS
WHERE EXPERIMENTAL WORK SHOULD BE FOCUSED. AMONG THEM, THE
PROBLEMS CONNECTED WITH THE MANAGEMENT OF LOW-LEVEL
ALPHA-BEARING WASTE SHOULD BE STUDIED WITH HIGH PRIORITY.

65

SOME ASPECTS AND LONG-TERM PROBLEMS OF HIGH-LEVEL AND
ACTINIDE-CONTAMINATED SPENT FUEL REPROCESSING WASTES
FROM THE U-PU AND TH-U FUEL CYCLES

STI/PUB/433, VOL. 2; CONF-760310

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IAEA, VIENNA

GESELLSCHAFT FUER KERNFORSCHUNG MBH, KARLSRUHE

MANAGEMENT OF RADIOACTIVE WASTE, VOL. 2, PP. 233-241.

L,1;L,2;L,9;N,1;N,2;N,9

A COMPARISON IS MADE OF THE LONG-TERM RADIOTOXICITY OF
DIFFERENT HIGH-LEVEL AND ACTINIDE-CONTAINING WASTES FROM NUCLEAR
FUEL REPROCESSING AND OF NATURALLY OCCURRING RADIOACTIVE
MATERIALS. THE RADIOTOXICITY OF THE RADIONUCLIDE INVENTORY IN
SOLID OR SOLIDIFIED WASTES FIXED IN A PRACTICABLE INSOLUBLE
MATRIX IS COMPARED WITH THE RADIOTOXICITY OF THE NUCLIDE
INVENTORY OF THE SAME AMOUNT OF URANIUM ORES (0.2 WT% U), WHICH
CONSEQUENTLY ALLOWED THE DEFINITION OF A RELATIVE TOXICITY
INDEX. THE COMPARISON IS EXTENDED TO HIGH-LEVEL WASTE DISPOSED
OF IN SINGLE BORE HOLES IN DEEP GEOLOGICAL FORMATIONS. THE
RESULTS INDICATE THAT AFTER ABOUT 1000 YRS OF DECAY THE
RADIOTOXICITY OF THE CONTROLLING ACTINIDES IN THE TOTAL VOLUME
OF THE HIGH-LEVEL WASTE DISPOSAL LAYER WILL NOT BE HIGHER THAN
THE RADIOTOXICITY OF THE SAME AMOUNT OF A LOW GRADE URANIUM ORE
DEPOSIT CONTAINING 0.2 WT% U. THE CONCENTRATION LIMITATIONS MET
BY SIMILAR DISPOSAL CONDITIONS FOR OTHER ACTINIDE-CONTAINING

WASTES.

66

COMPUTER CODES FOR THE ASSESSMENT OF RADIONUCLIDES RELEASED
TO THE ENVIRONMENT

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NUCL. SAF. 18(3):343-354.

C,3;C,5;L,3;L,5;N,3;N,5

A COMPILATION OF COMPUTER CODES THAT MAY BE USED FOR THE ASSESSMENT OF ACCIDENTAL OR ROUTINE RELEASES OF RADIOACTIVITY TO THE ENVIRONMENT FROM NUCLEAR POWER FACILITIES IS PRESENTED. THE CAPABILITIES OF 83 COMPUTER CODES IN THE AREAS OF ENVIRONMENTAL TRANSPORT AND RADIATION DOSIMETRY ARE SUMMARIZED IN TABULAR FORM. THIS PRELIMINARY ANALYSIS CLEARLY INDICATES THAT THE INITIAL EFFORTS IN ASSESSMENT METHODOLOGY DEVELOPMENT HAVE CONCENTRATED ON ATMOSPHERIC DISPERSION, EXTERNAL DOSIMETRY, AND INTERNAL DOSIMETRY VIA INHALATION. THE INCORPORATION OF TERRESTRIAL AND AQUATIC FOOD-CHAIN PATHWAYS HAS BEEN A MORE RECENT DEVELOPMENT AND REFLECTS THE NEED FOR SATISFYING THE CURRENT REQUIREMENTS OF ENVIRONMENTAL LEGISLATION AND THE NEEDS OF REGULATORY AGENCIES. THE CHARACTERISTICS OF THE CONCEPTUAL MODELS EMPLOYED BY THESE CODES ARE REVIEWED.

67

AN APPROACH TO SENSITIVITY ANALYSIS OF COMPUTER MODELS: PT.
1. INTRODUCTION, INPUT VARIABLE SELECTION AND
PRELIMINARY VARIABLE ASSESSMENT

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J. QUAL. TECHNOL. 13(3):174-183.

C,3;C,8;L,3;L,6;L,7;L,8

PT. 1 DEFINES THE OBJECTIVES OF SENSITIVITY ANALYSIS AND PRESENTS A COMPUTER MODEL THAT IS USED FOR PURPOSES OF ILLUSTRATION IN THE PAPER. A DISCUSSION OF THE NECESSARY CONSIDERATIONS FOR SELECTION OF SAMPLE VALUES OF VARIABLES USED AS INPUT TO THE MODEL IS GIVEN. DETAILS ARE GIVEN FOR THE IDENTIFICATION OF IMPORTANT VARIABLES WHEN THE COMPUTER OUTPUT VARIES WITH TIME AND WHEN ALL INPUT VARIABLES HAVE BEEN VARIED SIMULTANEOUSLY. FOR THIS LATTER TOPIC THE IMPORTANCE OF CONSIDERING DATA TRANSFORMATION IS EXPLAINED.

68

AN APPROACH TO SENSITIVITY ANALYSIS OF COMPUTER MODELS: PT.
2. RANKING OF INPUT VARIABLES, RESPONSE SURFACE
VALIDATION, DISTRIBUTION EFFECTS AND TECHNIQUE
SYNOPSIS

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J. QUAL. TECHNOL. 13(4):232-240.

C,8;L,2;L,5;L,6;L,8

PT. 2 GIVES CONSIDERATION TO RESPONSE SURFACE CONSTRUCTION
TECHNIQUES INCLUDING IDENTIFICATION OF POSSIBLE OVERFIT AND DATA
TRANSFORMATION TO HANDLE NONLINEARITIES. METHODS FOR RESPONSE
SURFACE VALIDATION ARE PRESENTED AS IS A SUMMARY OF THE
SENSITIVITY ANALYSIS APPROACH CONTAINED IN THIS PAPER.

69

ON ASSESSING THE LONG-TERM INTEGRITY OF NUCLEAR WASTE
REPOSITORIES

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TRANS. AM. NUCL. SOC. 33:383.

C,1;C,2;C,3;C,5;C,6;C,7;L,1;L,2;L,3;L,5,B;L,5,D;L,6;L,7

A METHODOLOGY FOR ANALYZING MECHANISMS THAT COULD LEAD TO
THE RELEASE OF RADIONUCLIDES FROM DEEP GEOLOGIC REPOSITORIES AND
THEIR POSSIBLE TRANSPORT TO THE ACCESSIBLE BIOSPHERE HAS BEEN
DEVELOPED. GENERIC REPOSITORY PARAMETERS WERE CONSIDERED FOR
FIVE GEOLOGIC HOST MEDIA: BEDDED SALT, GRANITE, BASALT, SHALE,
AND SALT DOMES. IN ALL CASES THE REPOSITORY WAS overlain BY AN
AQUIFER; IN CASES OF BEDDED SALT, BASALT AND SHALE THERE WAS
ALSO AN AQUIFER LAYER BELOW THE REPOSITORY.

70

ON THE USE OF A BAYESIAN REASONING IN SAFETY AND
RELIABILITY DECISIONS - THREE EXAMPLES

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NUCL. TECHNOL. 44(2):231-245.

C,3;C,5;C,6;C,0;D,3;D,9;D,0

BAYES' THEOREM IS USED TO QUANTIFY THE IMPACT OF NEW
EVIDENCE IN THREE ENERGY-RELATED DECISION PROBLEMS. THE FIRST
PROBLEM CONCERNS THE RISK OF RADIOACTIVITY RELEASE DURING
RAILROAD TRANSPORT OF SPENT NUCLEAR FUEL. THIS HISTORY OF

SHIPMENTS THUS FAR IS SHOWN TO MAKE IT HIGHLY UNLIKELY THAT THE FREQUENCY OF RELEASE IS ON THE ORDER OF 10 TO THE MINUS 3 OR GREATER PER SHIPMENT. THE SECOND AND THIRD APPLICATIONS INVOLVE PREDICTING THE AVAILABILITY PERFORMANCE OF NEW GENERATIONS OF TURBINE BLADES. BAYES' THEOREM IS DEMONSTRATED AS A MEANS FOR INCORPORATING IN THE PREDICTION THE LIMITED OPERATIONAL DATA ON THE NEW BLADES ALONG WITH THE EXPERIENCE OF THE EARLIER GENERATION AND THE KNOWLEDGE OF THE DESIGN CHANGES.

71

USE OF PRA IN EVALUATING SAFETY OF NUCLEAR POWER

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APPLIED SCIENCE PUBLISHERS, LTD, ENGLAND

GENERAL ATOMIC CO.

RELIAB. ENG. 1:69-78.

C,3;C,4;C,5

THIS PAPER OFFERS AN OVERVIEW OF USES AND LIMITATIONS OF PROBABILISTIC RISK ASSESSMENT (PRA) TECHNIQUES IN EVALUATING SAFETY OF NUCLEAR POWER IN THE U.S. AS SEEN AND EXPERIENCED BY THE AUTHORS. IT DISCUSSES SUBJECTS LIKE PRA CONTRIBUTIONS TO THE DEFENSE-IN-DEPTH PHILOSOPHY ADOPTED IN THE U.S. MANY YRS AGO FOR LICENSING NUCLEAR POWER PLANTS, NEEDS TO EXPAND ITS PRESENT ROLE, PRESENT PITFALLS, THE THREE MILE ISLAND ACCIDENT SEQUENCE, RETROSPECTIVE AND PROSPECTIVE SAFETY IMPROVEMENTS, QUANTITATIVE SAFETY GOALS AND THE NUCLEAR FUEL CYCLE.

72

RISKS AND CONSEQUENCES IN ENERGY PRODUCTION

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INTERLIDIP. SCI. REV. 5(4):304-311.

C,3;C,4;C,5;P,3;P,4;P,5

THE WORD RISK IS OFTEN USED IN ASSOCIATION WITH ENERGY PRODUCTION AND IN SOME CASES IT IS EQUATED WITH CONSEQUENCES. THE DISTINCTION IS IMPORTANT AND HAS IMPLICATIONS FOR THE STUDY OF ENERGY SYSTEMS. FAILURE IN A GIVEN ENERGY SYSTEM, SUCH AS NUCLEAR POWER OR HYDROELECTRIC DAMS, CAN GIVE RISE TO HUMAN CONSEQUENCES, SUCH AS DEATHS, INJURIES OR DISEASE. THE EXTENT OF THESE CONSEQUENCES VARIES FROM ONE SYSTEM TO ANOTHER. FURTHERMORE, THE PROBABILITY OF SUCH FAILURES IS A CHARACTERISTIC OF THE GIVEN SYSTEM. FOR EXAMPLE, A NUCLEAR REACTOR OR HYDROELECTRIC DAM MAY HAVE A PROBABILITY OF ONE CATASTROPHIC FAILURE IN X YRS OF OPERATION, WHERE X IS A LARGE NUMBER. THE PROBABILITY MULTIPLIED BY THE NUMBER OF DEATHS, INJURIES AND ILLNESSES CAUSED BY THE FAILURES = THE CONSEQUENCES

- CAN BE TAKEN AS A MEASURE OF THE RISK, OR RISK INDEX.

73

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE - REPROCESSING LIGHT-WATER REACTOR FUEL

ORNL/NUREG/TM-6

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OAK RIDGE NATIONAL LABORATORY

J,1;J,2,B;J,2,D;J,5,B;J,5,D;J,6

A COST/BENEFIT STUDY WAS MADE TO DETERMINE THE COST AND EFFECTIVENESS OF RADIOACTIVE WASTE TREATMENT SYSTEMS FOR DECREASING THE RELEASE OF RADIOACTIVE MATERIALS FROM A MODEL NUCLEAR FUEL REPROCESSING PLANT WHICH PROCESSES LIGHT-WATER REACTOR (LWR) FUELS AND THEN DETERMINE THE RADIOLOGICAL IMPACT (DOSE COMMITMENT) OF THE RELEASED MATERIALS ON THE ENVIRONMENT. THE STUDY IS DESIGNED TO ASSIST IN DEFINING THE TERM "AS LOW AS REASONABLY ACHIEVABLE" IN RELATION TO LIMITING THE RELEASE OF RADIOACTIVE MATERIALS FROM NUCLEAR FACILITIES. THE BASE CASE MODEL PLANT IS REPRESENTATIVE OF CURRENT PLANT TECHNOLOGY AND HAS AN ANNUAL CAPACITY OF 1500 METRIC TONS OF LWR FUEL. ADDITIONAL RADWASTE TREATMENT SYSTEMS ARE ADDED TO THE BASE CASE PLANT IN A SERIES OF CASE STUDIES TO DECREASE THE AMOUNTS OF RADIOACTIVE MATERIALS RELEASED AND TO REDUCE THE RADIOLOGICAL DOSE COMMITMENT TO THE POPULATION IN THE SURROUNDING AREA. THE COST FOR THE ADDED WASTE TREATMENT OPERATIONS AND THE CORRESPONDING DOSE COMMITMENTS ARE CALCULATED FOR EACH CASE. IN THE FINAL ANALYSIS, RADIOLOGICAL DOSE IS PLOTTED VS THE ANNUAL COST FOR TREATMENT OF THE RADWASTES. THE STATUS OF THE RADWASTE TREATMENT METHODS USED IN THE CASE STUDIES IS DISCUSSED. MUCH OF THE TECHNOLOGY USED IN THE ADVANCED CASES IS IN AN EARLY STAGE OF DEVELOPMENT AND IS NOT SUITABLE FOR IMMEDIATE USE. THE METHODOLOGY USED IN ESTIMATING THE COSTS, AND THE RADIOLOGICAL DOSES, DETAILED CALCULATIONS, AND TABULATIONS ARE PRESENTED IN APPENDIX A AND ORNL-4992 (ACN=189). THIS REPORT IS A REV. OF THE ORIGINAL STUDY (ORNL/TM-4901).

74

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE FOR USE IN ESTABLISHING "AS LOW AS PRACTICABLE" GUIDES - MINING OF URANIUM ORES

ORNL-TM-4903, VOL. 1

SEARS, M.B.; BLANCO, R.E.; DAHLMAN, R.C.; HILL, G.S.; RYON, A.D.; WITHERSPOON, J.P.

750101

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN. 291 P.

OAK RIDGE NATIONAL LABORATORY

E,1,E,3,D;E,3,H;E,5,D;E,5,H;E,7,D;E,7,H;E,9,D;E,9,H; E,0,D;E,0,H

A COST-BENEFIT STUDY WAS MADE TO DETERMINE THE COST AND EFFECTIVENESS OF RADIOACTIVE WASTE TREATMENT SYSTEMS FOR DECREASING THE RELEASE OF RADIOACTIVE MATERIALS FROM MODEL URANIUM ORE PROCESSING MILLS, AND TO DETERMINE THE RADIOLOGICAL IMPACT (DOSE COMMITMENT) OF THE RELEASED MATERIALS ON THE ENVIRONMENT. THE STUDY IS DESIGNED TO ASSIST IN DEFINING THE TERM "AS LOW AS PRACTICABLE" IN RELATION TO LIMITING THE RELEASE OF RADIOACTIVE MATERIALS FROM NUCLEAR FACILITIES. THE BASE CASE MODEL MILLS ARE REPRESENTATIVE OF MILLS WHICH WILL PROCESS A MAJOR FRACTION OF THE ORE IN THE NEXT 20 YRS. EACH MILL PROCESSES 2,000 SHORT TONS OF ORE PER DAY. ADDITIONAL RADWASTE TREATMENT TECHNIQUES ARE APPLIED TO THE BASE CASE MILL AND THE WASTE TAILINGS AREA IN A SERIES OF CASE STUDIES TO DECREASE THE AMOUNTS OF RADIOACTIVE MATERIALS RELEASED AND TO REDUCE THE RADIOLOGICAL DOSE COMMITMENT TO THE POPULATION IN THE SURROUNDING AREA. THE COST FOR THE ADDED WASTE TREATMENT OPERATIONS AND THE CORRESPONDING DOSE COMMITMENT ARE CALCULATED FOR EACH CASE. IN THE FINAL ANALYSIS, RADIOLOGICAL DOSE IS PLOTTED VS THE ANNUAL COST FOR TREATMENT OF THE RADWASTES. THE STATUS OF THE RADWASTE TREATMENT METHODS USED IN THE CASE STUDIES IS DISCUSSED. MUCH OF THE TECHNOLOGY USED IN THE ADVANCED CASES WILL REQUIRE DEVELOPMENT AND DEMONSTRATION AND IS NOT SUITABLE FOR IMMEDIATE USE.

75

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE FOR USE IN ESTABLISHING "AS LOW AS PRACTICABLE" GUIDES - APPENDIX A, PREPARATION OF COST ESTIMATES FOR VOLUME 1, MILLING OF URANIUM ORES

ORNL-TM-4903, VOL. 2

RYON, A.D.; BLANCO, R.E.

750101

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN. 255 P.

OAK RIDGE NATIONAL LABORATORY

E,1,E,2;E,5

THE METHODOLOGY USED IN ESTIMATING THE COSTS, DETAILED CALCULATIONS, AND TABULATIONS ARE PRESENTED IN VOL. 2. THE METHODOLOGY AND ASSUMPTIONS FOR THE RADIOLOGICAL DOSES ARE FOUND IN ORNL-4992 (ACN=189).

76

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE FOR USE IN ESTABLISHING "AS LOW AS PRACTICABLE" GUIDES - FABRICATION OF LIGHT-WATER REACTOR FUELS CONTAINING PLUTONIUM

ORNL-TM-4904

BLANCO, R.C.; GROENIER, W.S.; DAHLMAN, P.E.; FINNEY, B.C.;
KIBBEY, A.H.; WITHERSPOON, J.P.

750105

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN. 140 P.

OAK RIDGE NATIONAL LABORATORY

I,1;I,2;I,4,D;I,5,B;I,5,D;I,9;I,0,D

A COST-BENEFIT STUDY WAS MADE TO DETERMINE THE COST AND EFFECTIVENESS OF RADIOACTIVE WASTE TREATMENT SYSTEMS FOR DECREASING THE RELEASE OF RADIOACTIVE MATERIALS FROM A MODEL LIGHT-WATER PU RECYCLE REACTOR FUEL FABRICATION PLANT, AND TO DETERMINE THE RADIOLOGICAL IMPACT (DOSE COMMITMENT) OF THE RELEASED MATERIALS ON THE ENVIRONMENT. THE STUDY IS DESIGNED TO ASSIST IN DEFINING THE TERM "AS LOW AS PRACTICABLE" IN RELATION TO LIMITING THE RELEASE OF RADIOACTIVE MATERIALS FROM NUCLEAR FACILITIES. THE BASE CASE MODEL PLANT IS REPRESENTATIVE OF CURRENT PLANT TECHNOLOGY AND HAS AN ANNUAL CAPACITY OF 300 METRIC TONS OF LWR PU RECYCLE FUEL. ADDITIONAL RADWASTE TREATMENT EQUIPMENT IS ADDED TO THE BASE CASE PLANTS IN A SERIES OF CASE STUDIES TO DECREASE THE AMOUNTS OF RADIOACTIVE MATERIALS RELEASED AND TO REDUCE THE RADIOLOGICAL DOSE COMMITMENT TO THE POPULATION IN THE SURROUNDING AREA. THE COST FOR THE ADDED WASTE TREATMENT OPERATIONS AND THE CORRESPONDING DOSE COMMITMENT ARE CALCULATED FOR EACH CASE. IN THE FINAL ANALYSIS, RADIOLOGICAL DOSE IS PLOTTED VS THE ANNUAL COST FOR TREATMENT OF THE RADWASTES. THE STATUS OF THE RADWASTE TREATMENT METHODS USED IN THE CASE STUDIES IS DISCUSSED. SOME OF THE TECHNOLOGY USED IN THE ADVANCED CASES IS IN AN EARLY STAGE OF DEVELOPMENT AND IS NOT SUITABLE FOR IMMEDIATE USE. THE METHODOLOGY USED IN ESTIMATING THE COSTS AND THE RADIOLOGICAL DOSES, DETAILED CALCULATIONS, AND TABULATIONS ARE PRESENTED IN APPENDIXES A AND B.

77

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE - CONVERSION OF YELLOW CAKE TO URANIUM HEXAFLUORIDE. PT. 1. THE FLUORINATION-FRACTIONATION PROCESS

ORNL/NUREG-/TM-7

SEARS, M.B.; BLANCO, R.E.; FINNEY, B.C.; HILL, G.S.; MOORE, R.E.;
WITHERSPOON, J.P.

770101

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN. 305 P.

OAK RIDGE NATIONAL LABORATORY

F,1;F,3,D;F,5,D;F,9,D;F,0,D

A COST/BENEFIT STUDY WAS MADE TO DETERMINE THE COST AND EFFECTIVENESS OF RADIOACTIVE WASTE TREATMENT SYSTEMS FOR DECREASING THE RELEASE OF RADIOACTIVE MATERIALS AND CHEMICALS FROM A MODEL UF6 PRODUCTION PLANT USING THE FLUORINATION-FRACTIONATION PROCESS, AND TO EVALUATE THE

RADIOLOGICAL IMPACT OF THE RELEASED MATERIALS ON THE ENVIRONMENT. THIS STUDY IS DESIGNED TO ASSIST IN DEFINING THE TERM 'AS LOW AS IS REASONABLY' ACHIEVABLE (ALARA) IN RELATION TO LIMITING THE RELEASE OF RADIOACTIVE MATERIALS FROM NUCLEAR FACILITIES. THE MODEL PLANT PROCESSES 10,000 METRIC TONS OF U PER YR. BASE-CASE WASTE TREATMENT IS THE MINIMUM NECESSARY TO OPERATE THE PROCESS. EFFLUENTS MEET THE RADIOLOGICAL REQUIREMENTS LISTED IN CIO CFR 20 APPENDIX B, TABLE II, BUT MAY NOT BE ACCEPTABLE CHEMICALLY AT ALL SITES. ADDITIONAL RADWASTE TREATMENT TECHNIQUES ARE APPLIED TO THE BASE-CASE PLANT IN A SERIES OF CASE STUDIES TO DECREASE THE AMOUNTS OF RADIOACTIVE MATERIALS RELEASED AND TO REDUCE THE RADIOLOGICAL DOSE COMMITMENT TO THE POPULATION IN THE SURROUNDING AREA. THE COSTS FOR THE ADDED WASTE TREATMENT OPERATIONS AND THE CORRESPONDING DOSE COMMITMENT ARE CALCULATED FOR EACH CASE. IN THE FINAL ANALYSIS, RADIOLOGICAL DOSE IS PLOTTED VS THE ANNUAL COST FOR TREATMENT OF THE RADWASTES. THE STATUS OF THE RADWASTE TREATMENT METHODS USED IN THE CASE STUDIES IS DISCUSSED. MUCH OF THE TECHNOLOGY USED IN THE ADVANCED CASES WILL REQUIRE DEVELOPMENT AND DEMONSTRATION OR ELSE IS PROPRIETARY AND UNAVAILABLE FOR IMMEDIATE USE. THE METHODOLOGY AND ASSUMPTIONS FOR RADIOLOGICAL DOSES ARE FOUND IN ORNL-4992 (ACN=189).

78

USE OF RISK ASSESSMENT IN EVALUATING ISFSI DESIGN CRITERIA
CONF-790602
SARGENT, I.H.
790601

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
WESTEC SERVICES, INC., FT. WASHINGTON, PA
TRANS. AM. NUCL. SOC. 32:678-680.
C,7;L,3,B;L,3,D;L,5,B;L,5,D;M,2;M,4,A;M,4,B;M,7;M,0

THE STUDY PERFORMED WAS A COMPARATIVE RA TO DETERMINE AND DEPICT THE RANGE OF RISKS ASSOCIATED WITH EXTERNAL SOURCE DAMAGE TO AN INDEPENDENT SPENT-FUEL STORAGE INSTALLATION DESIGNED IN COMPLIANCE WITH THE PROPOSED DESIGN CRITERIA OF DRAFT STANDARD 57.7. IT CONSISTED OF SEVERAL PHASES WHICH ARE DISCUSSED BRIEFLY.

79

DISPOSAL OF NUCLEAR WASTES BY TRANSMUTATION

BLOEMKE, J.O.; CROFT, A.G.
810601

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
OAK RIDGE NATIONAL LABORATORY
TRANS. AM. NUCL. SOC. 38:88-89.

I,1;I,2;I,3;I,4,A;I,4,C;I,4,E;I,4,G;I,5,B;I,5,D;I,5,F;I,5,H;I,6;
I,7;I,8;I,0; J,1;J,2;J,3;J,4,A;J,4,C;J,4,E;J,4,G;J,5,B;J,5,
D;J,5,F;J,5,H;J,6;J,7;J,8;J,0;L,1;L,2;L,3;L,4,A;L,4,C;L,4,E;
L,4,G;L,5,B;L,5,D;L,5,F;L,5,H;L,6;L,7;L,8;L,0;O,1;O,2;O,3;O,

4,A;0,4,C;0,4,E;0,4,G;0,5,B;0,5,D;0,5,F;0,5,H;0,6;0,7;0,7;0,
0

ONE METHOD FOR TREATING RADIOACTIVE WASTES TO REDUCE THEIR LONG-TERM RADIOTOXICITY IS TO TRANSMUTE THE LONG-LIVED SPECIES TO SHORT-LIVED OR STABLE PRODUCTS. A PREREQUISITE FOR TRANSMUTATION IS THAT THESE SPECIES FIRST BE PARTITIONED FROM THE WASTES AND THEN RECOVERED IN A FORM SUITABLE FOR BOMBARDMENT WITH NEUTRONS. SINCE THE DIFFICULTIES OF EFFECTING THE NECESSARY SEPARATIONS AND RECOVERIES ARE AS GREAT, OR GREATER, THAN THOSE ASSOCIATED WITH REPROCESSING THE FUELS TO RECOVER U AND PU, ANY REALISTIC EVALUATION OF THIS APPROACH MUST CONSIDER BOTH PARTITIONING AND TRANSMUTATION IN A JOINT CONTEXT. WE RECENTLY COMPLETED A VERY COMPREHENSIVE ASSESSMENT OF THE TRANSMUTATION OPTION WITH A VIEW TO ESTABLISHING ITS TECHNICAL FEASIBILITY AND TO IDENTIFYING ANY INCENTIVES THAT MIGHT EXIST FOR ITS IMPLEMENTATION. WE CONCLUDED THAT, WHILE BOTH PARTITIONING OF THE ACTINIDES FROM WASTES AND THEIR SUBSEQUENT TRANSMUTATION IN POWER REACTORS WERE FEASIBLE USING CURRENTLY IDENTIFIED AND STUDIED TECHNOLOGY, IMPLEMENTATIONS OF THIS CONCEPT CANNOT BE JUSTIFIED BECAUSE OF THE SMALL RADIOLOGICAL BENEFITS AND SUBSTANTIALLY INCREASED COSTS. ON THE OTHER HAND, IT SHOULD BE POINTED OUT THAT SOME OF THE TECHNOLOGY IDENTIFIED DURING THIS PROGRAM CAN BE EFFECTIVELY UTILIZED TO IMPROVE FUTURE WASTE MANAGEMENT PRACTICES WITHIN CONVENTIONAL FUEL CYCLE OPERATIONS. SEE ALSO ORNL-5566 (ACN=264).

80

GEOHYDROLOGIC STUDY OF A BURIAL SITE FOR SOLID LOW-LEVEL
RADIOACTIVE WASTES AT THE IDAHO NATIONAL ENGINEERING
LABORATORY

CONF-770512

BARRACLOUGH, J.T.; ROBERTSON, J.B.; JANZER, V.J.
790101

PERGAMON PRESS, NEW YORK

USGS, IDAHO FALLS

MANAGEMENT OF LOW-LEVEL RADIOACTIVE WASTE, VOL. 2. PP. 795-824.
L,1;L,5

A STUDY OF THE GEOHYDROLOGIC AND GEOCHEMICAL CONDITIONS WHICH MAY CONTROL SUBSURFACE MIGRATION OF RADIONUCLIDES FROM A SEMIARID BURIAL SITE FOR SOLID RADIOACTIVE WASTES IS DESCRIBED. FIELD INVESTIGATION INVOLVED DRILLING 10 OBSERVATION WELLS AROUND AND WITHIN AN 88-ACRE (36-HA) AREA AT THE IDAHO NATIONAL ENGINEERING LABORATORY; 1,700 SEDIMENT, ROCK, AND WATER SAMPLES WERE COLLECTED FOR MINERALOGIC, CHEMICAL, AND PHYSICAL/RADIOLOGICAL ANALYSIS. THE SUBSURFACE ROCKS ARE CHIEFLY BASALT WITH TWO PRINCIPAL SEDIMENTARY BEDS OCCURRING AT DEPTHS OF ABOUT 110 AND 240 FT (34 AND 73 M). THE WATER TABLE IN THE UNDERLYING SNAKE RIVER PLAIN AQUIFER (BASALT) IS AT A DEPTH OF 580 FT (177 M) AT THE SITE. STATISTICALLY SIGNIFICANT TRACE AMOUNTS OF RADIOACTIVITY WERE FOUND IN ABOUT ONE-HALF OF THE 44 SEDIMENT SAMPLES FROM SIX SHALLOW CORE HOLES DOWN TO DEPTHS OF

240 FT (73 M), AND IN WATER SAMPLES FROM A SMALL PERCHED ZONE BENEATH THE BURIAL SITE, THE LEVELS OF RADIOACTIVITY DETECTED WERE GENERALLY LESS THAN THE AMOUNTS RESULTING FROM WORLD-WIDE FALLOUT FOUND IN SURFACE SOILS IN THIS REGION. THE OBSERVED TRACE AMOUNTS OF RADIOACTIVITY MAY HAVE BEEN DERIVED FROM THE DOWNWARD MIGRATION OF RADIONUCLIDES FROM THE BURIED WASTES, FROM ARTIFICIAL CONTAMINATION OF THE CORES DURING DRILLING AND SAMPLE HANDLING, OR FROM A COMBINATION OF THESE PROCESSES. AVAILABLE DATA INDICATE THAT WASTE RADIONUCLIDES HAVE NOT MIGRATED FROM THIS SITE INTO THE SNAKE RIVER PLAIN AQUIFER IN DETECTABLE CONCENTRATIONS. SUCH DOWNWARD MIGRATION APPEARS UNLIKELY, PROVIDED THAT WATER CAN BE PREVENTED FROM COMING IN CONTACT WITH THE BURIED WASTES.

81

OVERVIEW OF THE U.S. NUCLEAR REGULATORY COMMISSION
HIGH-LEVEL WASTE MANAGEMENT REPOSITORY ASSESSMENT
METHODS AND ANALYSIS MODELS

SCHREURS, S.

791101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

U.S. NRC

TRANS. AM. NUCL. SOC. 33:381-383.

L,2;L,3;L,5;L,7

THE U.S. NRC IS SPONSORING TWO HIGH-LEVEL REPOSITORY ASSESSMENT PROGRAMS AND SEVERAL RESEARCH PROJECTS PERTAINING TO HIGH-LEVEL WASTE MANAGEMENT. BOTH OF THE REPOSITORY ASSESSMENT PROGRAMS HAVE BEEN ONGOING FOR THREE YRS. THIS PAPER PRESENTS THE PROGRESS THAT THE ASSESSMENT PROGRAMS HAVE MADE. THE PAPER ALSO PROVIDES A SUMMARY OF THE PLANNED WORK FOR ALTERNATIVE MEDIA (I.E., OTHER THAN BEDDED SALT) AND A SUMMARY OF THE RESEARCH PROJECT.

82

FUNDAMENTAL RELIABILITY OF THE WASTE TREATMENT AND STORAGE
CENTRE FROM THE SAFETY ENGINEERING ASPECTS

NONE

REACTORS SAFETY COMMISSION; RADIOLOGICAL PROTECTION COMMISSION

780101

GESELLSCHAFT FUER REAKTORSICHERHEIT (GRS) MBH, COLOGNE, 76 P.

REACTOR SAFETY COMMISSION; RADIOLOGICAL PROTECTION COMMISSION

J,1;K,1;M,1;N,1

THE REACTOR SAFETY COMMISSION (RSK) AND THE RADIOLOGICAL PROTECTION COMMISSION (SSK) HAVE INVESTIGATED THE QUESTION OF WHETHER THE NECESSARY KNOWLEDGE AND TECHNICAL MEANS ARE AVAILABLE OR CAN BE PROCURED IN TIME IN ORDER TO CONSTRUCT AND OPERATE THE NUCLEAR WASTE TREATMENT AND STORAGE PLANT IN ACCORDANCE WITH THE PERMIT CONDITIONS OF SEC. 7, PARA. (2) OF THE ATOMIC ENERGY ACT. THEY TOOK AS THEIR BASE THE LEGAL

FOUNDATIONS (ATOMIC ENERGY ACT, RADIOLOGICAL PROTECTION ORDINANCE) AND TRANSFERRED THE SAFETY ENGINEERING PRINCIPLES DEVELOPED IN THE ASSESSMENT OF NUCLEAR POWER STATIONS AND OTHER NUCLEAR PLANTS ANALOGOUSLY TO THE WASTE TREATMENT AND STORAGE CENTER. THE RESULTS OF THE INVESTIGATIONS AND DELIBERATIONS ARE SUMMARIZED. (ORIG. GERMAN PUBL. OCT. 1977)

83

PRA PROCEDURES GUIDE. A GUIDE TO THE PERFORMANCE OF
PROBABILISTIC RISK ASSESSMENTS FOR NUCLEAR POWER
PLANTS. REVIEW DRAFT

NUREG/CR-2300

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS

810101

U.S. NRC, OFFICE OF NUCLEAR REGULATORY RESEARCH, WASHINGTON, DC.
600 P.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, NEW YORK
C,3;C,5;C,6,C;C,6,D;C,7,F;C,6,F;C,8;C,1;C,2;C,9

THIS PROCEDURES GUIDE DESCRIBES METHODS FOR PERFORMING
PROBABILISTIC RA (PRAS) FOR NUCLEAR POWER PLANTS AT FOUR LEVELS
OF SCOPE: (1) SYSTEMS ANALYSIS; (2) SYSTEMS AND CONTAINMENT
ANALYSIS; (3) SYSTEMS, CONTAINMENT, AND CONSEQUENCE ANALYSIS;
AND (4) FULL RA, INCLUDING EXTERNAL EVENTS. AFTER REVIEWING ITS
OBJECTIVES AND LIMITATIONS, THIS DOCUMENT DESCRIBES THE
ORGANIZATION AND MANAGEMENT OF A PRA PROJECT AND THEN PRESENTS
PROCEDURES FOR ACCIDENT-SEQUENCE DEFINITION AND SYSTEMS MODELING,
HUMAN-RELIABILITY ANALYSIS, THE DEVELOPMENT OF A DATA BASE, AND
THE QUANTIFICATION OF ACCIDENT SEQUENCES. PROCEDURES FOR
EVALUATING THE PHYSICAL PROCESSES OF CORE MELTDOWN ARE PRESENTED
NEXT, FOLLOWED BY GUIDANCE ON THE EVALUATION OF RADIONUCLIDE
RELEASES FROM THE CONTAINMENT AS WELL AS THE ANALYSIS OF
ENVIRONMENTAL TRANSPORT AND OFFSITE CONSEQUENCES. THE ANALYSIS
OF EXTERNAL HAZARDS IS DISCUSSED, INCLUDING PROCEDURES FOR
SEISMIC, FIRE, AND FLOOD ANALYSES. THE GUIDE CONCLUDES WITH
SUGGESTIONS FOR THE DEVELOPMENT AND INTERPRETATION OF RESULTS
AND THE PERFORMANCE OF UNCERTAINTY ANALYSES.

84

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: MODEL DESCRIPTION AND USER MANUAL FOR PATHWAYS
MODEL

NUREG/CR-1636, VOL.1; SAND78-1711

HELTON, J.C.; KAESTNER, P.C.

810301

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM, 155 P.

SANDIA NATIONAL LABORATORIES

C,5;L,5,C;L,5,D;L,6,C;L,6,D

A MODEL FOR THE ENVIRONMENTAL MOVEMENT AND HUMAN UPTAKE OF
RADIONUCLIDES IS PRESENTED. THIS MODEL IS DESIGNATED THE
PATHWAYS-TO-MAN MODEL AND WAS DEVELOPED AS PART OF A PROJECT

FUNDED BY THE NUCLEAR REGULATORY COMMISSION TO DESIGN A METHODOLOGY TO ASSESS THE RISK ASSOCIATED WITH THE GEOLOGIC DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTE. THE PATHWAYS-TO-MAN MODEL IS DIVIDED INTO TWO SUBMODELS. ONE OF THESE, THE ENVIRONMENTAL TRANSPORT MODEL, REPRESENTS THE LONG-TERM DISTRIBUTION AND ACCUMULATION OF RADIONUCLIDES IN THE ENVIRONMENT. THIS MODEL IS BASED ON A MIXED-CELL APPROACH AND DESCRIBES RADIONUCLIDE MOVEMENT WITH A SYSTEM OF LINEAR DIFFERENTIAL EQUATIONS. THE OTHER, THE TRANSPORT-TO-MAN MODEL, REPRESENTS THE MOVEMENT OF RADIONUCLIDES FROM THE ENVIRONMENT TO MAN. THIS MODEL IS BASED ON CONCENTRATION RATIOS. GENERAL DESCRIPTIONS OF THESE MODELS ARE PROVIDED. DOCUMENTATION IS PROVIDED FOR THE PATHWAYS MODEL.

85

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE WASTE: DOSIMETRY AND HEALTH EFFECTS

NUREG/CR-2166; SAND80-1372

RUNKLE, G.E.; CRANWELL, R.M.; JOHNSON, J.D.

810101

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM. 52 P.

SANDIA LABORATORIES

C,5,B;C,5,D;C,9;C,0,B;C,0,D;L,1;L,5,B;L,5,D;L,6;L,9;L,0,B;L,0,D

THE DOSIMETRY AND HEALTH EFFECTS MODEL WAS DEVELOPED AT SANDIA TO ESTIMATE THE LONG-TERM RISKS (EXPRESSED IN LATENT HEALTH EFFECTS) THAT MAY RESULT FROM POTENTIAL RELEASES FROM RADIOACTIVE WASTE DISPOSAL IN DEEP GEOLOGIC MEDIA. INCLUDED IN THIS REPORT ARE THE EQUATIONS TO CALCULATE 70-YR INTAKE/70-YR DOSE COMMITMENT FACTORS TO CONVERT THE CURIE INTAKE VALUES TO DOSE EXPRESSED IN REM. EXTERNAL DOSE FACTORS ARE INCLUDED TO ESTIMATE THE DOSE FROM EXPOSURE TO CONTAMINATED SOIL, SEDIMENT, AIR AND WATER. RISK ESTIMATORS FROM BEIR (1972-1980) ARE INCLUDED TO ASSESS THE LONG-TERM HEALTH EFFECTS THAT COULD RESULT FROM CALCULATED DOSE LEVELS. FINAL RISK ESTIMATES ARE EXPRESSED AS THE CONDITIONAL PROBABILITY OF AN INDIVIDUAL DYING OF LATENT SOMATIC CANCER.

86

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE WASTE: THE NETWORK FLOW AND TRANSPORT (NWFT) MODEL

NUREG/CR-L1190

CAMPBELL, J.E.; KAESTNER, P.C.; LANGKOPF, B.S.; LANTZ, R.B.

600101

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM. 77 P.

SANDIA NATIONAL LABORATORIES

C,1;C,3;C,5;C,8;L,3;L,5;L,8;N,3;N,5;N,8

THE NETWORK FLOW AND TRANSPORT (NWFT) MODEL HAS BEEN DEVELOPED AT SANDIA TO SUPPLEMENT THE GROUNDWATER FLOW AND RADIONUCLIDE TRANSPORT CAPABILITY PROVIDED BY THE SANDIA WASTE ISOLATION FLOW AND TRANSPORT (SWIFT) MODEL. NWFT REQUIRES ONLY A

SMALL FRACTION OF THE COMPUTER TIME REQUIRED BY SWIFT. HOWEVER, TRANSPORT CALCULATIONS IN NWFT ARE PRESENTLY LIMITED TO DECAY CHAINS OF UP TO THREE ISOTOPES WHICH MUST HAVE THE SAME DISTRIBUTION COEFFICIENTS. IT IS ANTICIPATED THAT NWFT WILL BE USED JOINTLY WITH SWIFT. SWIFT WILL BE USED TO ESTABLISH THE FLUID FLOW FIELD FOR DIFFERENT REPOSITORY BREACHMENT SCENARIOS. SWIFT WILL ALSO PROVIDE PRESSURE BOUNDARY CONDITIONS FOR NWFT AND WILL BE USED TO CHECK SELECTED NWFT RADIONUCLIDE DISCHARGE RESULTS. NWFT WILL BE USED IN SENSITIVITY AND RISK ANALYSIS TO EXAMINE THE EFFECTS OF VARIABLES WHICH ALTER THE RADIONUCLIDE SOURCE RATE MIGRATION TIME.

87

RISK ANALYSIS METHODOLOGY FOR SPENT FUEL REPOSITORIES IN
BEDDED SALT: REFERENCE REPOSITORY DEFINITION AND
CONTRIBUTIONS FROM HANDLING ACTIVITIES

NUREG/CR-1931; SAND81-0219

PEPPING, R.E.; CAMPANA, R.J.; JENSEN, D.D.; RAABE, P.H.

810101

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM. 425 P.

SANDIA NATIONAL LABORATORIES

C,1;C,2,C,3,A;C,3,B;C,4,A;C,4,B;C,5,B;C,6;C,7;C,8;C,9;C,0;L,1;L,
2;L,3,A;L,3,B;L,4,A;L,4,B;L,5,B;L,6;L,7;L,8;L,9;L,0,A;L,0,B;
N,1;N,2;N,3,A;N,3,B;N,4,A;N,4,B;N,5,B;N,6;N,7;N,8;N,9;N,0,
A;N,0,B

THIS REPORT SUMMARIZES THE WORK ACCOMPLISHED DURING A SIX-MONTH STUDY PERFORMED FOR SANDIA NATIONAL LABORATORIES BY GENERAL ATOMIC CO. THE PURPOSE OF THE STUDY WAS TO DEVELOP A METHODOLOGY TO BE USED IN ASSESSING THE RISKS ASSOCIATED WITH THE OPERATING PHASE OF A BEDDED SALT REPOSITORY FOR DISPOSING OF SPENT UNREPROCESSED FUEL. THE BASIC METHODOLOGY SELECTED FOR THIS PURPOSE WAS THAT OF A PROBABILISTIC RISK ASSESSMENT. THE STUDY FOCUSED ON RELEASES OF RADIONUCLIDES FROM THE REPOSITORY TO ITS ENVIRONS (ATMOSPHERE, SURFACE LAND AND WATERS, SUBTERRANEAN STRATA, AND GROUND WATER), AND THE ASSOCIATED DOSES AND DOSE COMMITMENTS WERE ESTIMATED FOR ONE ACCIDENT SEQUENCE. THE METHODOLOGY WAS BROAD ENOUGH TO INCLUDE ALL OPERATIONS, INCLUDING RETRIEVAL. THIS REPORT DESCRIBES THE REFERENCE REPOSITORY AND SITE USED AS THE BASIS FOR DEVELOPING AND EXERCISING THE METHODOLOGY, THE TYPES OF FACILITY ANALYSES NEEDED TO PREPARE FOR A RISK ASSESSMENT, THE PRELIMINARY SCREENING NEEDED TO FOCUS ATTENTION IN THE IMPORTANT AREAS OF ANALYSIS, THE EVENT AND FAULT TREES DEVELOPED TO STRUCTURE THE ACCIDENT SCENARIOS AND TO GUIDE THE NUMERICAL ANALYSES, THE FREQUENCY AND CONSEQUENCE ANALYSES DEVELOPED FROM THOSE TREES, AND THE RESULTS AND CONCLUSIONS FROM THE STUDY.

88

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: THE SANDIA WASTE ISOLATION FLOW AND TRANSPORT

(SWIFT) MODEL
SAND78-1267; NUREG/CR-0424
DILLON, R.T.; LANTZ, R.B.; PAHWA, S.B.
780101
SANDIA LABORATORIES, ALBUQUERQUE, NM. 116 P.
SANDIA LABORATORIES
C,5,B;L,1;L,5,B

THIS REPORT DESCRIBES THE DEVELOPMENT OF A THREE-DIMENSIONAL FINITE DIFFERENCE MODEL (SWIFT) TO SIMULATE THE TRANSPORT BY GROUND WATER OF TRACE CONCENTRATIONS OF RADIOISOTOPES. THE MODEL WAS DEVELOPED FOR USE BY NRC IN THE ANALYSIS OF DEEP GEOLOGICAL NUCLEAR WASTE DISPOSAL FACILITIES. IT IS BASED UPON AN EXISTING MODEL WHICH TREATS THE INJECTION OF LIQUID CHEMICAL WASTES INTO DEEP SALINE AQUIFERS. COMPLETE DOCUMENTATION OF SWIFT IS PROVIDED. COMPARISON OF SWIFT RESULTS WITH THE ANALYTICAL SOLUTION FOR CONSTANT VELOCITY AND DIFFUSIVITY CONDITION AND WITH THE ORIGEN CODE RESULTS FOR STATIC CONDITIONS IS PRESENTED. A DISCUSSION OF POSSIBLE FUTURE DEVELOPMENTS IS GIVEN.

89
RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE WASTE: INTERIM REPORT
NUREG/CR-0458; SAND78-0029
CAMPBELL, J.E.; DILLON, R.T.; TIERNEY, M.S.; DAVIS, H.T.; MCGRATH, P.E.; PEARSON, T.J., JR.; SHAW, H.R.; HELTON, J.C.; DONATH, F.A.

780101
SANDIA LABORATORIES, ALBUQUERQUE, NM. 264 P.
SANDIA LABORATORIES
C,1;C,2;C,3;C,4;C,5,B;C,6;C,7;C,9;C,0,B;L,1;L,2;L,3,B;L,4;L,5,B;L,6;L,7;L,9;L,0;N,1;N,2;N,3,B;N,4;N,5,B;N,6;N,7;N,9;N,0;P,9

THE FUEL CYCLE RISK ANALYSIS DIVISION OF SANDIA IS FUNDED BY THE NRC TO DEVELOP METHODOLOGY FOR ASSESSMENT OF THE LONG-TERM RISKS FROM RADIOACTIVE WASTE DISPOSAL IN DEEP, GEOLOGIC MEDIA. THE FIRST PHASE OF THIS WORK, WHICH IS DOCUMENTED IN THIS REPORT, INVOLVES THE FOLLOWING: (1) DEVELOPMENT OF ANALYTICAL MODELS TO REPRESENT THE PROCESSES BY WHICH RADIOACTIVE WASTE MIGHT LEAVE THE WASTE REPOSITORY, ENTER THE SURFACE ENVIRONMENT AND EVENTUALLY REACH HUMANS AND (2) DEFINITION OF A HYPOTHETICAL "REFERENCE SYSTEM" TO PROVIDE A REALISTIC SETTING FOR EXERCISE OF THE MODELS IN A RISK OR SAFETY ASSESSMENT OF THE REFERENCE SYSTEM. THE ANALYTICAL METHODS AND DATA DEVELOPED IN THIS STUDY ARE EXPECTED TO FORM THE BASIS FOR A PORTION OF THE NRC REPOSITORY LICENSING METHODOLOGY.

90
RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE WASTE: EFFECTS OF VARIABLE HYDROLOGIC PATTERNS ON THE ENVIRONMENTAL TRANSPORT MODEL

NUREG/CR-1636, VOL.4; SAND79-1909

BROWN, J.B.; HELTON, J.C.

810101

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM. 105 P.

SANDIA NATIONAL LABORATORIES

L,1;L,7;K,3;K,5,B;K,8;L,3;L,5,B;L,8;N,3;N,5,B;N,8

THE ENVIRONMENTAL TRANSPORT MODEL IS A COMPARTMENT MODEL WHICH REPRESENTS RADIONUCLIDE MOVEMENT THROUGH A SURFACE HYDROLOGIC SYSTEM. SOME OF THE PARAMETERS IN THE MODEL ARE BASED ON WATER AND SOLID FLOW RATES BETWEEN VARIOUS COMPARTMENTS IN THE SYSTEM. MEAN-YEARLY FLOW RATES HAVE BEEN USED IN THE CALCULATION OF THESE PARAMETERS, WHEREAS THE FLOW RATES ARE (AT BEST) PERIODIC FUNCTIONS OF TIME OR (MORE REALISTICALLY) PERIODIC STOCHASTIC PROCESSES. THIS REPORT PRESENTS THE RESULTS OF AN INVESTIGATION INTO THE EFFECTS THAT THESE VARIABLE HYDROLOGIC PATTERNS HAVE ON THE ENVIRONMENTAL TRANSPORT MODEL.

91

USER'S MANUAL FOR THE SANDIA WASTE-ISOLATION FLOW AND

TRANSPORT MODEL (SWIFT) 4,81

NUREG/CR-2324; SAND81-2516

REEVES, M.; CRANWELL, R.M.

810101

U.S. GPO, NRC; NTIS, 145 P.

INTERA ENVIRONMENTAL CONSULTANTS, INC.

C,5;C,7;L,5;L,7;N,5;N,7

THE PURPOSE OF THIS DOCUMENT IS TO DESCRIBE THE FULLY TRANSIENT VERSION SWIFT IN SUFFICIENT DETAIL THAT IT MAY BE USED EFFECTIVELY IN THE SIMULATION OF FLOW AND TRANSPORT. THE DISCUSSION BEGINS WITH THE BASIC TRANSPORT EQUATIONS AND THEIR SUBMODELS AND CONTINUES THROUGH A DESCRIPTION OF THE PROGRAM AND ITS DATA INPUT.

92

GEOCHEMICAL PARAMETERS USED IN THE BEDDED SALT REFERENCE

REPOSITORY RISK ASSESSMENT METHODOLOGY

NUREG/CR-1946; SAND81-0557

MULLER, A.B.; FINLEY, N.C.; PEARSON, F.J., JR.

810101

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM. 86 P.

SANDIA NATIONAL LABORATORIES

L,1;L,5,B;L,9

THIS DOCUMENT IS A SUMMARY OF THE RATIONALE FOR SELECTING RANGES OF GEOCHEMICAL PARAMETERS AND FOR MAKING GEOCHEMICAL ASSUMPTIONS IN THE BEDDED SALT REFERENCE REPOSITORY RISK METHODOLOGY PUBLISHED IN 1978. THE SUMMARY INCLUDES PHYSICAL AND CHEMICAL PROPERTIES OF THE FLUID GEOCHEMICAL PROPERTIES OF THE REFERENCE SITE AND A DISCUSSION OF RADIONUCLIDE CHEMISTRY IN BEDDED SALT ENVIRONMENTS. THIS DISCUSSION CONSIDERES SOLUTION CHEMISTRY, SOLUBILITY AND RETARDATION OF WASTE NUCLIDES.

93
SYSTEMATIC APPROACH TO SAFETY DESIGN AND EVALUATION

SALVATORI, R.
710101
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IEEE TRANS. NUCL. SCI. NS18(1):495-504.
C,1/C,2/C,3

THE CONCEPT OF PROBABILISTIC ANALYSIS IS RECOMMENDED AS A PRACTICAL TOOL FOR DEVELOPING DESIGN CRITERIA AND GOALS. THE PROPOSED PROCEDURE AND THE BASIC PRINCIPLES ARE DEVELOPED IN DETAIL. PRACTICAL APPLICATIONS OF THE PROBABILISTIC APPROACH ARE INCLUDED AT THE END OF THE PAPER.

94
CONTRIBUTIONS TO THE RISK ANALYSIS OF A REPOSITORY FOR
HIGH-LEVEL RADIOACTIVE WASTES IN GEOLOGIC FORMATIONS

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770601
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GESELLSCHAFT FÜR STRAHLEN- UND UMWELTFORSCHUNG M.B.H., GERMANY
TRANS. AM. NUCL. SOC. 26:277-278.
C,1/C,2/C,3/C,5/L,2/L,3/L,5/L,8

THE METHODOLOGY OF RISK ANALYSIS WAS USED TO TEST THE APPLICABILITY OF THIS METHODOLOGY TO GEOLOGIC AND MINING SYSTEMS, TO EVALUATE THE RISK OF A HYPOTHETICAL REPOSITORY FOR VITRIFIED HIGH-LEVEL RADIOACTIVE WASTES IN GEOLOGIC SALT FORMATIONS, AND TO IDENTIFY CRITICAL SAFETY AREAS IN THAT SYSTEM. THE RESULTS SHOW THAT AT LEAST THREE MEANS WOULD RESULT IN AN INCREASED SAFETY OF A DISPOSAL SITE IN A GEOLOGIC SALT FORMATION: (1) KEEP THE UNDERGROUND WORKINGS DURING THE OPERATIONAL PHASE AS SMALL AS POSSIBLE (E.G., ONLY ONE LEVEL), (2) PROVIDE A PROPER LINING OF THE SHAFT TO BE SURE OF EXCLUSION OF ANY WATER INFLOW DURING THE OPERATIONAL PHASE, AND (3) PROVIDE A CAREFUL REFILL AND SEALING OF ALL UNDERGROUND WORKINGS AND THE SHAFTS AFTER THE OPERATIONAL PHASE.

95
APPLICATION OF SIMPLIFIED RELIABILITY METHODS FOR RISK
ASSESSMENT OF NUCLEAR WASTE REPOSITORIES

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NUCL. TECHNOL. 48:289-297.

L,5

A METHOD HAS BEEN DEVELOPED THAT IS BASED ON SIMPLIFIED RELIABILITY MODELS AND THAT ALLOWS FOR THE ESTIMATE OF THE NUCLIDE RELEASE RISK FROM UNDERGROUND NUCLEAR WASTE REPOSITORIES. THE PROTOTYPE REPOSITORY IS TREATED AS A COMBINATION OF GEOLOGICAL AND MAN-MADE BARRIERS. RISK DEPENDS ON TIME AND IS EXPRESSED AS FAILURE PROBABILITY OF THE BARRIER SYSTEM FOR ALL POSSIBLE INITIATING EVENTS MULTIPLIED BY THE INVENTORY TO BE RELEASED. THE RESULTS INCLUDE, FOR EACH NUCLIDE, THE TIME AND AMOUNT OF THE MAXIMUM PROBABLE DISCHARGE RATE, WHICH CAN BE USED IN A BIOSPHERE TRANSPORT MODEL. THEY ALSO ILLUSTRATE THE EFFECTIVENESS OF SINGLE BARRIERS IN THE BARRIER SYSTEM, AND THEREFORE ALLOW A PRESELECTION AMONG ALTERNATIVE BARRIER CONCEPTS, BARRIER QUALITIES, AND REPOSITORY SITES. THE PROBABILISTIC FAILURE MODELS FOR THE SINGLE BARRIERS AND THE ENTIRE BARRIER SYSTEM DEPEND ON ONLY A FEW PARAMETERS; THEREFORE, THE APPLICATION OF THE METHOD IS FAST AND INEXPENSIVE. IT HAS TO BE STRESSED, HOWEVER, THAT THIS SIMPLE METHOD CANNOT REPLACE MORE DETAILED AND SOPHISTICATED RISK STUDIES, BUT ALLOWS CONCENTRATING THEM ON PRESELECTED REPOSITORY CONCEPTS. IT THEREFORE REPRESENTS A USEFUL TOOL IN THE EARLY DESIGN AND SITE EVALUATION PHASE FOR ALL KINDS OF REPOSITORIES AND WASTE TYPES. ITS USEFULNESS HAS BEEN DEMONSTRATED BY PERFORMING SEVERAL CASE STUDIES WITH THE COMPUTER PROGRAM RISK ON SOME TYPICAL NUCLIDES IN HLW, BEARING IN MIND THAT FOR A REPOSITORY CONCEPT ALL NUCLIDES OF POSSIBLE IMPORTANCE SHOULD BE CONSIDERED.

96

A RISK ASSESSMENT METHOD FOR NUCLEAR FUEL CYCLE OPERATIONS
BNWL-SA-6064

PELTO, P.J.; WINEGARDNER, W.K.
770601

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 20 P.
BATTELLE, PACIFIC NORTHWEST LABORATORIES
C,1;C,2;C,3;C,4;C,5;C,6;C,7;C,8;C,9;J,1

THE ARTICLE FORM OF THIS REPORT IS TRANS. AM. NUCL. SOC. 26:266-267. THIS REPORT DESCRIBES A METHOD FOR THE IDENTIFICATION AND PRELIMINARY EVALUATION OF POTENTIAL ACCIDENTS (RELEASE SEQUENCES) WHICH COULD LEAD TO THE RELEASE OF RADIOACTIVE MATERIAL FROM NUCLEAR FUEL CYCLE OPERATIONS. POTENTIAL ACCIDENT SEQUENCES ARE EVALUATED ON THE BASIS OF RISK. THE BASIC ELEMENTS OF THIS METHOD ARE PRESENTED ALONG WITH ITS APPLICATION TO A CONCEPTUAL HIGH-LEVEL RADIOACTIVE WASTE MANAGEMENT SYSTEM.

97

CHARACTERIZATION AND EVALUATION OF UNCERTAINTY IN
PROBABILISTIC RISK ANALYSIS

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010101

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UKAEA, SAFETY AND RELIABILITY DIRECTORATE

NUCL. SAF. 22(1):28-42

C,3;C,8

THE SOURCES OF UNCERTAINTY IN PROBABILISTIC RISK ANALYSIS ARE DISCUSSED, USING THE EVENT AND FAULT-TREE METHODOLOGY AS AN EXAMPLE. THE ROLE OF STATISTICS IN QUANTIFYING THESE UNCERTAINTIES IS INVESTIGATED. A CLASS OF UNCERTAINTIES IS IDENTIFIED WHICH ARE, AT PRESENT, UNQUANTIFIABLE USING EITHER CLASSICAL OR BAYESIAN STATISTICS. IT IS ARGUED THAT BAYESIAN STATISTICS IS THE MORE APPROPRIATE VEHICLE FOR THE PROBABILISTIC ANALYSIS OF RARE EVENTS, AND A SHORT REVIEW IS GIVEN WITH SOME DISCUSSION ON THE REPRESENTATION OF IGNORANCE.

98

A NEW CONCEPT IN RISK ANALYSIS FOR NUCLEAR FACILITIES

PAPP, R.; MCGRATH, P.E.; MAXIM, L.D.; COOK, F.X., JR.

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GESELLSCHAFT FUER KERNFORSCHUNG MBH

NUCL. NEWS 17(4):62-65.

C,3;C,4;C,5

THE PURPOSE OF THIS ARTICLE IS TO ADDRESS THE AREA OF RISK ANALYSIS, IN PARTICULAR TO POINT OUT GAPS IN THE METHODOLOGY OF RISK ANALYSIS AND TO "SHOW CAUSE" FOR VIEWING THE APPROACH TO RISK ANALYSIS FROM A DIFFERENT PERSPECTIVE. MORE SPECIFICALLY, IT IS CONTENDED THAT THE PRESENTLY UTILIZED CONCEPT OF RISK (EXPECTED FATALITIES PER EXPOSED POPULATION PER YR) IS INAPPROPRIATE. INSTEAD, HANDLING THE PROBLEM WITH A MATHEMATICAL APPROACH TERMED UTILITY THEORY IS PROPOSED.

99

RISK ESTIMATION, EVALUATION, AND MANAGEMENT

OTWAY, H.J.; LINGEROUTH, J.; NIEHAUS, F.

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TRANS. AM. NUCL. SOC. 26:263-264.

C,1;C,2;C,3;C,4;C,5;C,6;C,0

PUBLIC CONCERNS ABOUT ENVIRONMENTAL RISKS HAVE DEMONSTRATED THE IMPORTANCE OF A FORMAL CONSIDERATION OF SOCIAL VALUES IN PUBLIC POLICY DECISIONS, SUCH AS THOSE AFFECTING REGULATORY CRITERIA. A THEORETICAL FRAMEWORK HAS BEEN DEVELOPED FOR INTERDISCIPLINARY RA STUDIES; IT INCLUDES RISK ESTIMATION, EVALUATION, AND MANAGEMENT AS SUBTOPICS. RISK MANAGEMENT CONSIDERS THE ORDERED LIST OF OPTIONS PROVIDED BY THE FORMAL DECISION ANALYSES IN LIGHT OF THE SOCIAL CULTURAL AND POLITICAL

BACKGROUND WITH A VIEW TOWARD SELECTING STRATEGIES TO MODIFY SYSTEMS, BASED ON THEIR TECHNOLOGICAL AND RISK CHARACTERISTICS AND KNOWLEDGE OF THE CORRESPONDING FACTORS UNDERLYING THE SOCIAL RESPONSE.

100

KR-85 MANAGEMENT TRADE-OFFS: RADIOLOGICAL CONSEQUENCES

MELLINGER, P.J.; HOENES, G.R.; BRACKENBUSH, L.W.; GREENBORG, J.
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TRANS. AM. NUCL. SOC. 34:407-408.

J,4,A;J,4,B;J,4,C;J,4,D;J,5,B;J,5,D

THE RECOVERY OF ENERGY RESOURCES FROM SPENT NUCLEAR FUEL HAS BEEN INDEFINITELY DEFERRED IN THE U.S. WHILE THE INTERNATIONAL SAFEGUARDS ISSUES ASSOCIATED WITH PU EXTRACTION AND RECYCLE ARE REVIEWED. IF IT IS EVENTUALLY DECIDED TO REPROCESS SPENT FUEL TO RECOVER THE RESIDUAL ENERGY, COLLECTION OF KR-85 HAS BEEN REQUIRED BY THE ENVIRONMENTAL PROTECTION AGENCY. COLLECTION OF KR-85 IS IN CONTRAST TO THE PAST PRACTICE OF RELEASE. HOWEVER, THE PRACTICE OF COLLECTION COULD LEAD TO INCREASED OCCUPATIONAL EXPOSURES AS WELL AS THE POSSIBILITIES OF ACCIDENTAL RELEASES FROM STORED INVENTORIES. THIS PAPER BRIEFLY DESCRIBES A COMPREHENSIVE COMPARISON OF THE RADIOLOGICAL CONSEQUENCES OF THE TWO MANAGEMENT ALTERNATIVES. RESULTS OF OUR STUDY INDICATE THAT IT MAKES LITTLE DIFFERENCE TO THE MAGNITUDE OF THE WORLD POPULATION DOSE WHETHER KR-85 IS CAPTURED AND STORED, OR CHRONICALLY RELEASED TO THE ENVIRONMENT. A WORLD POPULATION DOSE OF 2.9×10^5 MAN-REM, RESULTING FROM THE TOTAL RELEASE OF KR-85 YIELDS A PER CAPITA CUMULATIVE DOSE OF 0.05 MREM OVER AN 80-YR PERIOD OR AN AVERAGE DOSE OF 6×10^{-4} MREM/YR PER PERSON. BY CONTRAST, ON A PER CAPITA BASIS, AN OCCUPATIONAL WORK FORCE OF ABOUT 10 PERSONS WOULD RECEIVE ABOUT 400 MREM/YR OR A DIFFERENCE OF ABOUT 660,000 OVER PUBLIC EXPOSURE. THESE RESULTS CLEARLY BLUR ANY MANDATE FOR KR-85 RECOVERY; I.E. THE LOW DOSE CALCULATED FOR THE NONRECOVERY CASE COUPLED WITH LESS THAN AN ORDER OF MAGNITUDE DIFFERENCE BETWEEN THE TWO WASTE MANAGEMENT TECHNIQUES. FINALLY, COST STUDIES MAY SHOW THAT INORDINATE AMOUNTS OF MONEY MAY BE REQUIRED TO LOWER THE ALREADY INSIGNIFICANT 80-YR CUMULATIVE DOSE MEMBERS OF THE WORLD POPULATION OF 0.05 MREM/PERSON (<0.001 OF NATURAL BACKGROUND RADIATION FOR THE SAME TIME PERIOD). SEE ALSO PNL-3176 (ACN-441).

101

ORIGIN AND CHARACTERISTICS OF LOW-LEVEL NON-TRANSURANIC WASTE FROM THE NUCLEAR FUEL CYCLE

CONF-770512

ALEXANDER, C.W.; BIOMEKE, J.D.

770101

PERGAMON PRESS, NEW YORK
OAK RIDGE NATIONAL LABORATORY
MANAGEMENT OF LOW LEVEL RADIOACTIVE WASTE, VOL. 1, PP. 55-76.
C,2;N,2

LOW-LEVEL NONTRANSURANIC WASTES ARE GENERATED IN ALL NUCLEAR FUEL CYCLE OPERATIONS. WHILE THE ACTIVITY LEVELS AND RADIOTOXICITIES OF THESE EFFLUENTS ARE GENERALLY OF A LOWER MAGNITUDE THAN OTHER FUEL CYCLE WASTES, THEIR LARGE VOLUMES AND THEIR APPEARANCE THROUGHOUT THE FUEL CYCLE MAKE THEIR MANAGEMENT A VERY REAL CONCERN REGARDLESS OF THE FUEL CYCLE OPTION BEING CONSIDERED. LOW-LEVEL NONTRANSURANIC WASTES ARE DEFINED HERE AS WASTES THAT CONTAIN LESS THAN ABOUT 10 NCI OF LONG-LIVED ALPHA RADIATION PER GRAM AND HAVE GAMMA RADIATIONS LOW ENOUGH TO REQUIRE ONLY MINIMAL BIOLOGICAL SHIELDING AND REMOTE HANDLING. WASTES FROM U MINING AND MILLING, UF-6 CONVERSION, ENRICHMENT, FUEL FABRICATION, AND FUEL REPROCESSING ARE EXAMINED WITH RESPECT TO THEIR RADIONUCLIDE CONTENT, VOLUME, AND CHEMICAL COMPOSITION. PROJECTIONS OF TOTAL QUANTITIES THROUGH THE END OF THIS CENTURY ARE ALSO PRESENTED. FUEL CYCLES BASED ON RECYCLING ONLY U, AND ON RECYCLING BOTH U AND PU, ARE CONSIDERED.

102

WHAT WOULD HAPPEN IF HIGH-LEVEL NUCLEAR WASTES WERE STORED
NEAR THE SURFACE OF THE EARTH

CONF-790204

LAWROSKI, NH.; CHIPMAN, N.A.; FREEBY, W.A.; SIMPSON, G.G.;
KODGER, W.A.; FRENBURG, R.L.

790201

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WASTE MANAGEMENT AND FUEL CYCLES '79, PP. 73-98.

K,1;K,2;K,4,C;K,5,B;K,5,D;K,6;K,7;K,9;K,0,B;K,0,C;K,0,D;L,1;L,2;
L,4,C;L,5,B;L,5,D;L,6;L,7;L,9;L,0,B;L,0,C;L,0,D;O,9

SIX MAJOR CANDIDATE LONG-RANGE WASTE MANAGEMENT OPTIONS WERE ANALYZED TO ESTIMATE POSSIBLE INDIVIDUAL AND POPULATION EXPOSURES IF ANY ONE OF THE SIX OPTIONS WERE IMPLEMENTED. THE EXPOSURES WERE CALCULATED FOR INCREMENTAL PERIODS UP TO 100 MILLION YRS AFTER PROCESSING. EACH OPTION WAS EXAMINED FOR POTENTIAL SCENARIOS THAT MIGHT RESULT IN PATHWAYS TO MAN. OPERATIONAL RELEASES, MIGRATIONAL LOSSES, AND INTRUSION WERE EVALUATED FOR RELEASE OF RADIOACTIVITY. CALCULATED DOSES AT INCREMENTAL PERIODS FOR THE DIFFERENT RELEASE OPTIONS AND WASTE MANAGEMENT OPTIONS ARE TABULATED.

103

RISK COMPARISON OF ALTERNATIVES OF THE BACK END OF THE FUEL
CYCLE AT A PRE-PROJECT STAGE

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 AB ATOMENERGI, SWEEDEN

TRANS. AM. NUCL. SOC. 26:268-269.

J,2;J,3;J,4,A;J,5,B;J,0,A;J,0,B;K,2;K,3;K,4,A;K,5,B; K,0,A;K,0,B;
 L,2;L,3;L,4,A;L,5,B;L,0,A;L,0,B;M,2;M,3;M,4,A;M,5,B;M,0,A;M,
 0,B;O,2;O,3;O,4,A;O,5,B;O,7;O,0,A;O,0,B

A RISK ANALYSIS COMPRISING THE BACK END OF THE FUEL CYCLE IS PRESENTED. THE STUDY STARTS WITH SPENT FUEL IN THE REACTOR POOL AND INCLUDES THE STEPS UNTIL FINAL DISPOSAL OF THE HLW. THE PURPOSE OF THE RISK ANALYSIS IS TO COMPARE ALTERNATIVES AND STUDY THE INFLUENCE OF PROCESS VARIABLES. A COMPUTER PROGRAM IS USED FOR THE CALCULATIONS, AND THE PARAMETER STUDIES ARE MADE BY CALCULATING THE TOTAL SUM OF MANREM FOR THE ALTERNATIVES OF INTEREST.

104

LONG-TERM RISK ANALYSIS OF ACTINIDE PARTITIONING AND TRANSMUTATION

LOGAN, S.E.; CONARTY, R.L.; NG, H.S.
 800601

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 LOS ALAMOS TECHNICAL ASSOCIATES, INC.

TRANS. AM. NUCL. SOC. 26:416-417.

L,2;L,3;L,5,B;L,5,D;L,6;L,7;L,8;L,0

A REPOSITORY LONG-TERM RISK ANALYSIS WAS PERFORMED IN SUPPORT OF THE ACTINIDE PARTITIONING AND TRANSMUTATION (P-T) PROGRAM COORDINATED AT THE ORNL. WASTES FROM TWO FUEL CYCLES ARE CONSIDERED: (1) REFERENCE CYCLE (REF) WITH REPROCESSING BUT WITHOUT PARTITIONING OF ACTINIDES, AND (2) P-T CYCLE. A MODEL REPOSITORY IN BEDDED SALT IS ASSUMED FOR DISPOSAL. THE ANALYSIS WAS MADE WITH THE USE OF AMRAW (ASSESSMENT METHOD FOR RADIOACTIVE WASTE). OPERATION OF AMRAW WITH DISRUPTIVE EVENTS INITIATED AT DISCRETE TIMES PROVIDES A CONSEQUENCE ANALYSIS. OVER THE 1 E+6-YR TIME FRAME, REMOVAL OR IMMOBILIZATION OF TC-99 AND I-127 PRODUCES THE MOST IMPRESSIVE RESULTS. P-T HAS LITTLE BENEFICIAL EFFECT EXCEPT DURING INTERMEDIATE TIME PERIODS OR WHERE EXPULSION OR OTHER DIRECT ACCESS TO REPOSITORY CONTENT IS MORE LIKELY TO OCCUR. IN THE ABSENCE OF THE ABOVE TWO NUCLIDES, P-T WOULD DECREASE 1 E+6 YR CUMULATIVE DEATHS FROM AN ALREADY LOW CALCULATED VALUE (436) TO ABOUT 20. SEE ALSO ORNL/TM-6987, ACN=169, AND EPA-520/6-78-005, ACN=672-675. FOR A PAPER PRESENTING SHORT-TERM RISKS SEE ACN=251.

105

SELECTION OF SIGNIFICANT ELEMENTS AND RADIONUCLIDES FOR WASTE MANAGEMENT ASSESSMENT

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TRANS. AM. NUCL. SOC. 19:204-206,
L,5;L,9

ASSESSMENT OF HIGH-LEVEL RADWASTE MANAGEMENT CONCEPTS INVOLVES DETAILED EXAMINATION OF RELEASE AND ENVIRONMENTAL TRANSPORT MECHANISMS FOR RADIONUCLIDES IN A WASTE DEPOSIT. CALCULATIONS BY THE ORIGEN CODE INDICATE APPROXIMATELY 200 RADIONUCLIDES ARE PRESENT AT THE TIME OF SEPARATION IN FUEL REPROCESSED AT 160 DAYS. A SCREENING METHOD IS PROPOSED TO DETERMINE THE MOST SIGNIFICANT ELEMENTS AND NUCLIDES PRESENT IN EACH TIME INTERVAL, INCLUDING BUILDUP OF ACTINIDE DAUGHTERS, DURING LONG-TERM STORAGE. THE SCREENING TECHNIQUE WAS APPLIED TO ORIGEN DATA FOR A REFERENCE PWR OPERATED AT AN AVERAGE SPECIFIC POWER OF 30 MW/MT, AND BURNUP OF 33,000 MWd/MT, FOR 3.3% ENRICHED U AND FOR SELF-SUSTAINING PU RECYCLE FUELS. RECOVERY OF U AND PU WAS ASSUMED TO BE 99.5%.

106

NRC-INDUSTRY COOPERATIVE EFFORT SETS STAGE FOR
PROBABILISTIC RISK ASSESSMENT STUDIES

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810101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
NUCLEAR SAFETY ANALYSIS CENTER, PALO ALTO, CA
NUCL. NEWS 24(1):87-88,90-92,
C,1;C,2;C,3;C,4;C,5;C,6;C,7;C,8

THE U.S. NRC HAS JOINED HANDS WITH KEY INDUSTRY PERSONNEL TO DEVELOP A PROCEDURES GUIDE ON METHODS OF PRA. IN AN UNPRECEDENTED MOVE, THE NRC INITIATED DISCUSSIONS WITH INDUSTRY REPRESENTATIVES IN MID-1980 ON THE FEASIBILITY OF GAINING BROAD TECHNICAL INPUT TO ITS INTERIM RELIABILITY EVALUATION PROGRAM (IREP). THE OBJECTIVE OF THE JOINT NRC-INDUSTRY PROGRAM IS TO PREPARE A PROCEDURES GUIDE THAT DOCUMENTS THE PRESENT STATE OF THE ART FOR ALL MAJOR FACETS OF PRA AS APPLIED TO THE NUCLEAR POWER PLANTS. THE GUIDE WILL NOT CONSTITUTE AN ENCYCLOPEDIA OF ALL POSSIBLE APPROACHES, BUT WILL FOCUS ON ONE OR A FEW MUTUALLY ACCEPTABLE METHODS OF PERFORMING KEY PORTIONS OF PRA.

107

RISK ASSESSMENT AND RADIOACTIVE WASTE MANAGEMENT

COHEN, J.J.

790101

PERGAMON PRESS, NEW YORK
LAWRENCE LIVERMORE LABORATORY
MANAGEMENT OF LOW LEVEL RADIOACTIVE WASTE. PP. 217-226,
L,3;L,4;L,5;N,3;N,4;N,5;P,3;P,4;P,5

PROBLEMS ASSOCIATED WITH RADWASTE MANAGEMENT, BOTH

TECHNOLOGICAL AND ADMINISTRATIVE, HAVE BECOME A SERIOUS CONSTRAINT IN THE DEVELOPMENT OF NUCLEAR POWER. AN APPROACH TOWARD UNDERSTANDING THESE PROBLEMS CONSISTS OF PLACING THEM IN A PERSPECTIVE WHERE THE RISKS OF RADWASTE MANAGEMENT MIGHT BE EVALUATED IN RELATION TO SIMILAR PROBLEMS FACING SOCIETY SO THAT CONSISTENT JUDGEMENTS CAN BE MADE.

108

A REPOSITORY POST-SEALING RISK ANALYSIS USING MACRO

CONF-800313

KAUFMAN, A.M.; EDWARDS, L.L.; O'CONNELL, W.J.

800101

UNIV. OF ARIZONA, TUCSON, AZ

LAWRENCE LIVERMORE LABORATORY

WASTE MANAGEMENT '80. VOL. 1, PP. 109-123.

L,3;L,5;L,6

MACRO, A CODE TO PROPAGATE PROBABILITY DISTRIBUTIONS THROUGH A SET OF LINKED MODELS, IS CURRENTLY UNDER DEVELOPMENT AT LLL. AN EARLY VERSION OF THIS CODE, MACRO1, HAS BEEN USED TO ASSESS POST-SEALING DOSE TO MAN FOR SIMPLE REPOSITORY AND SITE MODELS BASED ON ACTUAL SITE DATA.

109

LONG-TERM LOW LEVEL WASTE MANAGEMENT: AN INTEGRATED ENVIRONMENTAL PROGRAM

CONF-780316

MANN, C.W.

780101

UNIV. OF ARIZONA, TUCSON, AZ

ROCKWELL HANFORD OPERATIONS

WASTE MANAGEMENT FUEL CYCLES '78. PP. 427-436.

N,1;N,5;N,7;N,9

THE REPORT FORM OF THIS PAPER IS RHO-SA-35. GROUND DISPOSAL OF LOW-LEVEL RADIOACTIVE SOLID AND LIQUID WASTES HAS BEEN CONTINUING ONSITE EVER SINCE OPERATIONS BEGAN IN 1944. MANAGEMENT OF THESE LOW-LEVEL WASTES WILL CONSIST OF TWO PHASES: TECHNOLOGY DEVELOPMENT AND OPERATIONAL. A BREAKDOWN IS GIVEN OF THE WORK UNDER WAY: PROGRAM MANAGEMENT, DATA BASE, SITE CHARACTERIZATION, FIELD-INSTRUMENT DEVELOPMENT, RA, SUPPORT STUDIES AND ASSESSMENTS, AND TECHNOLOGY DEVELOPMENT AND DEMONSTRATION. INTEGRATION OF LONG-TERM MANAGEMENT OF LLW PROGRAM WITH THREE OTHER PROGRAMS IS MENTIONED.

110

PERSPECTIVES AND RECONCILIATION OF VIEWPOINTS ON RISK ASSESSMENT ISSUES

CONF-800313

SMITH, C.F.; COHEN, J.J.

800101

UNIV. OF ARIZONA, TUCSON, AZ
LAWRENCE LIVERMORE LABORATORY
WASTE MANAGEMENT '80. VOL. 1, PP. 151-159.
C,1;C,3;C,4;C,5;P,1;P,3;P,4;P,5

IT IS IMPORTANT TO RECOGNIZE THE DISTINCTION BETWEEN RA AND ITS COMPONENTS WHICH INCLUDE RISK ANALYSIS, PERSPECTIVES STUDY, AND DECISION ANALYSIS. DIVERGENCE OF OPINION WITHIN THE SCIENTIFIC COMMUNITY AS WELL AS THE PUBLIC AT LARGE IS A CHARACTERISTIC OF ISSUES RELATED TO NUCLEAR POWER. THE DIVERGENT OPINIONS CAN LARGELY BE CHARACTERIZED AS EITHER OPTIMISTIC OR PESSIMISTIC IN NATURE. RECONCILIATION OF DIVERGENT VIEWPOINTS PRESENTS SOME DIFFICULT CHALLENGES. IT IS DOUBTFUL THAT ISSUES WHICH HAVE AN EMOTIONAL OR PHILOSOPHICAL BASIS CAN BE RESOLVED THROUGH TECHNICAL EFFORTS. PUBLIC EDUCATION ON THE TECHNICAL ISSUES MIGHT PROVE HELPFUL.

111
WHAT IS RISK ASSESSMENT
CONF-800313
WOOD, D.E.
800101
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ROCKWELL HANFORD OPERATIONS
WASTE MANAGEMENT '80. VOL. 1, PP. 67-77.
C,3;C,4;C,5

RISK ASSESSMENT HAS BECOME A POPULAR, CONTROVERSIAL, AND SOMETIMES MISUNDERSTOOD SUBJECT IN THE NUCLEAR FIELD. PART OF THE DIFFICULTY IS THE USE OF DIFFERENT MEANINGS BY DIFFERENT INVESTIGATORS, AS WELL AS VARIATIONS IN THE DEPTH OF ANALYSIS CONSIDERED TO BE APPROPRIATE. THIS PAPER DISCUSSES THE VARIOUS MEANINGS, SUGGESTS A SPECIFIC MEANING FOR DECISIONS INVOLVING RADIOLOGICAL HAZARDS, CONSIDERES THE PHASES OF SUCH AN ANALYSIS, AND PROPOSES AN APPROACH TO BE USED WHERE THE METHODOLOGY IS INCOMPLETE.

112
RISK EVALUATIONS OF TRANSURANIC WASTE AT THE IDAHO NATIONAL
ENGINEERING LABORATORY
CONF-800313
SMITH, T.H.; KENESHEA, F.J.
800101
UNIV. OF ARIZONA, TUCSON, AZ
EG&G IDAHO, INC.
WASTE MANAGEMENT '80. VOL. 1, PP. 79-91.
K,1;K,7;K,9;K,0,B;L,1;L,2;N,1;N,2,B;N,7;N,9;N,0,B

APPROX. 75% OF THE DEFENSE LOW-LEVEL TRANSURANIC (TRU) WASTE STORED IN THE U.S. AND 25% OF THE BURIED TRU WASTE IS LOCATED AT THE IDAHO NATIONAL ENGINEERING LABORATORY (INEL). STUDIES HAVE BEEN PERFORMED TO IDENTIFY AND EVALUATE TECHNICAL ALTERNATIVES FOR THE LONG-TERM MANAGEMENT OF THIS WASTE. AMONG

THE EVALUATIONS THAT HAVE BEEN PERFORMED WERE PRELIMINARY RISK EVALUATIONS. DOSE COMMITMENT AND RISK OF HYPOTHETICAL, NEAR-TERM, ACCIDENTAL OR UNCONTROLLED RELEASES OF RADIONUCLIDES HAVE BEEN EVALUATED FOR EACH ALTERNATIVE. THE FOLLOWING POTENTIAL CAUSES OF RADIONUCLIDE RELEASE HAVE BEEN STUDIED: PROCESS AND HANDLING ACCIDENTS, SHIPPING ACCIDENTS, NATURAL EVENTS, MAN-CAUSED EVENTS, AND FUTURE INTRUSION BY INDIVIDUALS OR SMALL POPULATIONS AFTER LOSS OF SOCIETAL CONTROL OVER THE WASTE. THE HYPOTHETICAL RELEASES HAVE BEEN EVALUATED, IN TERMS OF DOSE COMMITMENT AND PROBABILITY AND RISK, FOR ALL OPERATIONAL STEPS MAKING UP EACH CONCEPT. THE DOMINANT SCENARIOS IN TERMS OF NEAR-TERM RISK ARE (1) LAVA FLOW UP THROUGH OR OVER THE WASTE, LEADING TO AIRBORNE RELEASES; (2) AN EXPLOSION OR A CRITICALITY ACCIDENT IN THE WASTE-PROCESSING FACILITY; AND (3) A TORNADO STRIKE OR A FIRE DURING WASTE RETRIEVAL. THE DOMINANT LONG-TERM RELEASES ARE (1) VOLCANIC ACTION; AND (2) INTRUSION OF PEOPLE ON THE WASTE SITE. ALTHOUGH SUBSTANTIAL DOSE COMMITMENTS TO INDIVIDUAL MEMBERS OF THE PUBLIC WERE CALCULATED FOR THE LAVA FLOW AND INTRUSION SCENARIOS, NO PROMPT HEALTH EFFECTS WOULD BE EXPECTED FROM THE EXPOSURES. THE EFFECTS WOULD BE IN THE FORM OF A SLIGHTLY INCREASED LIKELIHOOD OF LATENT CANCER INDUCTION.

113

QUANTIFICATION OF DEPENDENT FAILURES OF HIGH-POPULATION COMPONENTS OF A FAULT TREE

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BROOKHAVEN NATIONAL LABORATORY

TRANS. AM. NUCL. SOC. 38:491-492.

C,3

DESCRIBES A METHODOLOGY FOR IDENTIFICATION AND QUANTIFICATION OF SIGNIFICANT DEPENDENT FAILURES OF HIGH-POPULATION COMPONENTS OF A SYSTEM FAULT TREE IS DESCRIBED. THE ACCURACY OF THE APPROACH IS ESSENTIALLY LIMITED BY THE EXACTNESS OF THE AVAILABLE CONDITIONAL FAILURE DATA AND THE MAGNITUDE OF THE ERROR INTRODUCED BY THE ELIMINATED MINIMAL CUT SETS. IT USES A SINGLE ITERATION SCHEME FOR EACH GROUP OF HIGH-POPULATION COMPONENTS AND THE PROPERTIES OF THE FAULT TREE TOGETHER WITH THE DATA ON THE PROBABILITIES OF MULTIPLE FAILURES. THIS METHODOLOGY IS SHOWN TO BE VERY EFFECTIVE IN QUANTIFICATION OF DEPENDENT FAILURE OF HIGH-POPULATION COMPONENTS OF A SYSTEM FAULT TREE. THE APPROACH IS SYSTEMATIC AND DETAILED, AND THEREFORE CHANCES OF OVERSIGHT ARE MINIMIZED.

114

SENSITIVITY ANALYSIS OF THE METEOROLOGICAL MODEL APPLIED IN THE GERMAN RISK STUDY

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TRANS. AM. NUCL. SOC. 38:96-97.

C,8;P,8,B

IF A REACTOR ACCIDENT OCCURS AND IF RADIOACTIVE MATERIAL IS RELEASED TO THE ATMOSPHERE, THE RISK TO THE PUBLIC DEPENDS ON THE FOLLOWING PARAMETERS: (1) THE TYPE AND AMOUNT OF RADIOACTIVE MATERIAL RELEASED INTO THE ATMOSPHERE, (2) THE METEOROLOGICAL CONDITIONS PREVAILING AT THE TIME OF THE ACCIDENT AND THEREAFTER,

(3) THE POPULATION CONCERNED. IN THE GERMAN RISK STUDY CONSEQUENCE MODEL, A REPRESENTATIVE SELECTION IS TAKEN FOR EACH OF THESE THREE PARAMETER GROUPS. FOR THE SECOND GROUP, A NUMBER OF SEQUENCES OF WEATHER CONDITIONS ARE SELECTED. A SENSITIVITY ANALYSIS OF THE METEOROLOGICAL MODEL IS PERFORMED THAT DOES NOT CHANGE THE FIRST AND LAST GROUPS OF PARAMETERS INCLUDED IN THE LISTING ABOVE, BUT DOES CHANGE INTERNAL PARAMETERS AND MODEL ASSUMPTIONS IN THE METEOROLOGICAL MODEL. THE SUBMODELS OF DOSE COMPUTATION, OF PROTECTIVE AND COUNTERACTIONS, AND OF HEALTH DAMAGE ALSO REMAIN UNCHANGED.

115

ON THE USE OF POINT ESTIMATES IN RISK ASSESSMENT

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SANDIA LABORATORIES

TRANS. AM. NUCL. SOC. 39:573-576.

C,3;C,8

IN RA OF COMPLEX TECHNOLOGICAL SYSTEMS, THE ACCIDENT MITIGATION SYSTEMS ARE GENERALLY MODELED BY FAULT TREES. BOOLEAN EXPRESSIONS OBTAINED FROM THE FAULT TREES REPRESENT THE EXISTENCE OF THE TOP EVENT (E.G., SYSTEM FAILURE). THE TOP EVENT UNAVAILABILITY IS OBTAINED BY USING THE FAILURE DATA OF THE BASIC EVENTS COMPRISING THE BOOLEAN EXPRESSION IN THE PROBABILITY FORMAT. ONE BASIC CONCEPT IN GENERAL USE IS THAT THE TOP EVENT UNAVAILABILITY OBTAINED BY USING THE MEDIAN UNAVAILABILITY OF THE BASIC EVENTS IS CLOSE TO THE MEDIAN VALUE. THUS, THE POINT ESTIMATE UNAVAILABILITY OBTAINED FOR A SYSTEM IS FREQUENTLY INTERPRETED AS THE MEDIAN UNAVAILABILITY AND COMPARED TO MEDIAN UNAVAILABILITY IN OTHER RISK STUDIES, SUCH AS THE "REACTOR SAFETY STUDY" (RSS). IT IS SHOWN IN THIS PAPER THAT, EXCEPT, FOR SIMPLE FAULT TREES WITH FEW MINIMAL CUTSETS, THE POINT ESTIMATE UNAVAILABILITY OF THE TOP EVENT, OBTAINED BY USING THE MEDIAN UNAVAILABILITY OF THE BASIC EVENTS, COULD DEPART CONSIDERABLY FROM ITS MEDIAN UNAVAILABILITY. BASED ON THE DISCUSSION, IT IS CONCLUDED THAT MEDIAN VALUES OF THE COMPONENT FAILURE DATA SHOULD NOT BE USED IN RA BASED ON POINT ESTIMATES. THE TOP EVENT UNAVAILABILITY THUS OBTAINED CAN REPRESENT MUCH

LOWER VALUES, I.E., THE SYSTEM WOULD APPEAR MUCH BETTER THAN IT ACTUALLY IS. THEREFORE, SPECIAL CARE IS WARRANTED IN THE CHOICE AND ANALYSIS OF COMPONENT FAILURE DATA, WHICH GENERALLY HAVE POSITIVELY SKEWED DISTRIBUTION WITH A MEAN VALUE GREATER THAN THE MEDIAN. IT IS THE MEAN VALUE OF THE FAILURE DATA THAT SHOULD BE USED FOR THE QUANTIFICATION OF THE TOP EVENT UNAVAILABILITY. THIS GIVES THE MEAN VALUE OF THE SYSTEM UNAVAILABILITY. WHEN COMPARING IT WITH THE RSS, IT IS AGAIN THE MEAN VALUE THAT SHOULD BE COMPARED.

116

UNCERTAINTY PROPAGATION IN PROBABILISTIC RISK ASSESSMENT:
A COMPARATIVE STUDY

AHMED, S.; METCALF, D.R.; PEGHAM, J.W.
810601
AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
BARCOCK & WILCOX, LYNCHBURG, VA
TRANS. AM. NUCL. SOC. 38:483-484.
C,3;C,8

IN FAULT TREE QUANTIFICATION, THE CUT SETS CONSISTING OF BOOLEAN PRODUCTS OF BASIC EVENTS WITH ASSOCIATED PROBABILITIES ARE EVALUATED TO OBTAIN A PROBABILITY FOR THE TOP EVENT. VARIOUS LEVELS OF UNCERTAINTY ARE ASSOCIATED WITH THE BASIC COMPONENT EVENT PROBABILITIES. THE STANDARD METHOD USED IN WASH-1400 TO OBTAIN A RANGE OF UNCERTAINTY IS THE MONTE CARLO METHOD (SAMPLE). THIS PAPER STUDIES TWO OTHER METHODS OF UNCERTAINTY PROPAGATION CALLED (1) METHOD OF MOMENTS AND (2) DISCRETE DISTRIBUTION (DPD) AND COMPARES THESE METHODS WITH THE MONTE CARLO METHOD. THE CONCLUSIONS ARE THAT TO AVOID OVERLY CONSERVATIVE ESTIMATES OF UNCERTAINTY IN TOP EVENT PROBABILITIES USING LOG-NORMAL PROBABILITY DISTRIBUTIONS, THE LOGNORMAL DISTRIBUTION SHOULD BE DISCRETIZED AND THEN USED IN MONTE CARLO (SAMPLE) OR IN THE DISCRETE PROBABILITY DISTRIBUTION AS DISCUSSED. THE METHOD OF MOMENTS IS IN ERROR ESPECIALLY FOR LARGE RANGE FACTORS, BUT CAN SAFELY BE USED FOR SMALL RANGE FACTORS. THIS METHOD HAS THE ADVANTAGE OF BEING A RELATIVELY SIMPLE CALCULATION AND SUBJECT TO EVALUATION VIA A HAND-HELD CALCULATOR FOR RELATIVE COMPLEX BOOLEAN EXPRESSIONS. FOR MORE COMPLEX FAULT TREES AND ASSOCIATED BOOLEAN EXPRESSIONS, THE MONTE CARLO METHOD MAY BE QUITE EXPENSIVE, I.E., REQUIRE LONG COMPUTER TIMES, AND THE DPD MAY BE MUCH FASTER ESPECIALLY IF COLLAPSING IS PERFORMED AFTER EACH MULTIPLICATION OF PROBABILITIES.

117

EVALUATION OF PRODUCT SPECIFICATIONS WITH A SAFETY ANALYSIS
FOR A DISPOSAL MINE

CONF-801124
WARNECKE, E. E.; ILLI, H.
810101

PLENUM PRESS, NEW YORK
 PHYSIKALISCH-TECHNISCHE BUNDESANSTALT, BRAUNSCHWEIG
 SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT, VOL. 3, PP. 19-26.
 C,2;C,3;J,9;L,3;L,4;L,5;L,7

THIS WORK WAS DONE ON THE BASIS OF PRELIMINARY DATA FOR RADIOACTIVE WASTES GENERATED IN A FUTURE REPROCESSING PLANT AND ASSUMPTIONS OF THE GEOLOGY AND HYDROLOGY OF THE SALT DOME AT GORLEPEN. IT SHOWED THAT IT IS POSSIBLE TO COME TO QUANTITATIVE REQUIREMENTS FOR TYPE SPECIFIC RADIOACTIVE WASTE FORMS WITH AN ITERATIVE SAFETY ANALYSIS FOR A REPOSITORY IF A SUITABLE DATA BASE IS AVAILABLE.

119

A COMBINED FRACTURE/POROUS MEDIA FOR CONTAINMENT TRANSPORT OF RADIOACTIVE IONS

NUTTALL, H.E.; RAY, A.DK.
 810101

PLENUM PRESS, NEW YORK
 UNIV. OF NEW MEXICO
 SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT, VOL. 3, PP. 577-590.

C,2;C,5;L,2;L,5

A MODEL, WITH AN ANALYTICAL SOLUTION, WAS DEVELOPED TO STUDY THE EFFECTS OF COMBINED FRACTURE AND POROUS MEDIA FLOW ON THE MIGRATION RATE OF RADIOACTIVE NUCLIDES. THE OBJECTIVE IS TO DETERMINE THE DEGREE OF ENHANCED MIGRATION DUE TO A THIN FRACTURE WITHIN THE OTHERWISE HOMOGENEOUS POROUS MEDIUM. THE GEOLOGICAL WASTE DISPOSAL ZONE IS TREATED AS AN INFINITE TWO-DIMENSIONAL MEDIUM CONSISTING OF A NARROW CHANNEL SURROUNDED BY A FLOWING AQUIFIER. THE TOP AND BOTTOM OF THE ZONE ARE ASSUMED TO BE BOUNDED BY IMPERMEABLE CLAYS. THE TWO-DIMENSIONAL CONVECTIVE-DISPERSION EQUATIONS, WITH A LINE SOURCE HAVE BEEN SOLVED GIVING ANALYTICAL EXPRESSIONS FOR THE CONTAMINANT CONCENTRATION, FLUX AND TOTAL DISCHARGE RATE DOWNSTREAM OF THE SOURCE. THE TOTAL DISCHARGE RATE OF NUCLIDES DOWNSTREAM OF THE PULSE SOURCE HAS BEEN CALCULATED AND COMPARED WITH THE RESULTS FOR ION MIGRATION IN A HOMOGENEOUS POROUS MEDIUM.

120

SENSITIVITY OF CALCULATED PORE-FLUID PRESSURE TO REPOSITORY FRACTURE GEOMETRY

EATON, R.R.; LARSON, D.E.; KORBIN, C.M.
 810101

PLENUM PRESS, NEW YORK
 SANDIA NATIONAL LABORATORIES
 SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT, VOL. 3, PP. 591-598.

C,1;C,2;C,7;L,1;L,2;L,7

CALCULATIONS HAVE BEEN MADE TO PREDICT THE SENSITIVITY OF PORE-FLUID PRESSURE TO THE GEOMETRY OF ROCK FRACTURE PATTERNS IN THE NEAR VICINITY OF NUCLEAR WASTE BURIED IN A TUFF REPOSITORY. THE SHAFT 79 CODE (FOR MULTI-DIMENSIONAL, TWO-PHASE FLOW IN POROUS MEDIUM) HAS BEEN USED. THE REPOSITORY CONSIDERED CONTAINS 1.0, 2.1 AND 2.5 KW/CAN, CANISTERS EMPLACED IN WELDED TUFF WITH A GLOBAL REPOSITORY LOADING OF 75 KW/ACRE. THE RESULTING CALCULATIONS SHOW THAT PREDICTED PORE FLUID PRESSURES VARY FROM 55 BARS FOR A HOMOGENEOUS, FRACTURE-FREE ROCK MASS TO 5 BARS FOR A WELL FRACTURED MASS. THIS ORDER OF MAGNITUDE VARIATION SHOWS THE IMPORTANCE OF PROPERLY MODELING FRACTURE PATTERNS IN HARD ROCK REPOSITORY ANALYSIS.

121

WASTE ISOLATION SAFETY ASSESSMENT PROGRAM SCENARIO ANALYSIS
METHODS FOR USE IN ASSESSING THE SAFETY OF THE
GEOLOGIC ISOLATION OF NUCLEAR WASTE

PNL-2643

GREENBURG, J.; WINEGARDNER, W.K.; PELTO, P.J.; STOTTLEMYER, J.A.;
FORBES, I.A.; FUSSELL, J.B.; BURKHOLDER, H.C.

780101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 32 P.

PACIFIC NORTHWEST LABORATORY

C,2;C,3;L,2;N,1;N,2

ASSESSING THE SAFETY OF A NUCLEAR WASTE REPOSITORY SYSTEM REQUIRES THE IDENTIFICATION AND EVALUATION OF POTENTIAL DISRUPTIVE PHENOMENA THAT COULD COMPROMISE THE REPOSITORY SYSTEM INTEGRITY. A VARIETY OF SAFETY ASSESSMENT METHODS HAVE BEEN EVALUATED WITH RESPECT TO THEIR POTENTIAL UTILITY IN PERFORMING SUCH EVALUATIONS. EXPERT OPINION, FAULT TREES/EVENT TREES, MONTE CARLO SIMULATION AND CLASSICAL SYSTEMS ANALYSIS WERE JUDGED TO HAVE THE GREATEST POTENTIAL APPLICATION TO THE PROBLEM OF SCENARIO ANALYSIS. THE METHODS WERE FOUND TO BE CONSTRAINED BY LIMITED DATA AND BY THE KNOWLEDGE OF THE PROCESSES GOVERNING THE SYSTEM - SOME MORE THAN OTHERS. IT WAS DETERMINED THAT NO SINGLE METHOD IS CLEARLY SUPERIOR TO OTHERS WHEN MEASURED AGAINST ALL THE CRITERIA. THEREFORE, TO GET THE BEST UNDERSTANDING OF SYSTEM BEHAVIOR, A COMBINATION OF THE METHODS IS RECOMMENDED. MONTE CARLO SIMULATION WAS JUDGED TO BE THE MOST SUITABLE MATRIX IN WHICH TO INCORPORATE A COMBINATION OF METHODS.

122

RISK ASSESSMENT METHODOLOGY DEVELOPMENT FOR WASTE ISOLATION
IN GEOLOGIC MEDIA. TECHNICAL REVIEW OF DOCUMENTS

NUREG/CR-0394, NUREG/CR-0424, AND NUREG/CR-0458

NUREG/CR-1672, VOL.1; SAI-219-80-PA

STEVENS, C.A.; FULLWOOD, R.R.; BASIN, S.L.

800101

U.S. GPO, NRC, WASHINGTON, DC. 90 P.

SCIENCE APPLICATIONS, INC.

C,1;C,2;C,3;C,5,B;C,6;C,7;C,8;K,1;K,2;K,3;K,5,B;K,6;K,7;K,8;N,1;
N,2;N,3;N,5,B;N,6;N,7;N,8

THE WORK AS REPRESENTED IN THE THREE REPORTS CONTAINS NOTEWORTHY INNOVATIONS. IT PRESENTS: (1) A PROBABILISTIC METHOD THAT SUPPLEMENTS THE RATHER SPARSE HISTORICAL DATA WITH PHYSICAL MODELS, (2) A VERY DETAILED THREE-DIMENSIONAL FINITE DIFFERENCE CODE FOR GROUNDWATER TRANSPORT OF THE RADIONUCLIDES, (3) A LATIN-HYPERCUBE MODEL FOR SENSITIVITY TESTING, AND (4) A VERY FLEXIBLE COMPARTMENT MODEL FOR THE RADIONUCLIDE TRANSPORT IN THE BIOSPHERE TO MAN. CRITICISMS OF THE WORK ARE: (1) IT PROVIDES NO NEW INSIGHT INTO THE UNDERSTANDING OF RISK TO AN UNKNOWN FUTURE POPULATION, (2) IT IS UNBALANCED IN PROVIDING VERY DETAILED TREATMENT IN SOME AREAS AND VERY APPROXIMATE TREATMENT OF OTHERS, (3) THE DETERMINISTIC FAILURE MODELING TENDS TO DOMINATE THE RESULTS SO THAT THE RESULTS ARE HIGHLY DEPENDENT ON THESE MODELS THAT DO NOT ALLOW FOR THE UNCERTAINTIES IN THE PARAMETERS, (4) IT PROVIDES NO FINAL RESULTS IN TERMS OF RISK MEASURES NOR DOES IT PRESENT A SENSITIVITY OR ERROR ANALYSIS, (5) MEDIA OTHER THAN SALT HAVE NOT BEEN CONSIDERED, (6) ENGINEERED BARRIERS SUCH AS THE CANISTER AND OVERPACK APPEAR TO BE IGNORED, AND (7) IT PROVIDES NO GUIDANCE FOR SITE SELECTION. THE PRIMARY USEFULNESS OF THE WORK WOULD APPEAR TO BE IN PROVIDING BENCHMARK SOLUTIONS TO TEST PROBLEMS WHICH CAN BE USED TO DEVELOP A MORE FLEXIBLE, BUT LESS PRECISE, METHODOLOGY.

123

RISK ASSESSMENT METHODOLOGY DEVELOPMENT FOR WASTE ISOLATION
IN GEOLOGIC MEDIA, TECHNICAL REVIEW OF NUREG/CR-1262,
NUREG/CR-1376, NUREG/CR-1377, NUREG/CR-1397, AND
NUREG/CR-1608

NUREG/CR-1672, VOL.2; SAI-252-18-PA
STEVENS, C.A.; FULLWOOD, R.R.; BASIN, S.L.
810101

U.S. GPO, NRC, WASHINGTON, DC. 118 P.
SCIENCE APPLICATIONS, INC.

C,2;C,3;C,5,B;C,6;C,7;C,8;K,2;K,3;K,5,B;K,6;K,7;K,8;N,2;N,3;N,5,
B;N,6;N,7;N,8

A REVIEW OF FIVE DOCUMENTS THAT WERE PREPARED FOR THE U.S. NRC BY SANDIA IS PRESENTED IN THIS REPORT. THE DOCUMENTS COVERED IN THE PRESENT REVIEW INCLUDE: NUREG/CR-1262, NUREG/CR-1376, NUREG/CR-1377, NUREG/CR-1397 AND NUREG/CR-1608. THIS CONSTITUTES THE SECOND PHASE OF THE REVIEW; THE FIRST PHASE WAS REPORTED IN VOL. 1 OF NUREG/R-1672, NOVEMBER 1980. TWO OF THE DOCUMENTS CONCERN SIMPLIFIED COMPUTATIONAL METHODS ILLUSTRATIVE OF THE CALCULATIONS NECESSARY TO PRODUCE A RESPONSE SURFACE. THREE OF THE REPORTS PERTAIN TO STATISTICAL METHODS, INCLUDING THE APPLICATION OF LATIN HYPERCUBE SAMPLING (LHVS). THE FOLLOWING OBSERVATIONS HAVE BEEN MADE RELATIVE TO THE ABOVE REPORTS: 81(1) THE REPORTS ARE, IN GENERAL, DIFFICULT TO READ, DUE IN PART TO UNNECESSARILY COMPLICATED NOTATION AND LACK OF ADEQUATE EXPLANATION AND EXAMPLES, (2) THE RELATIONSHIP OF THE WORK TO

SIMILAR WORK IN THE U.S. AND ABROAD IS NOT DISCUSSED, AND (3) LIMITATIONS OF THE LHS METHOD ARE NOT DISCUSSED IN SUFFICIENT DEPTH.

124

REGIONAL THERMOHYDROLOGICAL EFFECTS OF AN UNDERGROUND
REPOSITORY FOR NUCLEAR WASTES IN HARD ROCK

CONF-791112

WANG, J.S.Y.; TSANG, C.F.

800101

PLENUM PRESS, NEW YORK

LAWRENCE BERKELEY LABORATORY

SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT. VOL. 2, PP.
803-810.

C,5;C,6;C,7;L,5,B;L,5,D;L,7

THIS PAPER PRESENTS RESULTS OF TWO SETS OF CALCULATIONS: (1) REGIONAL TEMPERATURE EFFECTS ARE STUDIED FOR DIFFERENT WASTE FORMS, REPOSITORY DIMENSIONS AND ROCK FORMATIONS. THE TYPE OF REPROCESSING TREATMENT AND THE LENGTH OF COOLING PERIOD OF THE NUCLEAR WASTES BEFORE EMPLACEMENT INTO THE REPOSITORY ARE FOUND TO BE TWO OF THE MORE IMPORTANT FACTORS. (2) THERMALLY INDUCED FLUID FLOW IS CALCULATED ASSUMING A SIMPLE TWO-FRACTURE SYSTEM TO MAKE A WORST CASE ESTIMATE OF THE TRANSIT TIME OF WATER FROM REPOSITORY TO GROUND SURFACE. RECHARGE CAPACITY FROM THE SURROUNDING FORMATION IS FOUND TO BE A CONTROLLING FACTOR, ALTHOUGH THE THERMO-HYDROLOGIC MODEL USED FOR THE ANALYSIS PRESENTED IN THIS PAPER IS VERY SIMPLE, IT SHOULD POSSESS THE SAME PHYSICAL BEHAVIOR AS THAT OF THE MORE COMPLEX REPOSITORY SYSTEMS. IT MUST BE POINTED OUT THAT THE TRANSPORT OF NUCLIDES DOES NOT TAKE PLACE AT THE SAME RATE AS THAT OF THE GROUNDWATER. THE CALCULATIONS REPORTED IN THIS PAPER SUGGEST THAT THE MAGNITUDE OF THE THERMALLY INDUCED BUOYANT GROUNDWATER FLOW CARRYING TOXIC WASTES FROM A REPOSITORY TO THE BIOSPHERE DEPENDS UPON MANY FACTORS. OF THESE, THE AGGREGATE INCREASE IN THE TEMPERATURE OF THE ROCK MASS CONTAINING THE REPOSITORY IS ONE OF THE MOST IMPORTANT. THIS TEMPERATURE IS AFFECTED BY THE DESIGN OF THE REPOSITORY, THE KIND OF NUCLEAR WASTE BURIED IN IT AND THE PERIOD FOR WHICH THIS WASTE HAS BEEN COOLED NEAR SURFACE BEFORE BURIAL. SIGNIFICANT DIFFERENCES EXIST BETWEEN REPHROCESSED WASTE AND SPENT FUEL IN RESPECT OF THE DEGREE TO WHICH THE ROCK MASS IS HEATED AND HENCE THE TIME TAKEN FOR GROUNDWATER TO REACH THE SURFACE BY BUOYANT FLOW. THE HEAT CAPACITY OF DIFFERENT KINDS OF ROCKS HAS A SIGNIFICANT EFFECT ON BUOYANT GROUNDWATER FLOW ALSO. FINALLY, THE BUOYANT GROUNDWATER FLOW ALSO DEPENDS STRONGLY UPON THE RATIO OF THE HYDRAULIC TRANSMISSIVITIES OF THE VERTICAL AND HORIZONTAL FRACTURES.

125

ENVIRONMENTAL IMPACTS OF HIGH LEVEL RADIOACTIVE WASTE
DISPOSAL

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760f01

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IEEE TRANS. NUCL. SCI. 23(1):56-59.

L,2,D;L,3,D;L,6,D ;L,5,D

THE POTENTIAL HAZARDS OF HIGH LEVEL WASTE PRODUCED IN ONE YR BY ALL NUCLEAR POWER IN THE U.S. ARE CALCULATED AS A FUNCTION OF TIME FOR DIRECT GAMMA RADIATION, INHALATION, AND INGESTION. SCALES ARE GIVEN FOR CONSEQUENCES OF THE WORST CREDIBLE HANDLING. THE PROBABILITY FOR RADIOACTIVITY FROM BURIED WASTE TO BE RELEASED INTO THE ENVIRONMENT BY SEVERAL PATHWAYS IS ESTIMATED. SOME INTERESTING COMPARISONS ARE GIVEN FOR LETHAL EFFECTS PRODUCED BY INHALATION OR INGESTION OF OTHER MATERIALS FOUND IN THE ENVIRONMENT.

126

AN APPLICATION OF GEOMETRIC PROBABILITY TO THE EXISTENCE OF
FAULTS IN ANISOTROPIC MEDIA

CONF-791112

CRANWELL, R.M.; DONATH, F.A.

800101

PLENUM PRESS, NEW YORK

SANDIA LABORATORIES

SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT. VOL. 2. PP.
787-794.

L,3,C;L,5

THREE PRIMARY ASPECTS OF FAULTS WHICH RELATE TO THEIR POTENTIAL FOR DEGRADATION OF A REPOSITORY SITE ARE: THE POSSIBILITY OF AN EXISTING BUT UNDETECTED FAULT INTERSECTING THE REPOSITORY SITE; THE POTENTIAL FOR A NEW FAULT OCCURRING AND PROPAGATING THROUGH THE REPOSITORY SITE; THE ABILITY OF ANY SUCH FAULT TO TRANSMIT GROUNDWATER. GIVEN THAT A FAULT MIGHT BE PRESENT IN THE REGION SURROUNDING THE SITE, THE PROBABILITY THAT IT INTERSECTS THE SITE DEPENDS PRIMARILY ON ITS ORIENTATION AND ON THE DENSITY OF FAULTING IN THE AREA. ONCE THESE PARAMETERS ARE KNOWN, A MODEL CAN BE DEVELOPED TO DETERMINE THE PROBABILITY THAT AN EXISTING BUT UNDETECTED FAULT WILL INTERSECT THE REPOSITORY SITE. SIMILAR TECHNIQUES CAN BE USED TO ESTIMATE THE POTENTIAL FOR NEW FAULTS OCCURRING AND INTERSECTING SITE, OR INTERSECTION FROM PROPAGATION ALONG EXISTING FAULTS. HOWEVER, ADDITIONAL DATA INCLUDING IN SITU STRESS MEASUREMENTS AND RECORDS OF SEISMIC ACTIVITY WOULD BE NEEDED. ONE CAN ESTIMATE THE STRESS LEVEL AT WHICH THE STRENGTH IN THE SURROUNDING MEDIA WILL BE EXCEEDED, AND THUS DETERMINE A TIME-DEPENDENT PROBABILITY OF MOVEMENT ALONG A PRE-EXISTING FAULT OR OF A NEW FAULT OCCURRING, FROM A PREDICTED RATE OF CHANGE IN LOCAL STRESSES. IN SITU STRESS MEASUREMENTS TAKEN AT INTERVALS OF TIME COULD AID IN DETERMINING THE RATE OF STRESS CHANGE IN THE SURROUNDING MEDIA, ALTHOUGH MEASURABLE CHANGES MIGHT NOT OCCUR

OVER THE AVAILABLE PERIOD OF OBSERVATION, IN SITU STRESS MEASUREMENTS MIGHT ALSO AID IN ASSESSING THE ABILITY OF EXISTING FAULTS TO TRANSMIT FLUIDS.

127

THE WATERPROOF GEOMETRY OF SALT DOMES, AN IMPORTANT SAFETY ASPECT FOR THEIR EXPLOITATION FOR ULTIMATE DISPOSAL OF HIGH-LEVEL WASTE

STU/PUB/433

HAMSTRA, J.

760101

IAEA, VIENNA

REACTOR CENTRUM NEDERLAND

MANAGEMENT OF RADIOACTIVE WASTE, VOL. 2, PP. 295-301.

L,1;L,2;L,5

SALT DOMES USED AS POSSIBLE CONTAINMENT STRUCTURES FOR RADWASTE REPOSITORIES CAN ONLY FAIL IN THE LONG TERM THROUGH THE CONTINUOUS ACTION OF GROUNDWATER. THE POTENTIAL FAILURE MECHANISM WILL NOT BE THE GROUNDWATER PENETRATING INTO THE REPOSITORY AREA, AS LONG AS THE SALT DOME STILL REMAINS IN CONTACT WITH ITS SALT MATRIX. THE BUOYANT FORCE OF THE SEDIMENTS OVERLYING AND SURROUNDING THE SALT DOME WILL, UNDER CERTAIN STRESS CONDITIONS, ENABLE SALT TO MIGRATE TOWARDS THE DISSOLVING SURFACE AT SUCH A RATE THAT THE SALT DOME WILL MAINTAIN ITS PIERCEMENT SHAPE, NOTWITHSTANDING THE CONTINUING DISSOLVING ACTION. IF THIS SALT MIGRATION SHOULD PROVE TO BE A CONTAINMENT FAILURE MECHANISM, IT MAY ONLY AFFECT THE WASTE REPOSITORY TO A LIMITED EXTENT AND AFTER A VERY LONG PERIOD OF TIME. MODEL STUDIES MIGHT REVEAL WHETHER IT IS STILL REALISTIC TO ADAPT THE LAYOUT OF THE WASTE REPOSITORIES INSIDE SALT DOMES TO THE SALT MIGRATION PATHWAYS.

128

TREATMENT AND IMMOBILIZATION OF INTERMEDIATE-LEVEL RADIOACTIVE WASTE

CONF-770512

LERCH, R.E.; GREENALGH, W.O.; PARTRIDGE, J.A.; RICHARDSON, G.L.

790101

PERGAMON PRESS, NEW YORK

HANFORD ENGINEERING DEVELOPMENT LABORATORY

MANAGEMENT OF LOW LEVEL RADIOACTIVE WASTE, VOL. 1, PP. 513-550.

N,1;N,6

A NEW PROGRAM UNDERWAY AT HEDL TO DEVELOP AND DEMONSTRATE TREATMENT AND IMMOBILIZATION TECHNOLOGIES FOR INTERMEDIATE-LEVEL WASTES (ILW) GENERATED IN THE NUCLEAR FUEL CYCLE IS DISCUSSED. ILW ARE DEFINED AS THOSE LIQUID AND SOLID RADIOACTIVE WASTES, OTHER THAN HIGH-LEVEL WASTES AND FUEL CLADDING HULLS, THAT IN PACKAGED FORM HAVE RADIATION DOSE READINGS GREATER THAN 200 MILLIREM/HR AT THE PACKAGED SURFACE AND 10 MILLIREM/HR AT THREE FEET FROM THE SURFACE. THE IAEA VALUE OF 10 TO THE 4TH CI/CL M

FOR ILW DEFINES THE UPPER LIMIT, FOR COMPARATIVE PURPOSES, REFERENCE IS MADE TO CERTAIN ASPECTS OF LOW-LEVEL RADIOACTIVE WASTES (LLW). INITIAL WORK HAS DEFINED THE SOURCES, QUANTITIES AND TYPES OF WASTES WHICH COMPRISE ILW. BECAUSE OF THE WIDE DIFFERENCES IN COMPOSITION (E.G. ACIDS, SALT SOLUTIONS, RESINS AND ZEOLITES, HEPA FILTERS, ETC.) THE WASTES MAY REQUIRE DIFFERENT TREATMENTS, PARTICULARLY THOSE WASTE CONTAINING VOLATILE CONTAMINANTS, THE VARIOUS TYPES OF ILW HAVE BEEN GROUPED INTO CATEGORIES AMENABLE TO SIMILAR TREATMENT, LABORATORY STUDIES ARE UNDERWAY TO DEFINE TREATMENT TECHNOLOGIES FOR LIQUID ILW WHICH CONTAIN VOLATILE CONTAMINANTS AND TO DEFINE IMMOBILIZATION PARAMETERS FOR THE RESIDUES RESULTING FROM TREATMENT OF ILW. IMMOBILIZATION AGENTS INITIALLY BEING EVALUATED FOR THE VARIOUS RESIDUES INCLUDE CEMENT, UREA-FORMALDEHYDE, AND BITUMEN ALTHOUGH OTHER IMMOBILIZATION AGENTS WILL BE STUDIED. THE PROGRAM ALSO INCLUDES DEVELOPMENT OF PROPOSED CRITERIA FOR STORAGE, TRANSPORTATION, AND DISPOSAL OF THE IMMOBILIZED ILW.

129

WRAPPING UP THE NUCLEAR FUEL CYCLE. PT. 1. REPROCESSING NUCLEAR POWER'S SPENT FUEL

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760101

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, NEW YORK

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

MECH. ENG. 98(12):32-39.

J,1,A;J,1,B;J,1,C;J,1,D;J,5,A;J,5,B;J,5,C;J,5,D

REPROCESSING BASICALLY ENTAILS RECOVERING U AND PU FROM SPENT FUEL FOR REUSE IN LIGHT WATER REACTORS (LWRs). THE WASTES RESULTING FROM THIS PROCESS ARE TRANSFORMED TO PRODUCTS SUITABLE FOR DISPOSAL. THESE ENDEAVORS EXTEND U SUPPLIES AND ALSO REDUCE THE SIZE AND AMOUNT OF NUCLEAR WASTE THAT MUST BE STORED. REPROCESSING, HOWEVER, ALSO "UNLOCKS" THE FUEL RODS THAT CURRENTLY IMPRISON RADIOACTIVE SUBSTANCES. IF GREAT CARE IS NOT TAKEN, IT COULD RIP OPEN A PANDORA'S BOX, EXPOSING REPROCESSING PLANT WORKERS, THE GENERAL PUBLIC, AND THE ENVIRONMENT TO DEADLY RADIOACTIVE SUBSTANCES. WHILE NO COMMERCIAL REPROCESSING PLANTS ARE CURRENTLY OPERATING IN THE U.S., A SCENARIO FOR SUCH EFFORTS HAS BEEN MAPPED OUT. THE FIRST STEP IS TO CHOP THE FUEL ELEMENTS INTO SMALL PIECES SO THAT THE FUEL IS NO LONGER PROTECTED BY ITS CORROSION-RESISTANT CLADDING. THE FUEL IS THEN DISSOLVED AWAY FROM THE CLADDING WITH NITRIC ACID. AN ORGANIC SOLVENT EXTRACTS PU AND U, AND ADDITIONAL SOLVENT EXTRACTION OR ION EXCHANGE OPERATIONS SEPARATE THE TWO SUBSTANCES. PU IS CONVERTED TO PU OXIDE; U-235 IS CONVERTED TO OXIDE. THEY CAN THEN BE COMBINED TO MAKE MIXED OXIDE FUEL. THEN IT CAN BE FORMED INTO FUEL ELEMENTS FOR USE IN NUCLEAR REACTORS. VARIOUS WASTES WITH VARIED LEVELS OF RADIOACTIVITY ARE GENERATED DURING THESE OPERATIONS. ALL DEMAND ATTENTION. RADIOACTIVE GASEOUS WASTE MOST

OFTEN IS FILTERED BEFORE RELEASE THROUGH TALL STACKS. METAL SOLID WASTE (DEBRIS, FUEL CLADDINGS, AND HULLS) MAY BE COMPACTED OR CRYOGENICALLY CRUSHED AND STORED AT SPECIALLY DESIGNED STORAGE SITES. CONTAMINATED COMBUSTIBLES, SUCH AS PAPER AND RESINS, ARE INCINERATED AND THE ASH IS FIXED AND PACKAGED FOR STORAGE. THE PLANS OF ALLIED-GENERAL NUCLEAR SERVICES, WHICH CLAIMS TO HAVE THE CLOSEST THING IN THE U.S. TO A REPROCESSOR ARE DESCRIBED.

130

TECHNOLOGY ASSESSMENT AND NUCLEAR WASTE MANAGEMENT

TREVORROW, L.E; STEINDLER, M.J.

790101

AMERICAN CHEMICAL SOCIETY, WASHINGTON, DC

ARGONNE NATIONAL LABORATORY

CHEMTECH 9(2):88-96.

J,1,A;J,1,B;J,1,C;J,1,D;J,2,A;J,2,B;J,2,C;J,2,D; J,3,A;J,3,B;J,3,C;J,3,D;L,1,A;L,1,B;L,1,C;L,1,D; L,2,A;L,2,B;L,2,C;L,2,D;L,3,A;L,3,B;L,3,C;L,3,D ;O,1;O,2;O,3

THE PROBLEMS ASSOCIATED WITH THE MANAGEMENT OF NUCLEAR WASTES ARE USED TO ILLUSTRATE THE METHODS OF TECHNOLOGY ASSESSMENT (TA). A GENERAL REVIEW DESCRIBES THE ORIGINS AND CHARACTERIZATIONS OF THE WASTES, METHOD OF GENERATION IN NUCLEAR FACILITIES, HOW THEY MIGHT ESCAPE DURING REPROCESSING, THE RECOVERY OF FISSIONABLE MATERIAL, AND THE DANGERS INVOLVED. THE SEQUENCE OF TECHNOLOGY AND PROCEDURES FOR WASTE MANAGEMENT CONSIST OF THREE STEPS: WASTE CONVERSION, TRANSPORTATION, AND FINAL DISPOSAL. THE FOLLOWING IS A LIST OF METHODS WHICH HAVE BEEN USED TO ASSESS NUCLEAR WASTE TECHNOLOGIES: (1) COST/BENEFIT AND RISK/BENEFIT RATIOS; (2) SYSTEMS ANALYSIS; (3) DECISION ANALYSIS; (4) INPUT-OUTPUT ANALYSIS; (5) TREND ANALYSIS; (6) SURVEY AND DELPHI METHODS; (7) MODELING AND SIMULATION; AND (8) FAULT TREE ANALYSIS.

131

AN ANALYSIS ON THE USE OF ENGINEERED BARRIERS FOR GEOLOGIC ISOLATION OF SPENT FUEL

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810101

PLENUM PRESS, NEW YORK

PACIFIC NORTHWEST LABORATORY

SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT. VOL. 3. PP. 607-614.

L,1;L,5;L,9,L,0

THIS ANALYSIS IS BASED ON ESTIMATING THE POTENTIAL RELEASE FROM A DEEP GEOLOGIC REPOSITORY DUE TO A SCENARIO INVOLVING GROUNDWATER INTRUSION INTO THE REPOSITORY, LEACHING AND TRANSPORT OF NUCLIDES TO THE SURFACE AND TRANSPORT OF THE

NUCLIDES IN THE BIOSPHERE WHERE THEY INTERACT WITH HUMANS. RESULTS ARE COMPLETED IN CONSIDERABLE DETAIL FOR A REFERENCE SALT SITE REPOSITORY AND IN SOMEWHAT LESS DETAIL FOR REFERENCE GRANITE, BASALT AND SHALE SYSTEMS. PRIMARY NUCLIDES OF CONCERN ARE TC-99, I-129, RA-226 + DAUGHTERS (U), NP-237 (AM, NP)23 U-233, AND FOR THE EXTREME CASE OF THE WELL SCENARIO, SR-90.

132

NUCLEAR WASTE FORM RISK ASSESSMENT FOR U.S. DEFENSE WASTE
AT SAVANNAH RIVER PLANT. ANNUAL REPORT FISCAL YEAR 1980
UCRL-53188-80

CHEUNG, H.; JACKSON, D.D.; REVELLI, M.A.

810101

LAWRENCE LIVERMORE LABORATORY, LIVERMORE, CA. 133 P.

LAWRENCE LIVERMORE LABORATORY

L,1;L,2;L,7;L,8

WASTE FORM DISSOLUTION STUDIES AND PRELIMINARY PERFORMANCE ANALYSES WERE CARRIED OUT TO CONTRIBUTE A PART OF THE DATA NEEDED FOR THE SELECTION OF A WASTE FORM FOR THE DISPOSAL OF SAVANNAH RIVER PLANT DEFENSE WASTE IN A DEEP GEOLOGIC REPOSITORY. THE FIRST PORTION OF THIS WORK PROVIDES DESCRIPTIONS OF THE CHEMICAL INTERACTIONS BETWEEN THE WASTE FORM AND THE GEOLOGIC ENVIRONMENT. WE REVIEWED CRITICALLY THE DISSOLUTION/LEACHING DATA FOR BOROSILICATE GLASS AND SYNROC. BOTH CHEMICAL KINETIC AND THERMODYNAMIC MODELS WERE DEVELOPED TO DESCRIBE THE DISSOLUTION PROCESS OF THESE CANDIDATE WASTE FORMS SO AS TO ESTABLISH A FUNDAMENTAL BASIS FOR INTERPRETATION OF ALTERNATE WASTE FORMS UPON THE CONSEQUENCES OF DISPOSAL IN VARIOUS PROPOSED GEOLOGICAL MEDIA. EMPLOYING SYSTEMS ANALYSIS METHODOLOGY, EVALUATION OF THE PERFORMANCE OF A GENERIC WASTE FORM FOR THE CASE OF A HIGH RISK SCENARIO FOR A BEDDED SALT REPOSITORY WAS BEGUN. RESULTS OF SENSITIVITY ANALYSIS, UNCERTAINTY ANALYSES, AND SENSITIVITY TO UNCERTAINTY ANALYSIS ARE PRESENTED.

133

COMPARISON OF POTENTIAL RADIOLOGICAL CONSEQUENCES FROM A
SPENT-FUEL REPOSITORY AND NATURAL URANIUM DEPOSITS

PNL-3540

WICK, O.J.; CLONINGER, M.O.

800101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 75 P.

PACIFIC NORTHWEST LABORATORY

L,1;L,2;L,5,B;L,5,C;L,5,D;L,6;L,9;N,1;N,2;N,5,U;N,5,L;N,9;P,1;P,2;P,5,D;P,5,L;P,9

THE COMPARISON RESULTS SHOW THAT THE REPOSITORIES ARE QUITE COMPARABLE TO THE NATURAL ORE DEPOSITS, AND, IN SOME CASES, PRESENT LESS RADIOLOGICAL HAZARD THAN THEIR NATURAL COUNTERPARTS. ON THE BASIS OF THE FIRST COMPARISON, PLACING SPENT FUEL IN A DEEP GEOLOGIC REPOSITORY APPARENTLY REDUCES THE

HAZARD FROM NATURAL RADIOACTIVE MATERIALS OCCURRING IN THE EARTH'S CRUST BY LOCATING THE WASTE IN IMPERMEABLE STRATA WITHOUT ACCESS TO OXIDIZING CONDITIONS. ON THE BASIS OF THE SECOND COMPARISON, A REPOSITORY CONSTRUCTED WITHIN REASONABLE CONSTRAINTS PRESENTS NO GREATER HAZARD THAN A LARGE ORE DEPOSIT. EVEN WITHOUT SUCH CONSTRAINTS, HOWEVER, THE NATURAL HAZARD DUE TO SOME OBSERVED RADIOACTIVE RELEASES TO THE BIOSPHERE IN THE U.S. FAR EXCEEDS ANY HAZARD THAT COULD REASONABLY BE EXPECTED FROM A SPENT-FUEL REPOSITORY.

134

RADON EXHALATION FROM URANIUM MILL TAILINGS PILES.

DESCRIPTION AND VERIFICATION OF THE MEASUREMENT METHOD

ORP/LV-75-7(A)

BERNHARDT, D.E.; JOHNS, F.B.; KAUFMANN, R.F.

750101

U.S. EPA, OFFICE OF RADIATION PROGRAMS, LAS VEGAS FACILITY, LAS VEGAS, NV. 39 P.

U.S. EPA

E,5,D;E,9,D

U MILL TAILINGS PILES RESULT IN SEVERAL SOURCES OF RADIATION EXPOSURE. THESE EXPOSURES ARE PRIMARILY FROM CONCENTRATIONS OF THE U PROGENY TH-230, RA-226, AND RN-222 IN THE TAILINGS. RN-222 AND ITS PROGENY ARE A SOURCE OF EXTERNAL GAMMA AND LUNG EXPOSURE. USING THE ACCUMULATION TECHNIQUE, FIELD MEASUREMENTS OF THE RN FLUX FROM URANIUM MILL TAILINGS WERE MADE AT THREE MILLS AND AT ONE EXPERIMENTAL PLOT. THE SAMPLE COLLECTION TECHNIQUE, METHOD OF CALCULATING RESULTS, AND REPRODUCIBILITY OF THE TECHNIQUE ARE DESCRIBED. THE EXHALATION DATA (FCI/SQ CM-SEC) REVEAL THAT REPRODUCIBILITY IS WITHIN ABOUT 10% AND THAT THE VARIATION IS LESS THAN THE UNCERTAINTY ASSOCIATED WITH THE LINEAR REGRESSION ANALYSIS OF THE ACCUMULATED RADON CONCENTRATION VERSUS TIME. LONG TERM MEASUREMENTS (GREATER THAN ABOUT 8 HRS) RESULT IN ACCUMULATED CONCENTRATIONS THAT APPROACH THE RADON CONCENTRATION IN THE SURFACE SOIL GAS, AND INVALIDATE THE ASSUMPTIONS INHERENT IN THE ACCUMULATION TECHNIQUE.

135

RISK INVOLVED IN THE STORAGE OF RADIOACTIVE WASTES FROM NUCLEAR POWER PLANTS

ORNL-TR-4409

GRUEMM, H.

780101

NTIS. 17 P.

L,1;L,2;L,5;M,1;M,2;M,5

BOTTLENECKS STILL EXIST IN THE FUEL CYCLE OF NUCLEAR POWER PLANTS. THESE PLANTS WILL HAVE PRODUCED CUMULATIVELY APPROX. 53, 000 TONS OF U BY 1985, INCLUDING 500 TONS PU AND 1,500 TONS HIGH-ACTIVITY WASTES. THESE RADIOACTIVE WASTES ARE PUT INTO

PERSPECTIVE BY COMPARISON WITH OTHER INDUSTRIAL WASTES SUCH AS CARBON DIOXIDE AND LEAD. THE PROBLEM OF DISPOSING OF THESE RADIOACTIVE WASTES IS NEXT CONSIDERED; TWO METHODS BEING PURSUED CURRENTLY ARE TEMPORARY ABOVE-GROUND STORAGE IN MAN-MADE STRUCTURES AND PERMANENT STORAGE IN STABLE GEOLOGICAL FORMATIONS SUCH AS SALT DOMES. THE RISK OF WATER PENETRATION INTO THE SALT DEPOSIT IS REDUCED BY SOLIDIFYING THE WASTES BEFOREHAND. THE VARIOUS SOLIDIFICATION PROCESSES UNDER DEVELOPMENT ARE DESCRIBED;

IT IS POINTED OUT THAT THE WASTES FROM A 1000-MW(E) NUCLEAR POWER PLANT IN ONE YR IS IN THE FORM OF ONE 30 CM DIA X 3 M LONG CYLINDER. THE FISSION PRODUCTS IN THE OKLO DEPOSIT HAVE MOVED ONLY A FEW METERS AWAY FROM THEIR POINT OF ORIGIN. THE WASTES FROM BOMB PRODUCTION ARE 700 TIMES THOSE FROM NUCLEAR POWER PLANTS. PU IS DISCUSSED, AND ITS HAZARDS ARE SHOWN TO BE EXAGGERATED. IT IS CONCLUDED THAT THE NUCLEAR WASTE DEPOSITS WOULD BE A SMALLER DANGER TO FUTURE GENERATIONS THAN KNOWLEDGE ABOUT THE MILITARY UTILIZATION OF NUCLEAR ENERGY. (TRANSL. OF SGAE-2650. , SEPT. 1976)

136

ANALYSIS OF INTERACTIONS OF MECHANICAL DEFORMATIONS AND
MASS TRANSFER ON HEAT TRANSFER FROM AN UNDERGROUND
NUCLEAR WASTE REPOSITORY

ONR-64

BLOOM, S.G.; HULBERT, L.E.

790101

BATTELLE, OFFICE OF NUCLEAR WASTE ISOLATION, COLUMBUS, OH. 27 P.
BATTELLE COLUMBUS LABORATORIES

L,5;L,7;C,5;C,7

THIS RESEARCH PROGRAM CONSISTED OF FIVE TASKS: (1) REVIEW EXISTING MODELS OF HEAT TRANSFER AND THERMAL STRESS IN GEOLOGIC MATERIALS, (2) DEVELOP MATHEMATICAL FORMULATIONS FOR MECHANISMS OF INTERACTIONS THAT ARE MISSING FROM EXISTING MODELS, (3) EXAMINE THE MAGNITUDE OF THESE INTERACTIONS USING SIMPLIFIED ANALYTICAL PROCEDURES, (4) DEVELOP APPROX. METHOD AND MODELS TO SIMULATE SIGNIFICANT INTERACTIONS, AND (5) RECOMMEND ANY ADDITIONAL EFFORTS THAT MIGHT BE APPROPRIATE TO BETTER QUANTIFY THE SIGNIFICANT INTERACTIONS. A REVIEW OF EXISTING MODELS IDENTIFIED SEVERAL EFFECTS THAT MAY NEED CONSIDERATION IN FUTURE MODEL DEVELOPMENT. MOST OF THESE EFFECTS INVOLVED COUPLING EQUATIONS THROUGH VARIABLE PROPERTY VALUES RATHER THAN THROUGH OMISSION OF ANY SIGNIFICANT MECHANISM. HOWEVER, IT WAS ALSO SHOWN THAT MORE THAN ONE MECHANISM MAY ADEQUATELY SIMULATE A GIVEN SET OF EXPERIMENTAL DATA AND ADDITIONAL EXPERIMENTAL DATA ARE NEEDED TO ESTABLISH WHICH (IF ANY) OF THE POSSIBLE MECHANISMS WOULD ACTUALLY CONTROL CONDITIONS IN A NUCLEAR WASTE REPOSITORY. IN PARTICULAR, IT IS BELIEVED THAT MATHEMATICAL MODELING OF MAJOR THERMOMECHANICAL EFFECTS CAN BE ACCOMPLISHED WITH FINITE ELEMENT ANALYSIS COMPUTER PROGRAMS, PROVIDED THAT ADEQUATE THERMOMECHANICAL PROPERTY DATA OF SALT AND OVERBURDEN ARE ATTAINED.

137

AN ASSESSMENT OF LWR SPENT FUEL DISPOSAL OPTIONS. VOL. 3.
STUDY BASES AND SYSTEM DESIGN CONSIDERATIONS
(APPENDICES)

ONWI-39

BECHTEL NATIONAL, INC., NUCLEAR FUEL OPERATIONS, SAN FRANCISCO
790101

BATTELLE, OFFICE OF NUCLEAR WASTE ISOLATION, COLUMBUS, OH, 300
P..

BECHTEL NATIONAL, INC.

L,1;L,9;M,1;M,9;U,1;O,9

THE APPENDICES PROVIDE A TABULATION OF THE BASES AND
ASSUMPTIONS USED IN THE STUDY AS WELL AS PRECONCEPTUAL DESIGN
DESCRIPTIONS AND COST ESTIMATES OF THE FACILITIES AND
TRANSPORTATION SYSTEMS NECESSARY TO IMPLEMENT THE VARIOUS STUDY
CASES.

138

DRY STORAGE OF SPENT NUCLEAR FUEL, A PRELIMINARY SURVEY OF
EXISTING TECHNOLOGY AND EXPERIENCE

NUREG/CR-1223

ANDERSON, P.A.; MEYER, H.S.

800101

U.S. NRC, WASHINGTON, DC. 200 P.

EXXON NUCLEAR IDAHO CO., INC.

L,1;L,2;M,1;K,2

A SURVEY WAS MADE OF THE OPERATING AND EXPERIMENTAL DRY
STORAGE FACILITIES FOR IRRADIATED NUCLEAR FUELS AT THE IDAHO
NATIONAL ENGINEERING LABORATORY, HANFORD RESERVATION, AND NEVADA
TEST SITE IN THE U.S., AT THE WHITESHELL NUCLEAR RESEARCH
ESTABLISHMENT IN CANADA, AND AT THE WYLFA POWER STATION IN
ENGLAND. THE DESIGN, SAFETY FEATURES, AND OPERATIONAL
EXPERIENCES FOR EXISTING CANYON-, CAISSON-, AND SEALED STORAGE
CASK-MODE STORAGE FACILITIES ARE GIVEN.

139

RISK ANALYSIS METHODOLOGY AND DATA: STUDY OF ALTERNATIVES
FOR LONG-TERM MANAGEMENT OF HANFORD DEFENSE HIGH-LEVEL
RADIOACTIVE WASTE

NSC-PS-ARH-77001

NUCLEAR SERVICES CORP.

770101

NUCLEAR SERVICES CORP., CAMPBELL, CA. 176 P.

NUCLEAR SERVICES CORP.

K,1;K,2;K,3;K,4,A;K,4,C;K,4,E;K,4,G;K,5,B;K,5,D;K,5,F;K,5,H;K,7;
K,9;K,0,A;K,0,B;K,0,C;K,0,D;K,0,E;K,0,F;K,0,G;K,0,H;L,1;L,2;
L,3;L,4,A;L,4,C;L,4,E;L,4,G;L,5,B;L,5,D;L,5,F;L,5,H;L,7;L,9;
L,0,A;L,0,B;L,0,C;L,0,D;L,0,E;L,0,F;L,0,G;L,0,H;O,1;O,2;O,3;

O,4,A;O,4,C;O,4,E;O,4,G;U,5,B;O,5,D;O,5,F;O,5,H;O,7;O,9;O,U,
A;O,0,B;O,0,C;O,0,D;O,0,E;O,0,F;O,0,G;O,0,H

THIS REPORT PROVIDES INFORMATION ON THE RISK ANALYSIS PERFORMED IN CONJUNCTION WITH THE STUDY OF ALTERNATIVES FOR THE LONG-TERM MANAGEMENT OF THE DEFENSE HLW AT THE HANFORD RESERVATION. THE RISK ANALYSIS WAS DONE ON A MODULAR BASIS. THE MODULES INCLUDE: WASTE RETRIEVAL, WASTE PREPARATION, WASTE IMMOBILIZATION, TRANSPORTATION, AND STORAGE AND DISPOSAL. BASED ON THE VALUES OBTAINED IN THIS RISK ANALYSIS, IT IS APPARENT THAT THE OVERALL RISK EITHER TO AN INDIVIDUAL OR TO THE POPULATION IS EXTREMELY LOW.

140

ALTERNATIVES FOR LONG-TERM MANAGEMENT OF DEFENSE HIGH-LEVEL RADIOACTIVE WASTE: IDAHO CHEMICAL PROCESSING PLANT, IDAHO FALLS, IDAHO

ERDA 77-43

U.S. ERDA

770101

NTIS. 178 P.

U.S. ERDA

K,1;K,2;K,3;K,5,B;K,5,D;K,7;K,9;K,0,B;K,0,D;L,1;L,2;L,3;L,5,B;L,5,D;L,7;L,9;L,0,B;L,0,D; O,1;O,2;O,3;O,5,B;O,5,D;O,7;O,9;O,0,B;O,0,D

ALTERNATIVES FOR LONG-TERM MANAGEMENT OF RADIOACTIVE "DEFENSE WASTES" LOCATED AND GENERATED AT THE IDAHO CHEMICAL PLANT ARE DESCRIBED AND EVALUATED. THE COSTS AND RISKS ASSOCIATED WITH VARIOUS DISPOSAL LOCATIONS AND WASTE FORMS ARE COMPARED. ADDITIONAL DEVELOPMENT AND DESIGN DATA WILL BE REQUIRED BEFORE A SPECIFIC ALTERNATIVE CAN BE CHOSEN.

145

HEALTH IMPACT ASSESSMENT OF CARBON-14 EMISSIONS FROM NORMAL OPERATIONS OF URANIUM FUEL CYCLE FACILITIES

EPA 520/5-80-004; PB-81-234 460

FOWLER, T.W.; NELSON, C.B.

800101

NTIS

U.S. EPA, EASTERN ENVIRONMENTAL RADIATION FACILITY, MONTGOMERY, AL

J,2;J,5,B;J,5,D;J,9;J,0,B;J,0,D;P,2;P,5,B;P,5,D;P,9;P,0,B;P,0,D

IN A 1976 STUDY BY THE U.S. EPA ESTIMATED THE PUBLIC HEALTH IMPACT OF C-14 DISCHARGES FROM THE LIGHT-WATER-COOLED REACTOR (LWR) NUCLEAR POWER INDUSTRY. THIS STUDY REPORTED HERE EVALUATES THE ENVIRONMENTAL IMPACT OF C-14 DISCHARGES FROM LWR'S AND LWR FUEL REPROCESSING FACILITIES AND UPDATES THE 1976 EPA ESTIMATES. THE RESULTS OF THIS STUDY WILL BE USED TO HELP DELIBERATE THE NEED FOR A NATIONAL ENVIRONMENTAL STANDARD FOR C-14 ON EMISSIONS FROM NORMAL OPERATIONS OF U FUEL CYCLE FACILITIES. FOR A GIVEN RELEASE OF C-14 TO THE ATMOSPHERE, 5% OF

THE ENVIRONMENTAL DOSE COMMITMENT IS DELIVERED IN THE FIRST 100 YRS AFTER RELEASE, 50% IN 5,000 YRS, AND THE BALANCE TENS TO THOUSANDS OF YRS AFTER RELEASE. THE ADDITIONAL FATAL CANCER RISK TO ANY SINGLE INDIVIDUAL DUE TO C-14 EMISSIONS FROM LWR FACILITIES IS ESTIMATED TO BE SMALL. THE FATAL CANCERS AND GENETIC EFFECTS COMMITTED TO THE WORLD POPULATION DUE TO C-14 EMISSIONS FROM LWR FACILITIES IS ALSO SMALL COMPARED TO THE FATAL CANCERS AND GENETIC EFFECTS FROM ENVIRONMENTAL C-14 SOURCES SUCH AS COSMIC C-14 OR C-14 RELEASED DURING NUCLEAR WEAPONS TESTING. THE PRIMARY CONCERN OVER UNCONTROLLED DISCHARGES OF C-14 FROM LWR FACILITIES IS THE CUMULATIVE FATAL CANCERS AND GENETIC EFFECTS COMMITTED TO THE WORLD POPULATION OVER LONG PERIODS OF TIME.

146

ANALYSIS OF THE EFFECTS OF ABNORMAL NATURAL PHENOMENA ON
EXISTING PLUTONIUM FABRICATION PLANTS

CONF-770554

AYER, J.E.; BURKHARDT, W.

770101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

U.S. NRC

PLUTONIUM FUEL RECYCLE CONF. PROC. PP. V.6.1-V.6.9.

C,2;C,4;C,5;C,7;1,2;1,7

TITLE 10 CFR REQUIRES THAT EXISTING LICENSED PLUTONIUM FABRICATION PLANTS BE EXAMINED TO DETERMINE THEIR ABILITY TO WITHSTAND ADVERSE NATURAL PHENOMENA. THE NUCLEAR REGULATORY COMMISSION HAS STARTED THE ANALYSIS ON A SITE AND PLANT SPECIFIC BASIS USING A TEAM OF HIGHLY QUALIFIED REVIEWERS. THE NATURAL PHENOMENA BEING CONSIDERED ARE RECURRENT SEVERE WEATHER, EARTHQUAKE, AND FLOOD. THE REVIEW WILL PROVIDE FOR EACH FACILITY A REALISTIC RA OF THE RANGE OF CREDIBLE CONSEQUENCES OF NATURAL PHENOMENA AND THE LIKELIHOOD THEREOF. THE RESULTS OF ANALYSIS WILL PROVIDE AN ASSESSMENT OF THE CONSEQUENCES TO THE PUBLIC OF EXPOSURE OF EACH PLANT TO POTENTIALLY DAMAGING NATURAL PHENOMENA AND A BASIS FOR DETERMINING MODIFICATIONS, IF ANY, NECESSARY TO IMPROVE AN EXISTING PLANT'S ABILITY TO WITHSTAND ADVERSE NATURAL PHENOMENA.

147

LICENSING EXPERIENCES, RISK ASSESSMENT DEMONSTRATION TEST
ON NUCLEAR FUEL PACKAGES AND DESIGN CRITERIA FOR SEA
GOING VESSEL CARRYING SPENT FUEL IN JAPAN

CONF-780506

AOKI, S.; IKEDA, K.

780501

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TOKYU INSTITUTE OF TECHNOLOGY

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROC. 5TH
INT. SYMP. PP. 127-134.

0,9

IN JAPAN SPENT FUELS FROM NUCLEAR POWER PLANTS SHALL BE SHIPPED TO REPROCESSING PLANTS BY SEA-GOING VESSELS. ATOMIC ENERGY COMMITTEE HAS INITIATED A BOARD OF EXPERTS TO IMPLEMENT THE ASSESSMENT OF ENVIRONMENTAL SAFETY FOR SEA TRANSPORT. AS A PART OF THE ASSESSMENT A STUDY HAS BEEN CONDUCTED BY CENTRAL RESEARCH INSTITUTE OF ELECTRIC POWER INDUSTRY UNDER SPONSORSHIP OF NUCLEAR SAFETY BUREAU, WHICH IS INTENDED TO GUARANTEE THE SAFETY OF SEA TRANSPORT, NUCLEAR SAFETY BUREAU ALSO HAS A PROGRAM TO CARRY OUT A LONG TERM DEMONSTRATION TEST ON SPENT FUEL PACKAGE USING FULL SCALE PACKAGE MODELS. THE TEST CONSISTS OF DROP, HEAT TRANSFER, FIRE, COLLAPSE UNDER HIGH EXTERNAL PRESSURE, IMMERSION, SHIELDING AND SUBCRITICAL TEST. THE PURPOSE OF THIS TEST IS TO OBTAIN THE PUBLIC ACCEPTANCE AND ALSO TO VERIFY THE ADEQUACY OF THE SAFETY ANALYSIS FOR NUCLEAR FUEL PACKAGES. IN ORDER TO SECURE THE SAFETY OF SEA TRANSPORT, THE MINISTRY OF TRANSPORTATION HAS PROVIDED FOR THE DESIGN CRITERIA FOR SEA-GOING VESSEL IN THE CASE OF FULL LOAD SHIPPING, WHICH AIMS TO MAKE MINIMUM THE PROBABILITY OF SINKING AT COLLISION, GROUNDING AND OTHER UNFORSEEN ACCIDENTS ON THE SEA AND ALSO TO RETAIN THE RADIATION EXPOSURE TO CREWS ALAP. THE DESIGN CRITERIA CONSISTS OF THE FOLLOWING ITEMS: STRUCTURAL STRENGTH OF VESSEL, COLLISION PROTECTIVE STRUCTURE, ARRANGEMENT OF HOLDS, STABILITY AFTER DAMAGE, GROUNDING PROTECTIVE STRUCTURE, COOLING SYSTEM, TIE-DOWN EQUIPMENT, RADIATION INSPECTION APPARATUS, DECONTAMINATION FACILITIES, EMERGENCY WATER FLOODING EQUIPMENT FOR SHIP FIRE, EMERGENCY ELECTRIC SOURCES, ETC. BASED ON THE DESIGN CRITERIA A SEA-GOING VESSEL NAMED HINDUKA-MARU HAS BEEN RECONSTRUCTED TO TRANSPORT SPENT FUEL PACKAGES FROM NUCLEAR POWER STATIONS TO THE REPROCESSING PLANT.

148

TRANSPORTATION ACCIDENTS: HOW PROBABLE?

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730101

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U.S. AEC

NUCL. NEWS 16(7):48-52.

0,3;0,4,A;0,4,B;0,4,E;0,4,F;0,5,A;0,5,B;0,5,E;0,5,F;0,9,A;0,9,B;
0,9,E;0,9,F

ON THE BASIS OF THE ANALYSIS DESCRIBED IN THIS PAPER, IT MAY BE STATED THAT THE THEORETICAL PROBABILITY OF OCCURENCE OF ALMOST ANY KIND OF TRANSPORTATION ACCIDENT SITUATION CAN BE ESTIMATED WITH A REASONABLE DEGREE OF ACCURACY. THE METHODOLOGY SHOWN MAY BE EXTENDED TO DIFFERENT TYPES OF ACCIDENTS OR DIFFERENT TYPES OF ACCIDENT CONSEQUENCES IN TERMS OF DAMAGE TO DIFFERENT TYPES OF PACKAGES. WITH REGARD TO THE PROBABILITY OF SERIOUS PUBLIC CONSEQUENCES OF TRANSPORTATION ACCIDENTS INVOLVING RADIOACTIVE MATERIALS, IT APPEARS THAT THE PROBABILITY OF DEATH, INJURY, OR MASSIVE PROPERTY LOSS DUE TO TRANSPORTATION

OF RADIOACTIVE MATERIALS IS (1) DETERMINABLE; (2) NOT ZERO; AND (3) VERY SMALL. IN PROJECTING THE TOTAL ACCIDENT PROBABILITY FOR TRANSPORTATION OF RADIOACTIVE MATERIALS TO AND FROM NUCLEAR POWER PLANTS, IT SEEMS OBVIOUS THAT THE RADIOLOGICAL CONSEQUENCES OF THE TOTAL ACCIDENT SPECTRUM WILL BE SEVERAL ORDERS OF MAGNITUDE BELOW THE MORE COMMON NON-RADIOLOGICAL CAUSES.

150

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE FOR USE IN ESTABLISHING "AS LOW AS PRACTICABLE" GUIDES--FABRICATION OF LIGHT-WATER REACTOR FUEL FROM ENRICHED URANIUM DIOXIDE

ORNL-TM-4902

PECHIN, W.H.; BLANCO, R.E.; DAHLMAN, R.C.; FINNEY, B.C.; LINDAUER, R.B.; WITHERSPUON, J.P.

750105

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN, 208 P.

OAK RIDGE NATIONAL LABORATORY

H,1;H,2;H,4,D;H,5,D;H,9;H,0,D

A COST-BENEFIT STUDY WAS MADE TO DETERMINE THE COST AND EFFECTIVENESS OF RADWASTE TREATMENT SYSTEMS FOR DECREASING THE RELEASE OF RADIOACTIVE MATERIALS FROM A MODEL ENRICHED-URANIUM, LWR FUEL FABRICATION PLANT, AND TO DETERMINE THE RADIOLOGICAL IMPACT (DOSE COMMITMENT) OF THE RELEASED MATERIALS ON THE ENVIRONMENT. THE STUDY IS DESIGNED TO ASSIST IN DEFINING THE TERM "AS LOW AS PRACTICABLE" IN RELATION TO LIMITING THE RELEASE OF RADIOACTIVE MATERIALS FROM NUCLEAR FACILITIES. THE BASE CASE MODEL PLANT IS REPRESENTATIVE OF CURRENT PLANT TECHNOLOGY AND HAS AN ANNUAL CAPACITY OF 1500 METRIC TONS OF LWR FUEL. ADDITIONAL RADWASTE TREATMENT EQUIPMENT IS ADDED TO THE BASE CASE PLANTS IN A SERIES OF CASE STUDIES TO DECREASE THE AMOUNTS OF RADIOACTIVE MATERIALS RELEASED AND TO REDUCE THE RADIOLOGICAL DOSE COMMITMENT TO THE POPULATION IN THE SURROUNDING AREA. THE COST FOR THE ADDED WASTE TREATMENT OPERATIONS AND THE CORRESPONDING DOSE COMMITMENT ARE CALCULATED FOR EACH CASE. IN THE FINAL ANALYSIS, RADIOLOGICAL DOSE IS PLOTTED VS. THE ANNUAL COST FOR TREATMENT OF THE RADWASTES. THE STATUS OF THE RADWASTE TREATMENT METHODS USED IN THE CASE STUDIES IS DISCUSSED. SOME OF THE TECHNOLOGY USED IN THE ADVANCED CASES IS IN AN EARLY STAGE OF DEVELOPMENT AND IS NOT SUITABLE FOR IMMEDIATE USE. THE METHODOLOGY USED IN ESTIMATING THE COSTS AND THE RADIOLOGICAL DOSES, DETAILED CALCULATIONS, AND TABULATIONS ARE PRESENTED IN APPENDIX A AND ORNL-4992 (ACN=189).

152

A RISK COMPARISON

NUREG/CR-1916; BNL/NUREG-51338

COPPOLA, A.; HALL, R.E.

810101

BROOKHAVEN NATIONAL LABORATORY, UPTON, NY. 85 P.
BROOKHAVEN NATIONAL LABORATORY
P,5,B

THIS REPORT PRESENTS DATA FOR THE COMPARISON OF SOCIETAL RISK FROM NATURAL AND MAN-MADE HAZARDS. ONLY FATALITIES RESULTING FROM THE HAZARDS ARE USED IN THE COMPARISON, WITH THE DATA AND THE COMPARATIVE ANALYSIS TAKEN FROM THE CURRENT LITERATURE. IN COMPARING SOCIETAL RISKS FOR MOST OF THE HAZARDS, BOTH EXPECTED VALUES AND FREQUENCY VS. CONSEQUENCE CURVES ARE PRESENTED. FOR A SUBSET OF HAZARDS, NOTABLY THE POWER GENERATION TECHNOLOGIES (NUCLEAR, COAL, OIL, AND GAS), WHICH HAVE NOT EXHIBITED HIGH CONSEQUENCE EVENTS (CATASTROPHES), THE COMPARISONS ARE BASED ON ESTIMATED EXPECTED VALUES ONLY. INDIVIDUAL RISK DATA ARE PRESENTED IN TWO WAYS, A PROBABILITY OF DEATH WITHIN A YEAR AND THE AMOUNT OF LIFE SHORTENING OF AN AVERAGE LIFE SPAN.

153

SAFETY ANALYSIS OF THE TRANSPORTATION OF HIGH-LEVEL
RADIOACTIVE WASTE

BNWL-SA-5314

MURPHY, E.S.; WINEGARDNER, W.K.

740601

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 17 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

C,1;C,2;C,3;C,6;C,7;O,1;O,2;O,3;O,6;O,7

A CURRENT PROGRAM TO ASSESS THE RISK OF TRANSPORTING SOLIDIFIED HIGH-LEVEL WASTE FROM A FUEL REPROCESSING PLANT TO A RETRIEVABLE STORAGE FACILITY AT A FEDERAL REPOSITORY IS DESCRIBED. THE METHODOLOGY TO ACCOMPLISH TRANSPORTATION RISK ANALYSIS GOALS USES FAULT TREES TO IDENTIFY FAILURE EVENTS AND TO SPECIFY COMBINATIONS OF EVENTS THAT COULD BREACH THE SHIPPING CONTAINERS AND RELEASE RADIOACTIVE MATERIAL TO THE ENVIRONMENT. PROGRESS IN QUANTIFYING TRANSPORTATION RISK IS REPORTED. EVENTS THAT CAN PRODUCE CONTAINER FAILURE DURING SHIPMENT INCLUDE (1) RAILROAD ACCIDENTS, (2) NATURAL DISASTERS, (3) PHYSICAL OR CHEMICAL REACTIONS INDUCED BY THE RADIOACTIVE WASTE, AND (4) MONITORING AND PACKAGE CLOSURE ERRORS. PRELIMINARY DATA INDICATE THAT RAILROAD ACCIDENTS PRESENT THE HIGHEST RISK. STUDY CONTRIBUTIONS INCLUDE PROCEDURES FOR SCREENING FAILURE SEQUENCES TO DETERMINE THOSE THAT DOMINATE THE RISK, METHODS FOR QUANTIFYING THE EFFECTS OF PROBABILISTIC FAILURE EVENTS, AND COMPUTER CODE DEVELOPMENT.

154

TECHNICAL SUPPORT OF STANDARDS FOR HIGH-LEVEL RADIOACTIVE
WASTE MANAGEMENT, VOL. A, SOURCE TERM CHARACTERIZATION

EPA 520/4-79-007A; PB 81-106 221

ARTHUR D. LITTLE, INC.

790101

NTIS. 330 P.

ARTHUR D. LITTLE, INC.

L,5;L,9;L,0

THIS REPORT IS THE RESULT OF WORK PERFORMED UNDER THE FIRST PART (TASK A) OF A FOUR-PART CONTRACT TO GATHER TECHNICAL INFORMATION TO EVALUATE ENVIRONMENTAL ACCEPTABILITY OF VARIOUS HLW DISPOSAL OPTIONS. THE SCOPE OF TASK A INCLUDES: CHARACTERIZATION OF COMMERCIAL HLW, INCLUDING COMPARISONS OF SOURCE TERMS FROM VARIOUS FUEL CYCLES AND FUEL MIXES; CHARACTERIZATION OF GOVERNMENT HLW, AND COMPARISON WITH COMMERCIAL WASTE; ESTIMATION OF EXISTING AND PROJECTED QUANTITIES OF HLW.

155

40 CFR 190, ENVIRONMENTAL RADIATION PROTECTION REQUIREMENTS FOR NORMAL OPERATIONS OF ACTIVITIES IN THE URANIUM FUEL CYCLE. VOL. 1. FINAL ENVIRONMENTAL STATEMENT

EPA 520/4-76-016; PB-290 524

U.S. EPA, OFFICE OF RADIATION PROGRAMS

760101

NTIS. 240 P.

U.S. EPA

E,1;E,5,B;E,5,D;E,9;F,1;F,5,B;F,5,D;F,9;G,1;G,5,B;G,5,D;G,9;H,1;H,5,B;H,5,D;H,9;J,1;J,5,B;J,5,D;J,9;P,1;P,5,B;P,5,D;P,9

IN VOL. 1 NEW STANDARDS TO LIMIT RADIATION DOSES TO THE GENERAL PUBLIC AND QUANTITIES OF LONG-LIVED RADIOACTIVE MATERIALS IN THE GENERAL ENVIRONMENT ATTRIBUTABLE TO PLANNED RELEASES FROM OPERATIONS CONTRIBUTING TO THE GENERATION OF ELECTRICAL POWER THROUGH THE U FUEL CYCLE ARE DESCRIBED AND EVALUATED. THESE STANDARDS APPLY TO MILLING, CHEMICAL CONVERSION, ISOTOPIC ENRICHMENT, FUEL FABRICATION, LIGHT-WATER-COOLED REACTORS, AND FUEL REPROCESSING, BUT EXCLUDE MINING, THE TRANSPORTATION OF RADIOACTIVE MATERIALS IN CONNECTION WITH ANY OF THESE OPERATIONS. THE STANDARDS SPECIFICALLY LIMIT IRREVERSIBLE CONTAMINATION DUE TO RELEASES OF RADIOACTIVE KR, I-129, AND ALPHA-EMITTING TRANSURANICS. THE TOTAL REDUCTION IN POTENTIAL HUMAN HEALTH IMPACT ATTRIBUTABLE TO OPERATIONS THROUGH THE YR 2000 IS ESTIMATED TO BE IN EXCESS OF 1000 CASES OF CANCER, LEUKEMIA, AND SERIOUS GENETIC EFFECTS IN HUMAN POPULATIONS. IN ADDITION MAXIMUM ANNUAL RADIATION DOSES ARE LIMITED TO 25 MILLIREMS TO THE WHOLE BODY AND ALL OTHER ORGANS EXCEPT THE THYROID, WHICH WOULD BE LIMITED TO 75 MILLIREMS.

156

40 CFR 190, ENVIRONMENTAL RADIATION PROTECTION REQUIREMENTS FOR NORMAL OPERATIONS OF ACTIVITIES IN THE URANIUM FUEL CYCLE. VOL. 2. FINAL ENVIRONMENTAL STATEMENT

EPA 520/4-76-016; PB-290 525

U.S. EPA, OFFICE OF RADIATION PROGRAMS

760101

NTIS. 311 P.

U.S. EPA

E,1;E,5,B;E,5,D;E,9;F,1;F,5,B;F,5,D;F,9;G,1;G,5,B;G,5,D;G,9;H,1;
H,5,B;H,5,D;H,9;J,1;J,5,B;J,5,D;J,9;P,1;P,5,B;P,5,D;P,9

VOL. 2 PROVIDES RESPONSES TO ALL COMMITMENT LETTERS
SUBMITTED ON THE DRAFT EIS. TESTIMONY, BOTH WRITTEN AND ORAL,
RECEIVED IN CONNECTION WITH THE PUBLIC HEARING ON THE STANDARDS
HELD MARCH 8-10, 1976, AND LETTERS RELATED TO THAT HEARING ARE
NOT INCLUDED. ALL OF THE COMMENT LETTERS ARE REPRODUCED IN THE
APPENDIX TOGETHER WITH AN INDEX WHICH PROVIDES A GUIDE TO
LOCATING THE COMMENT LETTERS BY CODE NUMBER. THE COMMENTS ARE
GROUPED BY SUBJECT MATTER INTO SEVERAL AREAS OF CONCERN, WHICH
GENERALLY CORRESPOND TO THE ORGANIZATION OF MATERIAL IN VOL. 1.
THE RESPONSES ARE BRIEF, AND MAKE REFERENCE TO VOL. 1 AND ITS
SUPPORTING DOCUMENT WHEN MORE DETAILED TECHNICAL INFORMATION IS
APPROPRIATE. REGULATIONS SETTING FORTH THESE ENVIRONMENTAL
RADIATION STANDARDS WERE PROMULGATED IN FINAL FORM JANUARY 13,
1977 (42FR2858).

157

EARTHQUAKE RELATED DISPLACEMENT FIELDS NEAR UNDERGROUND
FACILITIES

DP-1533

PRATT, H.R.; ZANDT, G.; BOUCHON, P.

790101

SAVANNAH RIVER LABORATORY, Aiken, SC. 66 P.

SAVANNAH RIVER LABORATORY

L,7

RELATIVE DISPLACEMENTS OF ROCK MASSES ARE EVALUATED IN
TERMS OF GEOLOGICAL EVIDENCE, SEISMOLOGICAL EVIDENCE, DATA FROM
SIMULATION EXPERIMENTS, AND ANALYTICAL PREDICTIVE MODELS.
NUMERICAL MODELS HAVE BEEN DEVELOPED TO DETERMINE DISPLACEMENT
FIELDS AS A FUNCTION OF DEPTH, DISTANCE, AND AZIMUTH FROM AN
EARTHQUAKE SOURCE. COMPUTER CALCULATIONS FOR SEVERAL TYPES OF
FAULTS INDICATE THAT DISPLACEMENTS CAN EITHER INCREASE OR
DECREASE AS A FUNCTION OF DEPTH DEPENDING ON THE TYPE AND
GEOMETRY OF THE FAULT. FOR LONG SHALLOW VERTICAL STRIKE-SLIP
FAULTS AND FOR DIP SLIP FAULTS DISPLACEMENT DOES NOT DECREASE AS
MARKEDLY WITH DEPTH. GEOLOGIC STRUCTURE, MATERIAL PROPERTIES,
AND DEPTH AFFECT THE SEISMIC SOURCE SPECTRUM. AMPLIFICATION OF
THE HIGH FREQUENCIES OF SHEAR WAVES IS LARGER BY A FACTOR OF
ABOUT 2 FOR LAYERED GEOLOGIC MODELS THAN FOR AN ELASTIC HALF
SPACE.

158

NATIONAL PROGRAM FOR MANAGEMENT OF COMMERCIAL HIGH-LEVEL
WASTE. REPORT ON GEOLOGIC EXPLORATION ACTIVITIES

DOE-KL-C-14

BRESLIN, J.; LAUGHON, R.B.; HALL, R.J.; VOSS, J.W.

800101
U.S. GPC, 76 P.
BATTELLE, OFFICE OF NUCLEAR WASTE ISOLATION
L,1

THIS IS A POLICY AND PLANNING REPORT FOR SITE SELECTION.

159
PRELIMINARY ESTIMATES OF THE CHARGE FOR SPENT-FUEL STORAGE
AND DISPOSAL SERVICES
DOE/EI-0055
U.S. DOE, ASSISTANT SECRETARY FOR ENERGY TECHNOLOGY AND DIRECTOR
OF ENERGY RESEARCH
780701
U.S. DOE, WASHINGTON, DC, 60 P.
U.S. DOE
L,1;L,5,A;L,5,B;L,5,C;L,5,D;L,6;L,9;M,1;M,5,A;M,5,B;M,5,C;M,5,D;
M,8;M,9

THE PURPOSE OF THIS REPORT IS TO STIMULATE DISCUSSION AMONG
A WIDE RANGE OF INTERESTED PARTIES CONCERNING A ONE-TIME CHARGE
BY THE U.S. GOVERNMENT FOR DISPOSAL, OR INTERIM STORAGE AND
DISPOSAL, OF SPENT UNREPROCESSED NUCLEAR FUEL. THE REPORT
CONTAINS A SET OF ESTIMATES OF THE CHARGE BASED ON CURRENT COST
FIGURES AND A VARIETY OF DEMAND, LOGISTICAL, INSTITUTIONAL, AND
COST OVERRUN ASSUMPTIONS. THE SERVICES ARE TO BE OFFERED TO
DOMESTIC UTILITIES BY THE U.S. GOVERNMENT IN CONNECTION WITH THE
SPENT FUEL POLICY APPROVED BY THE PRESIDENT AND ANNOUNCED BY THE
DOE ON OCTOBER 16, 1977. THIS POLICY IS A DIRECT RESULT OF THE
INDEFINITE DEFERRAL OF ALL COMMERCIAL REPROCESSING OF SPENT FUEL
ANNOUNCED BY PRESIDENT CARTER ON APRIL 7, 1977. THE SERVICES
WILL ALSO BE OFFERED TO FOREIGN GOVERNMENTS ON A LIMITED BASIS
IN CASES WHERE THIS ACTION WOULD CONTRIBUTE TO U.S. GOALS FOR
NONPROLIFERATION OF NUCLEAR WEAPONS. THE REPORT DESCRIBES BASIC
PRINCIPLES AND METHODOLOGIES FOR CALCULATING THE CHARGE AND
HIGHLIGHTS PRIMARY COST CENTERS. CURRENT ESTIMATES OF PROGRAM
AND FACILITY COSTS ARE USED. VARIOUS ASPECTS OF THE DOE SPENT
FUEL STORAGE PROGRAM ARE BROUGHT INTO FOCUS THROUGH THIS
ANALYSIS.

160
FINAL ENVIRONMENTAL IMPACT STATEMENT, MANAGEMENT OF
COMMERCIALLY GENERATED RADIOACTIVE WASTE, VOL. 1
DOE/EIS/0046F, VOL. 1
U.S. DOE, ASSISTANT SECRETARY FOR NUCLEAR ENERGY, OFFICE OF
NUCLEAR WASTE MANAGEMENT
800101
NHS, 621 P.
U.S. DOE
L,1;L,2;L,5,A;L,5,B;L,5,C;L,5,D;L,6,A;L,6,B;L,6,C;L,6,D;L,7,A;L,
7,B;L,7,C;L,7,D
THIS EIS ANALYZES THE SIGNIFICANT ENVIRONMENTAL IMPACTS

THAT COULD OCCUR IF VARIOUS TECHNOLOGIES FOR MANAGEMENT AND DISPOSAL OF HIGH-LEVEL AND TRANSURANIC WASTES FROM COMMERCIAL NUCLEAR POWER REACTORS WERE TO BE DEVELOPED AND IMPLEMENTED. THIS EIS WILL SERVE AS THE ENVIRONMENTAL INPUT FOR THE DECISION ON WHICH TECHNOLOGY WILL BE EMPHASIZED IN FURTHER RESEARCH AND DEVELOPMENT ACTIVITIES IN THE COMMERCIAL WASTE MANAGEMENT PROGRAM. THE ACTION PROPOSED IN THIS EIS IS TO (1) ADOPT A NATIONAL STRATEGY TO DEVELOP MINED GEOLOGIC REPOSITORIES FOR DISPOSAL OF COMMERCIALLY GENERATED HIGH-LEVEL AND TRU WASTE (WHILE CONTINUING TO EXAMINE SUBSEAED AND VERY DEEP HOLE DISPOSAL AS POTENTIAL BACKUP TECHNOLOGIES) AND (2) CONDUCT A R&D PROGRAM TO DEVELOP SUCH FACILITIES AND THE NECESSARY TECHNOLOGY TO ENSURE THE SAFE LONG-TERM CONTAINMENT AND ISOLATION OF THESE WASTES. DOE HAS CONSIDERED DEVELOPMENT OF CONVENTIONALLY MINED DEEP GEOLOGIC REPOSITORIES FOR DISPOSAL OF SPENT FUEL FROM NUCLEAR POWER REACTORS AND/OR RADIOACTIVE FUEL REPROCESSING WASTES; BALANCED DEVELOPMENT OF SEVERAL ALTERNATIVE DISPOSAL METHODS; AND NO WASTE DISPOSAL ACTION. THIS EIS REFLECTS THE PUBLIC REVIEW OF AND COMMENTS OFFERED ON THE DRAFT STATEMENT. INCLUDED ARE DESCRIPTIONS OF THE CHARACTERISTICS OF NUCLEAR WASTE, THE ALTERNATIVE DISPOSAL METHODS UNDER CONSIDERATION, AND POTENTIAL ENVIRONMENTAL IMPACTS AND COSTS OF IMPLEMENTING THESE METHODS. BECAUSE OF THE PROGRAMMATIC NATURE OF THIS DOCUMENT AND THE PRELIMINARY NATURE OF CERTAIN DESIGN ELEMENTS ASSUMED IN ASSESSING THE ENVIRONMENTAL CONSEQUENCES OF THE VARIOUS ALTERNATIVES, THIS STUDY HAS BEEN BASED ON GENERIC, RATHER THAN SPECIFIC, SYSTEMS. AT SUCH TIME AS SPECIFIC FACILITIES ARE IDENTIFIED FOR PARTICULAR SITES, STATEMENTS ADDRESSING SITE-SPECIFIC ASPECTS WILL BE PREPARED FOR PUBLIC REVIEW AND COMMENT.

161

FINAL ENVIRONMENTAL IMPACT STATEMENT, MANAGEMENT OF
COMMERCIALLY GENERATED RADIOACTIVE WASTE. VOL. 2
APPENDICES

DOE/EIS-0046F, VOL. 2

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800101

NTIS. 343 P.

U.S. DOE

L,1;L,2;L,5,A;L,5,B;L,5,C;L,5,D;L,6,A;L,6,B;L,6,C; L,6,D;L,7,A;L,
7,B;L,7,C;L,7,D;L,5,A;L,5,B;L,5,C;L,5,D

VOL. 2 CONTAINS APPENDICES OF SUPPLEMENTARY DATA ON WASTE
MANAGEMENT SYSTEMS, GEOLOGIC DISPOSAL, RADIOLOGICAL STANDARDS,
RADIATION DOSE CALCULATION MODELS, RELATED HEALTH EFFECTS,
BASELINE ECOLOGY, SOCIO-ECONOMIC CONDITIONS, HAZARD INDICES,
COMPARISON OF DEFENSE AND COMMERCIAL WASTES, DESIGN
CONSIDERATIONS, AND WASTES FROM THORIUM-BASED FUEL CYCLE
ALTERNATIVES. VOL. 3 (NOT INCLUDED) CONTAINS WRITTEN PUBLIC
COMMENTS AND HEARING BOARD RESPONSES AND REPORTS OFFERED ON THE

DRAFT STATEMENT.

162

TRIP REPORT: WORKSHOP ON RISK ANALYSIS AND GEOLOGIC
MODELING IN RELATION TO THE DISPOSAL OF RADIOACTIVE
WASTES IN GEOLOGICAL FORMATIONS

UY/DWI/TM-26

CLAIBORNE, H.C.

770101

UNION CARBIDE, OFFICE OF WASTE ISOLATION, OAK RIDGE, TN. 50 P.
UNION CARBIDE, OFFICE OF WASTE ISOLATION

L,1;L,6

THE WORKSHOP WAS HELD AT ISPRA, ITALY, ON MAY 23-27, 1977,
AND WAS CO-SPONSORED BY THE COMMISSION OF EUROPEAN COMMUNITIES
AND THE OFFICE OF ECONOMIC COOPERATION AND DEVELOPMENT/
NUCLEAR ENERGY AGENCY. THE PRIMARY OBJECT WAS TO PROMOTE
INTERNATIONAL COOPERATION IN DEVELOPING AND USING RISK
ASSESSMENT TECHNIQUES FOR THE LONG-TERM SAFELY ASSESSMENT OF
WASTE DISPOSAL. THE ATTENDANCE WAS RESTRICTED TO SPECIALISTS IN
THE FIELD AND A FEW OBSERVERS. NOTHING PARTICULARLY NEW OR NOVEL
WAS PRESENTED NOR ANY FORMAL COOPERATION AGREED UPON. HOWEVER,
THERE WAS A FEELING THAT CONTINUED INFORMAL COOPERATION WAS
HELPFUL AND SHOULD BE CONTINUED. GREATER OR LESSER DEGREES OF
FORMALITY COULD BE DECIDED LATER. THE U.S. PROGRAM WAS
DEFINITELY MORE ADVANCED AND LARGER IN SCOPE THAN THE OTHERS.
THE PROGRAM (AS AMENDED), A LIST OF ATTENDEES, THE DRAFTS OF THE
CONSENSUS RESULTS OF THE WORKING GROUPS ON CONTAINMENT FAILURE
MODES AND GEOSPHERE TRANSPORT MODELING, AND SOME ABSTRACTS ARE
APPENDED TO THIS REPORT.

163

WASTE ISOLATION FACILITY DESCRIPTION: BEDDED SALT

Y/DWI/SUB-76-16506

PARSONS, BRINCKERHOFF, QUADE AND DOUGLAS, INC.

760101

UNION CARBIDE, OFFICE OF WASTE ISOLATION, OAK RIDGE, TN. 109 P.
PARSONS, BRINCKERHOFF, QUADE AND DOUGLAS, INC.

L,1

THE WASTE ISOLATION FACILITY IS DESIGNED TO RECEIVE AND
STORE THREE BASIC TYPES OF SOLIDIFIED WASTES: HIGH-LEVEL WASTES,
INTERMEDIATE LEVEL HIGH-GAMMA TRANSURANIC WASTE, AND LOW- GAMMA
TRANSURANIC WASTES. THE FACILITY UNDER CONSIDERATION IN THIS
REPORT IS DESIGNED FOR BEDDED SALT AT A DEPTH OF APPROX. 1800
FT. THE PRESENT DESIGN FOR THE FACILITY INCLUDES AN AREA WHICH
WOULD BE USED INITIALLY AS A PILOT FACILITY TO TEST THE
VIABILITY OF THE CONCEPT, AND A LARGER FACILITY WHICH WOULD
CONSTITUTE THE FINAL STORAGE AREA. THE TOTAL STORAGE AREA IN THE
PILOT FACILITY IS PLANNED TO BE 77 ACRES AND IN THE THE FUEL
FACILITY 1601 ACRES. OTHER AREAS FOR SHAFT OPERATIONS AND ACCESS
WOULD RAISE THE OVERALL SIZE OF THE TOTAL FACILITY TO SLIGHTLY

LESS THAN 2,000 ACRES. THE FOLLOWING SUBJECTS ARE DISCUSSED IN DETAIL: SURFACE FACILITIES, SHAFT DESIGN AND CHARACTERISTICS, DESIGN AND CONSTRUCTION OF THE UNDERGROUND WASTE ISOLATION FACILITY, VENTILATION SYSTEMS, AND DESIGN REQUIREMENTS AND CRITERIA.

164

A SYSTEMATIC APPROACH FOR ASSESSMENT OF ALTERNATIVE NUCLEAR WASTE MANAGEMENT STRATEGIES

CONF-791112

YEH, G. T.

800101

PLENUM PRESS, NEW YORK

OAK RIDGE NATIONAL LABORATORY

SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT. VOL. 2. PP. 841-848.

C,1;C,2;C,5;L,1;L,2;L,5;N,1;N,2;N,5

A SYSTEMATIC APPROACH FOR ALTERNATIVE NUCLEAR WASTE MANAGEMENT ASSESSMENT IS PRESCRIBED FOR EVALUATING THE FATE AND TRANSPORT OF RADWASTE IN THE ENVIRONMENT AND TO MAN. THE APPROACH CONSISTS OF A SYSTEM OF FLOW DYNAMIC AND WASTE TRANSPORT MODELS FOR THE PHYSICAL ENVIRONMENT, TRANSFER MODELS TO BIOTA, AND DOSE MODELS TO MAN. FLOW DYNAMIC AND WASTE TRANSPORT MODELS ARE INCLUDED FOR COMPUTING SPATIAL-TEMPORAL VARIATIONS OF THE FLOW FIELD AND RADWASTE CONCENTRATION IN SUBSURFACE AQUIFERS, SURFACE WATER REGIONS, ESTUARIES/OCEANS, AND THE ATMOSPHERE. TRANSFER MODELS TO STUDY THE UPTAKE FROM AND TO THE PHYSICAL ENVIRONMENT OF THE WASTE BY AQUATIC AND TERRESTRIAL BIOTA. DOSE MODELS ARE USED TO COMPUTE BOTH THE RADWASTE INPUT TO MAN AND ITS EFFECTS ON MAN. WITH THESE SERIES OF COMPUTATIONS, THE RADIATION DOSE FROM ALTERNATIVE NUCLEAR WASTE MANAGEMENT STRATEGIES CAN BE COMPUTED. COUPLED WITH THE EXPOSURE AND EFFECT ANALYSIS, THE APPROACH SHOULD FACILITATE THE SELECTION OF THE BEST MANAGEMENT METHODOLOGIES AMONG MANY ALTERNATIVES.

165

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE WASTE: THE NEFT/DVM COMPUTER CODE USERS MANUAL

NUREG/CR-2081; SAND81-0686

CAMPBELL, J.E.; LONGSINE, D.E.; CRANWELL, R.P.

810101

U.S. GPO, NRC; NTIS. 200 P.

SANDIA NATIONAL LABORATORIES

C,2;C,5,B;L,2;L,5,B;N,2;N,5,B

THE NETWORK FLOW AND TRANSPORT/DISTRIBUTION VELOCITY METHOD (NWFT/DVM) COMPUTER CODE HAS BEEN DEVELOPED TO SIMULATE GROUNDWATER AND CONTAMINANT TRANSPORT. IT IS USED IN CONJUNCTION WITH THE SANDIA WASTE ISOLATION FLOW AND TRANSPORT (SWIFT) MODEL. SWIFT SIMULATION OF A DEPOSITORY BREACHMENT SCENARIO

PROVIDES THE BOUNDARY CONDITIONS FOR THE GROUNDWATER FLOW MODEL IN NWFT/DVM. NWFT/DVM CAN THEN RECREATE THE SCENARIO VELOCITY FIELD AS A NETWORK OF ONE- DIMENSIONAL SEGMENTS THROUGH WHICH RADIONUCLIDES ARE TRANSPORTED. AN IMPORTANT APPLICATION OF NWFT/DVM IS THAT REPEATED RUNS NECESSITATED BY VARYING INPUT PARAMETERS FOR A SCENARIO CAN BE ACCOMPLISHED WITH REASONABLE COMPUTER COSTS. THE DISTRIBUTED VELOCITY METHOD (DVM) IS INCORPORATED TO PROVIDE FLEXIBILITY AND EFFICIENCY IN SOLVING THE RADIONUCLIDE TRANSPORT PROBLEM. IT ALLOWS FOR THE TRANSPORT OF DECAY CHAINS OF ANY LENGTH, WITH ISOTOPES HAVING DIFFERENT RETARDATIONS, AND WITH SOURCE RATES BEING LEACH- OR SOLUBILITY-LIMITED.

166

STUDIES OF INGESTION DOSE PATHWAYS FROM THE NUCLEAR FUEL SERVICES FUEL REPROCESSING PLANT

EPA-520/3-74-001; PB-259 658

MAGNU, P.J.; KRAMKO-SKI, R.; KEAVEY, T.; WOZNIAK, K.
740101

NTIS. 60 P.

U.S. EPA, OFFICE OF RADIATION PROGRAMS

J,5,D;J,6,D;J,9,D;J,0,D

STUDIES WERE CARRIED OUT TO EVALUATE INGESTION DOSES TO INDIVIDUALS AND THE LOCAL POPULATION RESULTING FROM THE OPERATION OF NUCLEAR FUEL SERVICES (NFSO) REPROCESSING PLANT IN WEST VALLEY, NY. THESE STUDIES INVOLVED EVALUATIONS OF RADIONUCLIDE INTAKES FROM INGESTION OF FISH, DEER, AND LOCALLY GROWN FOOD ITEMS AND INCLUDED SURVEYS OF FISHING AND DEER HUNTING IN THE VICINITY OF THE PLANT. THE MAXIMUM DOSE COMMITMENT TO AN INDIVIDUAL FROM THE FISH PATHWAY DURING 1974 WAS ESTIMATED TO HAVE BEEN 1.4 MILLIREM WHOLE BODY AND 7 MILLIREM BONE. THE MAXIMUM WHOLE-BODY DOSE COMMITMENT TO AN INDIVIDUAL FROM INGESTION OF VENISON FROM DEER KILLS IN 1970 WAS ESTIMATED TO HAVE BEEN 1.4 MILLIREM. DOSE ESTIMATES FOR THE LOCAL POPULATION FROM THE FISH AND DEER PATHWAYS INDICATED THAT THE INTEGRATED WHOLE-BODY POPULATION DOSE COMMITMENTS FROM EACH OF THESE PATHWAYS WAS ABOUT 0.1 MAN-REM PER YR. MEASUREMENTS OF RADIONUCLIDE CONCENTRATIONS IN LOCALLY GROWN FOOD ITEMS HAD NOT RESULTED IN ANY MEASURABLE INCREASE IN THE RADIONUCLIDE INTAKES OF THE POPULATION LIVING IN THE VICINITY OF PLANT FROM THE PATHWAY.

167

ASSESSMENT OF DOE LOW-LEVEL RADIOACTIVE SOLID WASTE DISPOSAL STORAGE ACTIVITIES: TASK 103

BMI-1984

DUGUID, J.O.

770101

BATTIELLE COLUMBUS LABORATORIES, COLUMBUS, OH. 100 P.
BATTIELLE COLUMBUS LABORATORIES

K,1;K,9;N,1;N,5,D;N,9

FROM A SURVEY OF DOE SITES, FACILITIES, AND PRACTICES FOR THE DISPOSAL/STORAGE OF LOW-LEVEL RADIOACTIVE SOLID WASTE, THE FOLLOWING CAN BE SUMMARIZED: (1) NO HEALTH HAZARD HAS BEEN REPORTED. (2) SOME BURIAL GROUNDS ARE RELEASING SMALL QUANTITIES OF RADIONUCLIDES TO THE IMMEDIATE ENVIRONMENT. THESE RELEASES ARE WELL WITHIN RELEASE LIMITS AT ALL SITES WITH THE EXCEPTION OF ON-SITE CONCENTRATIONS AT ORNL. AT ORNL, CONCENTRATIONS IN THE CLINCH RIVER ARE LESS THAN 1% OF THE RELEASE LIMITS. (3) MANY PRACTICES HAVE BEEN INSTITUTED IN THE LAST FEW YRS WHICH HAVE IMPROVED DISPOSAL/STORAGE OPERATIONS CONSIDERABLY.

168

GEOCHEMICAL BEHAVIOR OF LONG-LIVED RADIOACTIVE WASTES

ORNL-TM-4481

GERA, F.

750101

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN. 95 P.

OAK RIDGE NATIONAL LABORATORY

L,5;L,6

THE DECREASE IN HAZARD POTENTIALS ASSOCIATED WITH THE HEAVY ELEMENTS PRESENT IN HIGH-LEVEL RADIOACTIVE WASTE IS GIVEN, WITH THE PARTIAL EXCEPTION OF RADIUM, WHICH IS CONCENTRATED IN THE FRUIT OF SPECIFIC PERENNIAL PLANTS, THE LONG-LIVED ALPHA-EMITTERS ARE CHARACTERIZED BY VERY LOW BIOLOGIC AVAILABILITY IN TERRESTRIAL ECOSYSTEMS. THE BIOLOGIC AVAILABILITY MAY BE SOMEWHAT HIGHER IN AQUATIC ECOSYSTEMS DUE TO THE SIGNIFICANT RECONCENTRATION FACTORS IN PARTICULAR ORGANISMS. INHALATION HAZARDS ARE CONTROLLED PRIMARILY BY THE EFFICIENCY OF RESUSPENSION MECHANISMS. SOIL EROSION BY WIND IS MORE EFFECTIVE FOR PARTICLES BETWEEN 50 AND 500 MICRO METERS. ON THE OTHER HAND, THE PULMONARY DEPOSITION OF PARTICLES LARGER THAN 10 MICRO METERS IS PRACTICALLY NEGLIGIBLE. NATURAL HIGH-BACKGROUND AREAS AND THE PILES OF URANIUM MILL TAILINGS ARE INSTANCES OF UNUSUAL ACCUMULATIONS OF LONG-LIVED ALPHA-EMITTERS IN SURFACE MATERIALS. DATA CONCERNING THE LEVELS OF ACTIVITY IN FOODS GROWN ON RADIOACTIVE SOILS SEEM TO CONFIRM THE LOW BIOLOGIC AVAILABILITY OF THE NATURAL RADIOACTIVE ELEMENTS. SURVEYS OF U MILL TAILINGS INDICATE LITTLE DISPERSAL OF THE RADIOACTIVE ELEMENTS INTO THE ENVIRONMENT; EVEN THOUGH UNTREATED TAILINGS PILES WOULD APPEAR TO BE PARTICULARLY VULNERABLE TO RESUSPENSION OF DUST PARTICLES BY WIND.

169

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT.

VII. LONG-TERM RISK ANALYSIS OF THE GEOLOGIC REPOSITORY

ORNL-TM-6987

LOGAN, S.E.; CONARTY, R.D.; NG, H.S.; RAHAL, L.J.; SHIRLEY, C.G.

600101

NTIS. 126 P.

LOS ALAMOS TECHNICAL ASSOCIATES, INC.
L,2;L,3;L,5,8;L,5,D;L,6;L,7;L,8;L,0

THIS REPORT SUPPORTS THE OVERALL ASSESSMENT BY ORNL OF ACTINIDES PARTITIONING AND TRANSMUTATION BY PROVIDING AN ANALYSIS OF THE LONG-TERM RISKS ASSOCIATED WITH THE TERMINAL STORAGE OF WASTES FROM A FUEL CYCLE WHICH INCORPORATES PARTITIONING AND TRANSMUTATION (P-T) AND WASTE FROM A CYCLE THAT DOES NOT. THE SYSTEM MODEL AND ASSOCIATED COMPUTER CODE, CALLED AMRAW, ARE USED FOR THE ANALYSIS AND ARE APPLIED TO THE LOS MEDANOS AREA IN SE NEW MEXICO. IN ALL BUT THE EXPULSIVE MODES, TC-99 AND I-129 COMPLETELY DOMINATE CUMULATIVE EFFECTS BASED ON THEIR TRANSPORT TO MAN THROUGH LEACHING AND MOVEMENT WITH GROUNDWATER, EFFECTING ABOUT 33,000 HEALTH EFFECTS (DEATHS) OVER 1 MILLION YRS. P-T HAS ONLY LIMITED EFFECTIVENESS IN REDUCING LONG-TERM RISK FROM A RADIONUCLIDE WASTE REPOSITORY UNDER THE CONDITIONS STUDIED, AND SUCH EFFECTIVENESS IS ESSENTIALLY CONFINED TO THE EXTREMELY UNLIKELY EXPULSIVE EVENTS. REMOVAL OR IMMOBILIZATION OF TC-99 AND I-129 MIGHT PROVIDE BENEFITS SUFFICIENTLY TANGIBLE TO WARRANT SPECIAL CONSIDERATION.

170

EXPECTED ENVIRONMENTS IN HIGH-LEVEL NUCLEAR WASTE AND SPENT FUEL REPOSITORIES IN SALT

ORNL/1M-7201

CLAIBORNE, H.C.; RICKERTSEN, L.D.; GRAHAM, K.F.

800101

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN. 188 P.

OAK RIDGE NATIONAL LABORATORY

L,1;L,5;L,7

THE EXPECTED ENVIRONMENTS ASSOCIATED WITH HIGH-LEVEL AND SPENT FUEL REPOSITORIES IN SALT FORMATIONS ARE DESCRIBED. THESE ENVIRONMENTS INCLUDE THERMAL, FLUID, PRESSURE, BRINE CHEMISTRY, AND RADIATION FIELDS PREDICTED FOR THE REPOSITORY CONCEPTUAL DESIGNS.

171

ON THE GEOTECHNICAL MODELING OF HIGH-LEVEL NUCLEAR WASTE DISPOSAL BY ROCK MELTING

UCRL-53183

HEUZE, F.E.

810101

LAWRENCE LIVERMORE LABORATORY, LIVERMORE, CA. 53 P.

LAWRENCE LIVERMORE LABORATORY

L,2;L,5;L,7;L,9

A NEW STRATEGY HAS BEEN DEVELOPED FOR THE GEOTECHNICAL MODELING OF NUCLEAR WASTE DISPOSAL BY ROCK MELTING (DRM). THREE SEPARATE TASKS WERE PERFORMED TO REACH THIS OBJECTIVE: (1) A REVIEW OF THE FOUR SCENARIOS WHICH HAVE BEEN PROPOSED FOR DRM, TO DATE; (2) AN EVALUATION OF COMPUTER-BASED NUMERICAL MODELS WHICH COULD BE USED TO ANALYZE THE MECHANICAL, THERMAL, AND

HYDRAULIC PROCESSES INVOLVED IN DRM AND (3) A CRITICAL REVIEW OF ROCK MASS PROPERTIES WHICH ARE RELEVANT TO THE DESIGN AND SAFETY OF WASTE DISPOSAL BY ROCK MELTING. IT IS CONCLUDED THAT SEVERAL GEOTECHNICAL ASPECTS OF DRM CAN BE STUDIED REALISTICALLY WITH CURRENT STATE-OF-THE-ART MODEL CAPABILITIES AND KNOWLEDGE OF MATERIAL PROPERTIES. THE NEXT STEP IN THE FEASIBILITY STUDY SHOULD BE A BEST-ESTIMATE CALCULATION OF THE FOUR CAVITY-MELT AND CANISTER-BURIAL CONCEPTS. THESE NEW ANALYSES WILL INDICATE THE MOST CRITICAL AREAS FOR SUBSEQUENT RESEARCH.

172

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT:

VI. SHORT-TERM RISK ANALYSIS OF REPROCESSING,
REFABRICATION, AND TRANSPORTATION. SUMMARY

ORNL/TM-6986; SA1-099-78-PA

FULLWOOD, R.; JACKSON, R.

800101

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN. 64 P.

SCIENCE APPLICATIONS, INC.

I,1;I,2;I,3;I,4,A;I,4,C;I,4,E;I,4,G;I,5,B;I,5,D;I,5,F;I,5,H;I,8;
I,9;J,1;J,2;J,3;J,4,A;J,4,C;J,4,E;J,4,G;J,5,B;J,5,D;J,5,F;J,
5,H;J,6;J,9;O,1;O,2;O,3;O,4,A;O,4,C;O,4,E;O,4,G; O,5,B;O,5,
D;O,5,F;O,5,H;O,8;O,9

THIS REPORT COMPARES TWO FUEL CYCLES, A PARTITIONING-TRANSMUTATION (PT) FUEL CYCLE AND A REFERENCE CYCLE EMPLOYING CONVENTIONAL FUEL-MATERIAL RECOVERY METHODS, ON THE BASIS OF THE SHORT-TERM RADIOLOGICAL AND NONRADIOLOGICAL RISKS THEY PRESENT TO THE PUBLIC AND TO WORKERS. THE ACCIDENTAL RADIOLOGICAL RISK TO THE PUBLIC IS ANALYZED BY ESTIMATING THE PROBABILITIES OF SETS OF ACCIDENTS; THE CONSEQUENCES ARE CALCULATED USING THE CRAC CODE APPROPRIATELY MODIFIED FOR THE MATERIAL COMPOSITION. ROUTINE RADIOLOGICAL RISKS TO THE PUBLIC ARE ESTIMATED FROM THE CALCULATED RELEASE AMOUNTS; THE EFFECTS ARE CALCULATED USING THE CRAC CODE. RADIOLOGICAL OCCUPATIONAL RISKS ARE DETERMINED FROM PRIOR EXPERIENCE, PROJECTED STANDARDS, AND ESTIMATES OF ACCIDENT RISK. NONRADIOLOGICAL RISKS ARE CALCULATED FROM THE NUMBER OF PERSONNEL INVOLVED, HISTORICAL EXPERIENCE, AND EPIDEMIOLOGICAL STUDIES. THE RESULT OF THIS ANALYSIS IS THAT THE SHORT-TERM RISK OF PT IS 2.9 TIMES GREATER THAN THAT OF THE REFERENCE CYCLE, PRIMARILY DUE TO THE LARGER AMOUNT OF INDUSTRY. THIS CONCLUSION IS STRONGLY DOMINATED BY THE NONRADIOLOGICAL RISK, WHICH IS ABOUT 150 TIMES GREATER THAN THE RADIOLOGICAL RISK. THE ABSOLUTE RISK AS ESTIMATED FOR THE FUEL CYCLEPORTIONS CONSIDERED IN THIS REPORT IS 0.91 FATALITY/GWE-YR FOR THE PT CYCLE AND 0.34 FATALITY/GWE-YR FOR THE REFERENCE CYCLE. THIS SHOULD BE COMPARED WITH INHABER'S ESTIMATE OF 1.5 FOR NUCLEAR AND 150 FOR COAL. ALL OF THE RISKS ASSUMED HERE ARE ASSOCIATED WITH THE PRODUCTION OF ONE BILLION WATTS OF ELECTRICITY (GWE)/YR.

173

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: SENSITIVITY ANALYSIS TECHNIQUES

NUREG/CR-0394; SAND78-0912

IMAN, R.L.; HELTON, J.C.; CAMPBELL, J.E.

780101

NTIS, 107 P.

SANDIA LABORATORIES

C,8;L,5,B;L,7,B;L,8,B;L,9,B;L,0,B

STATISTICAL TECHNIQUES FOR SENSITIVITY ANALYSIS OF A
COMPLEX MODEL ARE PRESENTED, INCLUDED IN THESE TECHNIQUES ARE
LATIN HYPERCUBE SAMPLING, PARTIAL RANK CORRELATION, RANK
REGRESSION, AND PREDICTED ERROR SUM OF SQUARES. THE SYNTHESIS OF
THESE TECHNIQUES WAS MOTIVATED BY THE NEED TO ANALYZE A MODEL
FOR THE SURFACE MOVEMENT OF RADIONUCLIDES. THE MODEL AND
STATISTICAL TECHNIQUES PRESENTED IN THIS REPORT ARE PART OF A
PROJECT FUNDED BY NRC TO DEVELOP A METHODOLOGY TO ASSESS RISK
ASSOCIATED WITH GEOLOGIC DISPOSAL.

174

STUDIES AND RESEARCH CONCERNING BNFP, SPENT FUEL
DISASSEMBLY AND CANNING PROGRAM AT BARNWELL NUCLEAR
FUEL PLANT (BNFP) PRELIMINARY PROCESS ASSESSMENT
STUDIES

AGNS-47921-2,3-5

TEPE, H.G.

800101

ALLIED-GENERAL NUCLEAR SERVICES, BARNWELL, SC. 55 P.

ALLIED-GENERAL NUCLEAR SERVICES

M,1,B;M,1,D;M,2,B;M,2,D;M,4,A;M,5,B;M,5,D;M,7,B;M,7,D;M,9;M,0,A;
M,0,B

STUDIES BEING PERFORMED TO ASSESS NUCLEAR FUEL DISASSEMBLY
AND ENCAPSULATION TO ENHANCE SPENT FUEL STORAGE HAVE NOT
REVEALED ANY CONDITIONS WHICH UNFAVORABLY IMPACT THE FEASIBILITY
OF THE CONCEPT. THE STUDIES ARE AIMED AT EVALUATING VARIOUS
ISSUES WARRANTING RESOLUTION PRELIMINARY TO LICENSING A FACILITY
FOR THIS SPENT FUEL MANAGEMENT CONCEPT. THE AREAS ASSESSED ARE
POTENTIAL ACCIDENTS AND THEIR RESULTS; MAXIMUM TEMPERATURE LEVEL
OF CANNED FUEL RODS; RADIATION EXPOSURE TO PERSONNEL DURING
OPERATION AND FUEL STORAGE; CRITICALITY RISKS DURING STORAGE AND
AS A RESULT OF ABNORMAL INCIDENTS; PHYSICAL SECURITY
REQUIREMENTS AND MATERIAL ACCOUNTABILITY MEASURES; THE IMPACT OF
SAFEGUARDS ON ECONOMICS; AND A LICENSE SCHEDULE PROJECTION.

175

METHODOLOGY DEVELOPMENT FOR RISK ASSESSMENT OF FUEL
PROCESSING

NUREG/CR-1604

BUCKNER, J.T.; BUCKNER, M.R.; DURANT, W.S.; PERKINS, W.C.; PROUT,
W.E.; WATTS, J.R.

800101

SAVANNAH RIVER LABORATORY, AIKEN, SC. 340 P.

SAVANNAH RIVER LABORATORY

I,1;I,2;I,3;I,5,B;I,5,D;I,6,B;I,6,D;I,7,B;I,7,D;I,9;I,0,B;I,0,D;
J,1;J,2,B;J,2,D;J,3;J,5,B;J,5,D;J,6,B;J,6,D;J,7,B;J,7,D;J,9;
J,0,B;J,0,D

THE DESIGNS OF ALL EXISTING AND PLANNED COMMERCIAL FUEL REPROCESSING PLANTS AND MIXED OXIDE (MOX) FABRICATION PLANTS IN THE U.S. WERE REVIEWED AND THE FOLLOWING PLANTS WERE VISITED: BARNWELL NUCLEAR FUELS PLANT, MIDWEST FUELS RECOVERY PLANT, NUCLEAR FUEL SERVICES REPROCESSING PLANT, WESTINGHOUSE FUEL FABRICATION PLANT, AND GENERAL ELECTRIC FUEL FABRICATION PLANT. FROM THESE DESIGNS, A COMPOSITE REFERENCE DESIGN WAS SELECTED THAT MIGHT REPRESENT THE FUTURE REPROCESSING INDUSTRY. A THOROUGH REVIEW OF THE SELECTED DESIGN BY INDUSTRIAL REPRESENTATIVES WAS ACHIEVED BY WAY OF THE NRC RESEARCH REVIEW GROUP. THE REFERENCE DESIGN FOR THE INTEGRATED FUEL CYCLE SITE (IFCS) WILL INCLUDE, FUEL RECEIPT AND STORAGE, FUEL REPROCESSING, U AND PU CONVERSION, MOX FABRICATION, AND WASTE HANDLING FACILITIES.

177

MANAGEMENT OF RADIOACTIVE WASTE GASES FROM THE NUCLEAR FUEL

CYCLE. VOL. 1. COMPARISON OF ALTERNATIVES

NUREG/CR-1546, VOL. 1; DPST-NUREG-80-5

EVANS, A.G.; PROUT, W.E.; BUCKNER, J.T.; BUCKNER, M.R.

800101

NTIS. 88 P.

SAVANNAH RIVER LABORATORY

L,1;L,5;M,1;M,5;O,1;O,8;P,1;P,5

ALTERNATIVES WERE COMPARED FOR COLLECTION AND FIXATION OF RADWASTE GASES RELEASED DURING NORMAL OPERATION OF THE NUCLEAR FUEL CYCLE, AND FOR TRANSPORTATION AND STORAGE/DISPOSAL OF THE RESULTING WASTE FORMS. THE STUDY USED A NUMERICAL RATING SCHEME TO EVALUATE AND COMPARE THE ALTERNATIVES FOR KR-85, I-129, AND C-14; WHEREAS A SUBJECTIVE EVALUATION, BASED ON PUBLISHED REPORTS AND ENGINEERING JUDGMENT, WAS MADE FOR TRANSPORTATION AND STORAGE/DISPOSAL OPTIONS. BASED ON THESE EVALUATIONS, CERTAIN ALTERNATIVES ARE RECOMMENDED FOR AN INTEGRATED SCHEME FOR WASTE MANAGEMENT OF EACH OF THE SUBJECT WASTE GASES. PHASE II OF THIS PROJECT, WHICH IS CONCERNED WITH THE DEVELOPMENT OF PERFORMANCE CRITERIA FOR THE WASTE FORMS ASSOCIATED WITH THE SUBJECT GASES, WILL BE COMPLETED BY THE END OF 1980. THIS WORK WILL BE DOCUMENTED AS VOL. 2 OF THIS REPORT.

178

A METHODOLOGY AND A PRELIMINARY DATA BASE FOR EXAMINING THE HEALTH RISKS OF ELECTRICITY GENERATION FROM URANIUM AND COAL FUELS

NUREG/CR-21539; ORNL/SUB-76-15/1; SAI-OR-80-140-01

EL-BASSIONI , A.A.

800101

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN. 500 P.
SCIENCE APPLICATIONS, INC.

C,1;C,3;C,5;D,1;D,3;D,5;F,1;F,3;F,5;G,1;G,3;G,5;H,1;H,3;H,5;I,1;
I,3;I,5;J,1;J,3;J,5;K,1;K,3;K,5;L,1;L,3;L,5;M,1;M,3;M,5;N,1;N,3;N,5;O,1;O,3;O,5;P,7

AN ANALYTICAL MODEL WAS DEVELOPED TO ASSESS AND EXAMINE THE HEALTH EFFECTS ASSOCIATED WITH THE PRODUCTION OF ELECTRICITY FROM URANIUM AND COAL FUELS. THE MODEL IS BASED ON A SYSTEMATIC METHODOLOGY THAT IS BOTH SIMPLE AND EASY TO CHECK, AND PROVIDES DETAILS ABOUT THE VARIOUS COMPONENTS OF HEALTH RISK. PRELIMINARY QUANTITATIVE ASSESSMENT SHOWED THAT SEVERAL FACTORS NOT CONSIDERED IN DETAIL IN PREVIOUS STUDIES ARE POTENTIALLY IMPORTANT.

179

ENVIRONMENTAL SURVEY OF THE REPROCESSING AND WASTE
MANAGEMENT PORTIONS OF THE LWR FUEL CYCLE. A TASK
FORCE REPORT

NUREG-0116; PB-258 316

BISHOP, W.P.; MARALIGA, J.F., JR., (EDS.)

760101

NTIS. 450 P.

U.S. NRC

F,9;L;F,9,H;H,9,L;H,9,N;J,9,H;J,9,L;J,9,N;K,9,H; L,9,D;L,9,H;M,9,
D;M,9,H;N,9,D;N,9,H;O,9,D;O,9,H;O,9,N

THIS SUPPLEMENT (TO WASH-1248) DEALS WITH THE REPROCESSING AND WASTE MANAGEMENT PORTIONS OF THE NUCLEAR FUEL WASTE MANAGEMENT PORTIONS OF THE NUCLEAR FUEL CYCLE FOR URANIUM-FUELED REACTORS. THE SCOPE OF THE REPORT IS LIMITED TO THE ILLUMINATION OF FUEL REPROCESSING AND WASTE MANAGEMENT ACTIVITIES, AND EXAMINATION OF THE ENVIRONMENTAL IMPACTS CAUSED BY THESE ACTIVITIES ON A PER-REACTOR BASIS. THE APPROACH IS TO SELECT ONE REALISTIC REPROCESSING AND WASTE MANAGEMENT SYSTEM AND TO TREAT IT IN ENOUGH DEPTH TO ILLUMINATE THE ISSUES INVOLVED, THE TECHNOLOGY AVAILABLE, AND THE RELATIONSHIPS OF THESE TO THE NUCLEAR FUEL CYCLE IN GENERAL AND ITS ENVIRONMENTAL IMPACTS.

180

DRAFT ENVIRONMENTAL STATEMENT ON THE TRANSPORTATION OF
RADIOACTIVE MATERIAL BY AIR AND OTHER MODES. DOCKET
NO. PR-71,73 (40 FR 23768)

NUREG-0034

U.S. NRC, OFFICE OF STANDARDS DEVELOPMENT

760101

U.S. NRC, WASHINGTON, DC. 235 P.

O,1;O,2,A;O,2,B;O,3;O,5,B;O,5,D;O,8;O,9,B;O,9,D;O,0,B;O,0,D

THIS DES HAS BEEN PREPARED IN CONNECTION WITH THE NRC RE-EVALUATION OF ITS PRESENT REGULATIONS GOVERNING AIR TRANSPORTATION OF RADIOACTIVE MATERIALS, TO PROVIDE SUFFICIENT

ANALYSIS TO DETERMINE THE EFFECTIVENESS OF THE PRESENT RULES AND OF POSSIBLE ALTERNATIVES TO THOSE RULES.

181

A BACKGROUND RISK ANALYSIS. VOLS. 1-4
INIS-MF-6339; INIS-MF-6340; INIS-MF-6341; INIS-MF-6342
TAYLOR, J.R.
790101

RISØE NATIONAL LABORATORY, ROSKILDE, DENMARK. 984 P.
RISØE NATIONAL LABORATORY
C,2;C,3;C,6;C,7;C,8

THIS IS A PRELIMINARY REPORT (IN 4 VOLS.). WHAT CAN BE CONCLUDED IS THAT THERE DOES NOT AT PRESENT EXIST ANY WELL FOUNDED THEORY FOR TREATING UNCERTAINTY IN RISK CALCULATIONS WHICH IS AT THE SAME TIME USEFUL DESIGN. IT IS HOPED TO BE ABLE TO CONTINUE WITH THIS PROBLEM IN LATER PROJECT WORK.

185

A REVIEW OF RADIATION EXPOSURE ESTIMATES FROM NORMAL OPERATION IN THE MANAGEMENT AND DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTES AND SPENT FUEL

EPA-520/3-8-008

HOLCOMB, W.F.

800101

U.S. EPA, OFFICE OF RADIATION PROGRAMS, WASHINGTON, DC. 32 P.
K,5,D;K,9,D;L,5,D;L,9,D;M,5,D;N,9,D

THIS IS AN ANALYSIS OF THE RADIOACTIVE RELEASES DURING NORMAL WASTE MANAGEMENT OPERATIONS AND GIVES THE RESULTING RADIATION DOSES AS TECHNICAL SUPPORT FOR EPA'S PROPOSED ENVIRONMENTAL RADIATION PROTECTION STANDARDS, 40 CFR 191. THE REVIEW INCLUDES PREPARATION FOR STORAGE OR DISPOSAL, STORAGE, AND EMPLACEMENT IN A DISPOSAL REPOSITORY. IT WAS FOUND THAT THEY ARE SMALL COMPARED TO THE RELEASES AND DOSES IN EPA'S URANIUM FUEL CYCLE STANDARDS, 40 CFR 190. FOR SUBPART A OF 40 CFR 191 ON WASTE MANAGEMENT AND STORAGE OPERATIONS, EPA PROPOSES TO EXTEND THE LIMITATIONS OF 40 CFR 290 TO THESE OPERATIONS.

186

THE WINDSCALE REPORT - A REVIEW

RIPPON, S.

780101

UKAEA, LONDON

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

ATOM (LONDON) (259):131-135.

P,1

GENERAL INTEREST ARTICLE.

187

PROBABILITY ENCODING IN DECISION ANALYSIS

SPETZLER, C.S.; STAEL VON HOLSTEIN, C.A.S.

750101

INSTITUTE OF MANAGEMENT SCIENCE, PROVIDENCE, RI

STANFORD RESEARCH INSTITUTE

MANAGE. SCI. 22(3):340-358.

C,3;C,6;C,8

A PHILOSOPHY OF PROBABILITY ENCODING IS PRESENTED. PROBABILITY ENCODING, THE PROCESS OF EXTRACTING AND QUANTIFYING INDIVIDUAL JUDGMENTS ABOUT UNCERTAIN QUANTITIES, IS ONE OF THE MAJOR FUNCTIONS REQUIRED IN THE PERFORMANCE OF DECISION ANALYSIS. THE PAPER DISCUSSES THE SETTING OF THE ENCODING PROCESS, INCLUDING THE USE OF SENSITIVITY ANALYSIS TO IDENTIFY CRUCIAL STATE VARIABLES FOR WHICH EXTENSIVE ENCODING PROCEDURES ARE APPROPRIATE. THE IMPORTANCE OF BALANCING MODELING AND ENCODING TECHNIQUES IS EMPHASIZED, AND EXAMPLES OF BIASES AND UNCONSCIOUS MODES OF JUDGEMENT ARE REVIEWED. A VARIETY OF ENCODING METHODS IS PRESENTED, AND THEIR APPLICABILITY IS DISCUSSED.

188

PROPOSED OUTLINE OF SAFETY ANALYSIS REPORT FOR FACILITIES
FOR GEOLOGIC ISOLATION OF RADIOACTIVE WASTES

Y/DW1/SUB-77/22320

WEISBECKER, L.W.; GERCHMAN, L.L.; HOLT, B.R.; MARA, S.J.; MCHUGH,
S.L.; TAYLOR, H.M.; VAN ZANDT, J.E.; ZCELLNER, D.R.

770101

STANFORD RESEARCH INSTITUTE, MENLO PARK, CA. 130 P.

STANFORD RESEARCH INSTITUTE

L,1;L,3;L,4;L,5;L,6;L,7

THE NRC GENERALLY REQUIRES THAT AN SAR BE PREPARED BY THE APPLICANT FOR A LICENSE FOR A MAJOR FACILITY THAT IS PART OF THE NUCLEAR FUEL CYCLE. ERDA ALSO REQUIRES SARS TO BE PREPARED FOR ALL NEW NUCLEAR FACILITIES CONSTRUCTED UNDER ITS PROGRAMS. NEITHER ERDA NOR NRC HAS DEVELOPED GUIDELINES FOR THE CONTENTS OF SARS FOR FEDERAL WASTE REPOSITORIES. THIS OUTLINE THEREFORE PROVIDES GUIDANCE IN PLANNING SAR CONTENTS FOR FEDERAL REPOSITORIES. SITE CHARACTERISTICS, PRINCIPAL DESIGN CRITERIA, FACILITY DESIGN, OPERATIONAL SYSTEMS AND COMPONENTS, LONG-TERM WASTE ISOLATION, CONDUCT OF OPERATIONS, TECHNICAL SPECIFICATIONS, AND QUALITY ASSURANCE ARE DISCUSSED.

189

A METHODOLOGY FOR CALCULATING RADIATION DOSES FROM
RADIOACTIVITY RELEASED TO THE ENVIRONMENT

ORNL-4992

KILLOUGH, G.G.; MCKAY, L.R., COMPS.

760101

NTIS. 400 P.

OAK RIDGE NATIONAL LABORATORY

C,5,B;C,5,D;C,9;P,2;P,3;P,9

THIS DOCUMENT REPRESENTS A COMPILATION OF THE PRINCIPAL ENVIRONMENTAL TRANSPORT AND DOSIMETRY MODELS DEVELOPED, ADAPTED, AND IMPLEMENTED BY THE RADIOLOGICAL ANALYSES AND APPLICATIONS GROUP OF THE ENVIRONMENTAL SCIENCES DIVISION OF ORNL. THE TRANSPORT OF RELEASED RADIOACTIVITY THROUGH THE NATURAL ENVIRONMENT IS DISCUSSED IN FOUR SECTIONS: ATMOSPHERIC DISPERSION, RESUSPENSION OF MATERIAL BY WIND ACTION, TERRESTRIAL TRANSPORT, AND MOVEMENT OF MATERIAL IN UNDERGROUND WATER SEEPAGE. THE DISCUSSION OF DOSE TO MAN AND BIGTA IS DIVIDED INTO INTERNAL AND EXTERNAL EXPOSURE SECTIONS. A DEVELOPMENTAL MODEL (CONDOS) WHICH ESTIMATES THE DOSE TO A POPULATION RESULTING FROM THE MANUFACTURE, STORAGE, DISTRIBUTION, USE, AND DISPOSAL OF CONSUMER PRODUCTS WHICH CONTAIN RADIOACTIVITY IS DESCRIBED. NUMEROUS TABLES ARE INCLUDED.

190

USERS GUIDE AND DOCUMENTATION FOR ADSORPTION AND DECAY

MODIFICATIONS TO THE USGS SOLUTE TRANSPORT MODEL

NUREG/CR-2502

TRACY, J.V.

820101

U.S. GPO, NRC. 120 P.

ERTEC WESTERN, INC., LONG BEACH, CA

C,5;C,7;L,5;L,7;N,5;N,7

DEVELOPMENT AND USER DOCUMENTATION FOR THE INCORPORATION OF RADIOACTIVE DECAY AND EQUILIBRIUM ADSORPTION INTO THE MOC SOLUTE TRANSPORT MODEL OF KONIKOW AND BREDEHOEFT IS PROVIDED. THE MODEL OF RADIOACTIVE DECAY, LINEAR ISOTHERM, LANGMUIR ISOTHERM, AND THE FREUNDLICH ISOTHERM, ARE DEVELOPED AS WELL AS THE BASIC FLOW AND CONSERVATION TRANSPORT EQUATIONS FOR A GROUNDWATER SYSTEM. THE REPORT INCLUDES THE THEORETICAL DEVELOPMENTS, NUMERICAL IMPLEMENTATIONS, DATA INPUT REQUIREMENTS, A LISTING OF THE COMPUTER CODE THAT IS WRITTEN TO COMPLY WITH FORTRAN 77 STANDARDS, SAMPLE INPUT AND OUTPUT, AND A BIBLIOGRAPHY OF SELECTED PUBLICATIONS ON VARIOUS ASPECTS OF THE TRANSPORT PROBLEMS. THIS DOCUMENT HAS BEEN DEVELOPED FOR USE BY NRC, WHICH HAS FUNDED THE MODIFICATION PROJECT.

191

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE

WASTE: THE DOSIMETRY AND HEALTH EFFECTS COMPUTER CODE

USER'S MANUAL

NUREG/CR-2346; SAND81-2066

RUNKLE, G.E.; CRANWELL, R.M.

810101

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM. 79 P.

SANDIA NATIONAL LABORATORIES

C,1;C,5;L,2;L,5,B;L,5,D

THE ROUGH DRAFT OF THIS USER'S GUIDE DESCRIBES THE COMPUTER CODE USED TO IMPLEMENT THE CONCEPTS OF THE DCSIMETRY AND HEALTH EFFECTS MODEL. IT CONTAINS A DESCRIPTION OF THE PHYSICAL STRUCTURE OF THE COMPUTER PROGRAM AND THE CALCULATIONS THAT ARE PERFORMED IN THE ANALYSIS. PROVIDED IS A DESCRIPTION OF THE MAIN PROGRAM AND THE SUBROUTINES THAT ARE USED, THE SPECIFIC PROCEDURES FOR EXECUTING THE COMPUTER PROGRAM TO PROCESS THE DATA FROM THE PATHWAYS MODEL FOR THE SCENARIOS ARE ANALYZED TO DEMONSTRATE THE WASTE MANAGEMENT RISK METHODOLOGY. AN EXAMPLE OF A U-TUBE WITH WELL WITHDRAWAL IS GIVEN.

192

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE

WASTE: THE DNEI COMPUTER CODE USER'S MANUAL

NUREG/CR-2343; SAND81-1663

CRANWELL, R.M.; CAMPBELL, J.E.; STUCKWISCH, S.E.

820101

U.S. GPC, NRC. 150 P.

SANDIA LABORATORIES

C,5;C,7;L,1;L,5;L,7

THIS REPORT DESCRIBES A NETWORK OF FLOW MODEL (DNET) FOR USE IN SIMULATING THE PROCESS OF SALT DISSOLUTION IN BEDDED SALT FORMATIONS. INCLUDED IN THE MODEL ARE THE CAPABILITIES FOR SIMULATING PROCESSES SUCH AS SALT CREEP, SUBSIDENCE, AND THERMOCHEMICAL EFFECTS, ALL OF WHICH CAN AFFECT THE SALT DISSOLUTION PROCESS. THE MODEL WAS DEVELOPED FOR USE BY THE NRC IN THE ANALYSIS OF THE NUCLEAR WASTE FACILITIES IN DEEP BEDDED SALT FORMATIONS. THIS DOCUMENT IS A USER'S MANUAL AND IS INTENDED TO FACILITATE THE USE OF THE DNET SIMULATOR. MATHEMATICAL EQUATIONS, SUBMODELS AND A DESCRIPTION OF THE FLOW NETWORK ARE GIVEN. A COMPLETE INPUT DATA GUIDE IS INCLUDED AS WELL AS FOUR SAMPLE PROBLEMS WITH INPUT DECK DESCRIPTIONS AND ASSOCIATED OUTPUT.

193

A DETERMINISTIC-PROBABILISTIC MODEL FOR CONTAMINANT

TRANSPORT. USER MANUAL

NUREG/CR-1609; CGS/NR85U060

SCHWARTZ, F.W.; CROWE, A.

800101

U.S. GPO, NRC; NTIS. 158 P.

CGS, INC, URBANA, IL

C,5;C,7;L,1;L,5;L,7

THIS MANUAL DESCRIBES A DETERMINISTIC-PROBABILISTIC CONTAMINANT TRANSPORT (BPCT) COMPUTER MODEL DESIGNED TO SIMULATE MASS TRANSFER BY GROUNDWATER MOVEMENT IN A VERTICAL SECTION OF THE EARTH'S CRUST. THE MODEL CAN ACCOUNT FOR CONVECTION, DISPERSION, RADIOACTIVE DECAY, AND CATION EXCHANGE FOR A SINGLE COMPONENT. A VELOCITY IS CALCULATED FROM THE CONVECTIVE

TRANSPORT OF THE GROUNDWATER FOR EACH REFERENCE PARTICLE IN THE MODELED REGION; DISPERSION IS ACCOUNTED FOR IN THE PARTICLE MOTION BY ADDING A RANDOM COMPONENT TO THE DETERMINISTIC MOTION. THE MODEL IS SUFFICIENTLY GENERAL TO ENABLE THE USER TO SPECIFY VIRTUALLY ANY TYPE OF WATER TABLE OR GEOLOGIC CONFIGURATION, AND A VARIETY OF BOUNDARY CONDITIONS. A MAJOR EMPHASIS IN THE MODEL DEVELOPMENT HAS BEEN PLACED ON MAKING THE MODEL SIMPLE TO USE, AND INFORMATION PROVIDED IN THE USER MANUAL WILL PERMIT CHANGES TO THE COMPUTER CODE TO BE MADE RELATIVELY EASILY FOR THOSE THAT MIGHT BE REQUIRED FOR SPECIFIC APPLICATIONS.

194

MANAGEMENT OF INTERMEDIATE LEVEL RADIOACTIVE WASTE, OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE. FINAL ENVIRONMENTAL IMPACT STATEMENT

ERDA-1553

U.S. ERDA

770101

U.S. ERDA, WASHINGTON, DC. 322 P.

U.S. ERDA

N,1;N,2;N,3,A;N,3,B;N,4,A;N,4,B;N,4,C;N,4,D;N,5,A;N,5,B;N,5,C;N,5,D;N,7,A;N,7,B;N,7,C;N,7,D;N,0,A;N,0,B;O,5,A;O,5,B;O,7,A;O,7,B

THIS EIS WAS PREPARED IN ACCORDANCE WITH NEPA TO SUPPORT AN ADMINISTRATIVE ACTION BY THE ERDA TO SELECT A PREFERRED TECHNIQUE FOR THE MANAGEMENT OF INTERMEDIATE-LEVEL RADIOACTIVE LIQUID WASTE ATORNL, AND COVER CONSTRUCTION OF A FACILITY TO IMPLEMENT THIS TECHNIQUE. REASONABLE ALTERNATIVE TECHNIQUES ARE ANALYZED. THE FACILITY REQUIREMENTS NECESSARY TO IMPLEMENT THE TECHNIQUE ARE ANALYZED AND THE POTENTIAL ENVIRONMENTAL IMPACTS OF THE AVAILABLE ALTERNATIVES ARE ASSESSED. CHAPTERS ARE DEVOTED TO THE FOLLOWING TOPICS: BACKGROUND AND DESCRIPTION; ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION; UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS; ALTERNATIVES; RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG TERM PRODUCTIVITY; STATE, LOCAL, OR REGIONAL CONFLICTS; IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES; AND COST BENEFIT ANALYSIS. FOUR APPENDICES ARE PROVIDED: GLOSSARY OF TERMS, CHARACTERIZATION OF EXISTING ENVIRONMENT, CALCULATIONS AND ENVIRONMENTAL MONITORING OF EXISTING ENVIRONMENT.

195

ALTERNATIVES FOR MANAGING WASTES FROM REACTORS AND POST-FISSION OPERATIONS IN THE LWR FUEL CYCLE. VOL. 1

ERDA-76-43, VOL. 1

BATTELLE, PACIFIC NORTHWEST LABORATORIES

760101

U.S. ERDA, WASHINGTON, DC. 182 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

J,1;J,7;J,9;K,1;K,7;K,9;L,1;L,7;L,9;M,1;M,7;M,9;N,1;N,7;N,9;O,1;

0,7;0,9

VOL. 1 OF THE 5 VOL. REPORT CONTAINS EXECUTIVE AND TECHNICAL SUMMARIES OF THE ENTIRE REPORT, BACKGROUND INFO OF THE LWR FUEL CYCLE ALTERNATIVES, DESCRIPTIONS OF WASTE TYPES, AND PROJECTIONS OF WASTE QUANTITIES. OVERVIEW CHARACTERIZATIONS OF ALTERNATIVE LWR FUEL CYCLE MODES ARE ALSO INCLUDED.

196

ALTERNATIVES FOR MANAGING WASTES FROM REACTORS AND
POST-FISSION OPERATIONS IN THE LWR FUEL CYCLE, VOL. 2
ERDA-76-43, VOL. 2
BATTELLE, PACIFIC NORTHWEST LABORATORIES
760101

U.S. ERDA, WASHINGTON, DC. 490 P.
BATTELLE, PACIFIC NORTHWEST LABORATORIES
J,1;K,1;L,1;N,1;J,9;K,9;L,9;N,9

VOL. 2 OF THE 5 VOL. REPORT IS DEVOTED TO THE DESCRIPTION OF ALTERNATIVES FOR WASTE TREATMENT. THE DISCUSSION IS PRESENTED UNDER THE FOLLOWING SECTION TITLES: FUEL REPROCESSING MODIFICATIONS; HIGH-LEVEL LIQUID WASTE SOLIDIFICATION; TREATMENT OF NONCOMBUSTIBLE SOLID WASTES; TREATMENT OF COMBUSTIBLE WASTES; TREATMENT OF NON-HIGH-LEVEL WASTES; IMMOBILIZATION OF MISCELLANEOUS NON-HIGH-LEVEL WASTES; IMMOBILIZATION OF VOLATILE RADIOISOTOPE RECOVERY AND OFF-GAS TREATMENT; IMMOBILIZATION OF VOLATILE RADIOISOTOPES; RETIRED FACILITIES (D&D); AND, MODIFICATION AND USE OF SELECTED FUEL REPROCESSING WASTES.

197

ALTERNATIVES FOR MANAGING WASTES FROM REACTORS AND
POST-FISSION OPERATIONS IN THE LWR FUEL CYCLE, VOL. 3
ERDA-76-43, VOL. 3
BATTELLE, PACIFIC NORTHWEST LABORATORIES
760101

U.S. ERDA, WASHINGTON, DC. 224 P.
BATTELLE, PACIFIC NORTHWEST LABORATORIES
K,1;M,1;N,1;O,1

VOL. 3 OF THE 5 VOL. REPORT CONTAINS INFORMATION ON ALTERNATIVES FOR INTERIM STORAGE AND TRANSPORTATION. SECTION TITLES ARE: INTERIM STORAGE AND TRANSPORTATION OF SPENT FUEL ELEMENTS; INTERIM STORAGE OF CHOP-LEACH FUEL BUNDLE RESIDUES; TANK STORAGE OF HLLW; INTERIM STORAGE OF SOLID NON-HLW; INTERIM STORAGE OF SOLIDIFIED HLW; AND, TRANSPORTATION ALTERNATIVES.

198

ALTERNATIVES FOR MANAGING WASTES FROM REACTORS AND
POST-FISSION OPERATIONS IN THE LWR FUEL CYCLE, VOL. 4
ERDA-76-43, VOL. 4
BATTELLE, PACIFIC NORTHWEST LABORATORIES
760101

U.S. ERDA, WASHINGTON, DC. 220 P.
 BATTELLE, PACIFIC NORTHWEST LABORATORIES
 L,1;N,1;L,9;N,9

VOL. 4 OF THE 5 VOL. REPORT CONTAINS INFORMATION ON
 ALTERNATIVES FOR FINAL STORAGE AND DISPOSAL OF RADIOACTIVE
 WASTES. SECTION TITLES INCLUDE: BASIC CONCEPTS FOR GEOLOGIC
 ISOLATION, GEOLOGIC STORAGE ALTERNATIVES, GEOLOGIC DISPOSAL
 ALTERNATIVES, EXTRATERRESTRIAL DISPOSAL, AND TRANSMUTATION.

199

ALTERNATIVES FOR MANAGING WASTES FROM REACTORS AND
 POST-FISSION OPERATIONS IN THE LWR FUEL CYCLE. VOL. 5
 ERDA-76-43, VOL. 5
 BATTELLE, PACIFIC NORTHWEST LABORATORIES
 760101

U.S. ERDA, WASHINGTON, DC. 300 P.
 BATTELLE, PACIFIC NORTHWEST LABORATORIES
 L,7;L,9;N,7;N,9

VOL. 5 OF THE 5 VOL. REPORT CONSISTS OF APPENDICES, WHICH
 PROVIDE SUPPLEMENTARY INFORMATION, WITH EMPHASIS ON
 CHARACTERISTICS OF GEOLOGIC FORMATIONS THAT MIGHT BE USED FOR
 FINAL STORAGE OR DISPOSAL. APPENDIX TITLES ARE: SELECTED
 GLOSSARY; CONVERSION FACTORS; GEOLOGIC ISOLATION, INCLUDING, (1)
 SITE SELECTION FACTORS FOR REPOSITORIES OF WASTES IN GEOLOGIC
 MEDIA, (2) ROCK TYPES - GEOLOGIC OCCURRENCE, (3) GLOSSARY OF
 GEOPHYLOGIC TERMS, AND (4) REFERENCES; THE OCEAN FLOOR; AND ,
 GOVERNMENT REGULATIONS PERTAINING TO THE MANAGEMENT OF
 RADIOACTIVE MATERIALS.

200

STATUS REPORT ON THE EPRI FUEL CYCLE ACCIDENT RISK
 ASSESSMENT

EPRI-NP-1128
 ERDMANN, R.C.; FULLWOOD, R.R.; GARCIA, A.A.; MENDCZA, Z.T.;
 RITZMAN, R.L.; STEVENS, C.A.
 790101

ELECTRIC POWER RESEARCH INSTITUTE, PALO ALTO, CA. 182 P.
 SCIENCE APPLICATIONS, INC.

D,1;D,2;D,3;D,4,A;D,4,C;D,4,E;D,4,G;D,5,B;D,5,D;D,5,F;D,5,H;D,9;
 E,1;E,2;E,3;E,4,A;E,4,C;E,4,E;E,4,G;E,5,B;E,5,D;E,5,F;E,5,H;
 E,9;I,1;I,2;I,3;I,4,A;I,4,C;I,4,E;I,4,G;I,5,B;I,5,D;I,5,F;I,
 5,H;I,9;J,1;J,2;J,3;J,4,A;J,4,C;J,4,E;J,4,G;J,5,B;J,5,D;J,5,
 F;J,5,H;J,9;K,1;K,2;K,3;K,4,A;K,4,C;K,4,E;K,4,G;K,5,B;K,5,D;
 K,5,F;K,5,H;K,9;L,1;L,2;L,3;L,4,A;L,4,C;L,4,E;L,4,G;L,5,B;L,
 5,D;L,5,F;L,5,H;L,9;N,1;N,2;N,3;N,4,A;N,4,C;N,4,E;N,4,G;N,5,
 B;N,5,D;N,5,F;N,5,H;N,9; O,1;O,2;O,3;O,4,A;O,4,C;O,4,E;O,4,
 G;O,5,B;O,5,D;O,5,F;O,5,H;O,9

THIS REPORT SUMMARIZES AND EXTENDS THE WORK REPORTED ON:
 THE ACCIDENTAL RADIOLOGICAL RISK OF REPROCESSING SPENT FUEL,
 MIXED OXIDE FUEL FABRICATION, THE TRANSPORTATION OF MATERIALS

WITHIN THE FUEL CYCLE, AND THE DISPOSAL OF NUCLEAR WASTES, AND THE ROUTINE ATMOSPHERIC RADIOLOGICAL RISK OF MINING AND MILLING URANIUM-BEARING ORE. RESULTS SHOW THAT THE TOTAL RISK CONTRIBUTION OF THE FUEL CYCLE IS ONLY ABOUT 1% OF THE ACCIDENT RISK OF THE POWER PLANT AND HENCE, WITH LITTLE ERROR, THE ACCIDENT RISK OF NUCLEAR ELECTRIC POWER IS THAT OF THE POWER PLANT ITSELF. THE POWER PLANT RISK, ASSUMING A VERY LARGE USAGE OF NUCLEAR POWER BY THE YR 2005, IS ONLY ABOUT 0.5% OF THE RADIOLOGICAL RISK OF NATURAL BACKGROUND. THIS WORK AIMS AT A REALISTIC ASSESSMENT OF THE PROCESS HAZARDS, THE EFFECTIVENESS OF CONFINEMENT AND MITIGATION SYSTEMS AND PROCEDURES, AND THE ASSOCIATED LIKELIHOODS AND ESTIMATED ERRORS. THE PRIMARY PROBABILISTIC ESTIMATION TOOL IS FAULT TREE ANALYSIS WITH THE RELEASE SOURCE TERMS CALCULATED USING PHYSICAL-CHEMICAL PROCESSES. DOSES AND HEALTH EFFECTS ARE CALCULATED WITH THE CRAC CODE. NO EVACUATION OR MITIGATION IS CONSIDERED: SOURCE TERMS MAY BE CONSERVATIVE THROUGH THE ASSUMPTION OF HIGH FUEL BURNUP (40,000 MWDT) AND SHORT COOLING (90 TO 150 D); HEPA FILTER EFFICIENCIES ARE DERIVED FROM EXPERIMENTS.

201
MULTIDIMENSIONAL ANALYSIS OF RADON DIFFUSION THROUGH
URANIUM MILL TAILINGS AND COVER SYSTEMS

MAYER, D.W.; NELSON, R.W.; GEE, G.W.
810901
COLORADO STATE UNIV., BOULDER, CO
PACIFIC NORTHWEST LABORATORY
URANIUM MILL TAILINGS MANAGEMENT, PROC. 4TH SYMF. PP. 275-288.
E,3,D/E,3,L/E,5,D/E,5,L/E,9/E,0

A NEW CAPABILITY HAS BEEN DEVELOPED FOR MODELING RADON DIFFUSION THROUGH U MILL TAILINGS AND COVERS. THIS CAPABILITY ALLOWS THE TRANSIENT SOLUTION FOR RADON CONCENTRATIONS AND FLUXES IN ONE, TWO AND THREE DIMENSIONS. THE METHOD UTILIZES AN INTEGRATED-FINITE DIFFERENCE SOLUTION TO THE CONSERVATION OF MASS EQUATION FOR RADON GAS. THE EFFECTS OF VARIABLE SOIL MOISTURE CONTENT CAN ALSO BE TAKEN INTO ACCOUNT. RESULTS ARE PRESENTED FROM THE ANALYSIS OF BOTH BARE AND COVERED TAILINGS PILES. COMPARISONS OF THE NUMERICAL RESULTS ARE MADE WITH AN AVAILABLE ONE DIMENSIONAL ANALYTIC SOLUTION. THE TWO DIMENSIONAL EFFECTS OF A DISCONTINUOUS COVER SYSTEM ARE ALSO ANALYZED.

202
SAVANNAH RIVER LABORATORY DATA BANKS FOR RISK ASSESSMENT OF
FUEL REPROCESSING PLANTS
DP-MS-81-90; CONF-811085-4
DURANT, W.S.
810101
NTIS, 10 P.
SAVANNAH RIVER LABORATORY

J,4;J,9

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE DOE NUCLEAR FACILITY SAFETY CONF. SRL MAINTAINS A SERIES OF COMPUTERIZED DATA BANKS PRIMARILY AS AN AID IN PROBABILISTIC RA STUDIES IN THE FUEL REPROCESSING FACILITIES. THESE INCLUDE COMPONENT FAILURE RATES, GENERIC INCIDENTS, AND REPORTS OF SPECIFIC DEVIATIONS FROM NORMAL OPERATING CONDITIONS. IN ADDITION TO PROVIDING DATA FOR PROBABILITY STUDIES, THESE BANKS HAVE SERVED AS A VALUABLE AID IN TREND ANALYSIS, EQUIPMENT HISTORIES, PROCESS HAZARDS ANALYSIS, CONSEQUENCE ASSESSMENTS, INCIDENT AUDIT, PROCESS PROBLEM SOLVING, AND TRAINING.

203

THE APPLICATION OF PROBABILISTIC RISK ASSESSMENT TO NUCLEAR FUEL REPROCESSING AT THE SAVANNAH RIVER PLANT

DP-MS-80-59; CONF-801104-2

DURANT, W.S.

800101

NTIS. 14 P.

SAVANNAH RIVER LABORATORY

C,1;C,2;C,3;C,4;C,5;C,6;C,9;J,1;J,2;J,3;J,4;J,5;J,6;J,9

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE 73RD AIChE ANNUAL MEETING. SRL METHODOLOGY CAN BE APPLIED TO SEVERAL TYPES OF DESIGN AND OPERATIONAL PROBLEMS. BASICALLY, THE ANALYSIS IS SUBDIVIDED INTO INDIVIDUAL MODULES THAT CAN BE EITHER UTILIZED SEPARATELY OR INTEGRATED INTO AN OVERALL RISK ANALYSIS. COMPUTER CODES AND COMPUTER DATA BANKS ARE UTILIZED EXTENSIVELY TO MINIMIZE THE MANUAL EFFORT. THE FLOW OF INFORMATION BEGINS WITH A DEFINITION OF THE SYSTEM TO BE ANALYZED FOLLOWED BY AN EVALUATION OF SOURCES OF FAULTY INFORMATION, STORAGE OF THIS INFORMATION IN DATA BANKS, DESIGN ANALYSIS AND DATA TREATMENT, RISK CALCULATIONS, AND END PRODUCT OPERATIONS.

204

IDENTIFICATION OF POTENTIAL SAFETY-RELATED INCIDENTS APPLICABLE TO A BREEDER FUEL REPROCESSING PLANT

DP-MS-80-3; CONF-800901-3

PERKINS, W.C.

800101

NTIS. 24 P.

SAVANNAH RIVER LABORATORY

C,2;C,3;C,9;J,1;J,2;J,3;J,9

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE ANS TOPICAL MEETING ON FUEL CYCLES FOR THE EIGHTIES. CURRENT EMPHASIS ON SAFETY IN ALL PHASES OF THE NUCLEAR FUEL CYCLE REQUIRES THAT SAFETY FEATURES BE IDENTIFIED AND INCLUDED IN DESIGNS OF NUCLEAR REPROCESSING PLANT. A POPULAR METHOD FOR EARLY IDENTIFICATION OF THESE SAFETY FEATURES IS THE PRELIMINARY HAZARDS ANALYSIS (PHA). AN EXTENSION OF THIS ANALYSIS IS TO ILLUSTRATE THE NATURE OF A HAZARD BY ITS EFFECTS IN ACCIDENT SITUATIONS, E.G., TO IDENTIFY

WHAT ARE CALLED SAFETY-RELATED INCIDENTS. SOME USEFUL TOOLS ARE DESCRIBED WHICH HAVE BEEN USED AT SRL TO MAKE PHA'S AS WELL AS SAFETY ANALYSES OF FACILITIES FOR PROCESSING SPENT NUCLEAR FUELS FROM BOTH POWER AND PRODUCTION REACTORS. THESE TOOLS HAVE ALSO BEEN USED IN SAFETY STUDIES OF WASTE HANDLING OPERATIONS AT SRP. THE TOOLS ARE THE SRL INCIDENTS DATA BANK AND THE WHAT IF MEETING. THE APPLICATION OF THIS METHODOLOGY TO A PROPOSED FACILITY WHICH HAS BREEDER FUEL REPROCESSING CAPABILITY, THE HOT EXPERIMENTAL FACILITY IS ILLUSTRATED.

205

RISK ANALYSIS FOR THE SAVANNAH RIVER PLANT FUEL SEPARATIONS FACILITIES

DP-MS-77-2; CONF-770221-2

DURANT, W.S.

770101

NTIS. 34 P.

SAVANNAH RIVER LABORATORY

J,1;J,3;J,4,A;J,4,B;J,4,C;J,5,B;J,5,D;J,6;J,7;J,9

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE EPRI FUEL CYCLE RISK ASSESSMENT WORKSHOP. THE GENERAL CONCLUSIONS DRAWN FROM THE ANALYSES MADE TO DATE ARE OPERATIONAL RISKS ARE PROPORTIONAL TO ACTIVITY IN THE SYSTEM; INCIDENT RISKS ARE A FUNCTION OF LOCATION; RELEASES TO SECONDARY CONTAINMENT ARE NOT HAZARDOUS, PER SE, BUT INCREASE THE VULNERABILITY; TRANSFER ERRORS OCCUR FREQUENTLY, BUT SELDOM IDENTICALLY; PERSONNEL ERRORS CONTRIBUTE TO A SIGNIFICANT PERCENTAGE OF THE INCIDENTS; AIRBORNE RELEASE RISK IS SMALL; NO SIGNIFICANT CHEMICAL TOXICITY HAZARDS OR UNIQUE INDUSTRIAL HAZARDS WERE IDENTIFIED.

207

A PERSPECTIVE ON THE RELATIVE HAZARD OF LOW-LEVEL RADIOACTIVE WASTE DISPOSAL

EPA-520/3-79-002; PB-296 947; CONF-790209

DORNSIFE, W.P.

790201

NTIS. 536 P.

PENNSYLVANIA DEPT. OF ENVIRONMENTAL RESOURCES, BUREAU OF RADIATION PROTECTION

LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT, PROC. HEALTH PHYS. SOC. 12TH MIDYR. TOP. SYMP. PP. 16-26.

N,1;N,4;N,5,D;N,5,L;N,9,L

THE PROBLEM OF RADIOACTIVE WASTE MANAGEMENT AND THE MANAGEMENT OF OTHER HAZARDOUS WASTES BY COMPARING THEIR RELATIVE TOXICITIES IS EXAMINED. THE RELATIVE RISKS OF THE TOTAL PROBLEM ARE THEN ASSESSED BY COMPARING THE GENERATION RATES OF EACH. IN ADDITION, THE RADIOACTIVE WASTES PRODUCED BY THE NUCLEAR FUEL CYCLE ARE COMPARED WITH POTENTIALLY HAZARDOUS WASTE PRODUCED BY ALTERNATE ENERGY SOURCES, NAMELY, THE COAL FUEL CYCLE AND THE MANUFACTURING OF EQUIPMENT FOR THE COLLECTION OF SOLAR ENERGY.

THESE COMPARISONS SUGGEST THAT THE CONSEQUENCES OF DISPOSAL OF OTHER HAZARDOUS WASTE COULD RESULT IN RISK TO CURRENT AND FUTURE GENERATIONS WHICH ARE COMPARABLE WITH OR WHICH MAY EXCEED THAT DUE TO RADIOACTIVE WASTE DISPOSAL. OTHER ASPECTS OF THE PROBLEMS INHERENT IN THE SAFE MANAGEMENT OF HAZARDOUS WASTE COMPARED TO RADIOACTIVE WASTE ARE EXPLORED.

208

WASTE MANAGEMENT OF URANIUM MINING AND MILLING OPERATIONS

EPA-520/3-79-002; PB-296 947; CONF-790209

KIRNER, N.P.; MOGHISSI, A.A.; BLACKBURN, P.A.

790101

NTIS. 536 P.

STATE OF WASHINGTON

LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT. PROC. HEALTH PHYS. SOC.

12TH MIDYR TOP SYMP. PP. 174-181.

D,1;D,5,D;D,5,L;E,1;E,5,D;E,5,L;E,9,D;E,9,D;E,9,L

URANIUM MINING AND MILLING OPERATIONS ASSOCIATED WITH WASTE PRACTICES ARE SOMEWHAT DIFFERENT FROM OTHER NUCLEAR OPERATIONS IN THAT NO NEW RADIOACTIVE MATERIAL IS GENERATED. THE METHODS AND PROCEDURES OF U MINING AND MILLING OPERATIONS USING THE ACID-LEACH SOLVENT EXTRACTION METHOD ARE DESCRIBED USING THE SHERWOOD PROJECT OF WESTERN NUCLEAR, INC., AS AN EXAMPLE.

209

THE USE OF A RISK LIMIT AS AN ENVIRONMENTAL SAFETY STANDARD

FOR RADIOACTIVE WASTE DISPOSAL SITES

EPA-520/3-79-002; PB-296 947; CONF-790209

DESROSIERS, A.E.; NJOKU, E.

790101

NTIS. 536 P.

PACIFIC NORTHWEST LABORATORY

LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT. PROC. HEALTH PHYS. SOC.

12TH MIDYR. TOP. SYMP. PP. 270-279.

N,2,D;N,3,D;N,3,L;N,5,D;N,5,L;N,9,D;N,9,L

RECOMMENDATIONS OF ICRP BUL. 26 MAY BE APPLIED TO SETTING ENVIRONMENTAL RADIATION STANDARDS FOR RADIOACTIVE WASTE DISPOSAL SITES. TRADITIONALLY, SUCH STANDARDS PRESCRIBE THE ALLOWABLE RADIATION DOSE TO THE MAXIMALLY EXPOSED OFFSITE INDIVIDUAL. DOSE LIMITS ARE USUALLY ESTABLISHED FOR THE TOTAL BODY AND FOR INDIVIDUAL ORGANS. IN THIS PAPER, THE RISK FACTORS RECOMMENDED BY ICRP FOR INDIVIDUAL ORGANS AND THE DOSES TO THOSE ORGANS ARE COMBINED TO CALCULATE THE TOTAL RISK PER UNIT OF INGESTED RADIOACTIVITY. THE ALLOWABLE INGESTION OF RADIOACTIVITY IS THEN CALCULATED FROM ICRP'S INDIVIDUAL RISK LIMIT. WHEN THESE DATA ARE COMPARED TO NORMALLY DERIVED INGESTION LIMITS, SIGNIFICANT DIFFERENCES APPEAR WHENEVER A RELATIVELY INSENSITIVE ORGAN RECEIVES THE MAJORITY OF THE DOSE. MAXIMUM ALLOWABLE CONCENTRATIONS OF RADIONUCLIDES IN WATER ARE DERIVED FROM THE INGESTION LIMITS AND THE CONCEPT OF AN EFFECTIVE WATER

CONSUMPTION RATE. USING RISK ASSESSMENT IN ENVIRONMENTAL STANDARDS FOR WASTE DISPOSAL SITES WOULD ALLOW (1) A RAPID AND CONSERVATIVE (CAUTIOUS) ASSESSMENT OF THE POTENTIAL IMPACT OF A WASTE DISPOSAL FACILITY, AND (2) A SIMPLER EVALUATION OF THE IMPACT OF INGESTING SEVERAL RADIONUCLIDES EVEN IF EACH RADIONUCLIDE AFFECTS DIFFERENT HUMAN ORGANS.

210

RADON - AN ENVIRONMENTAL POLLUTANT?

EPA-520/3-79-002; PB-296 947; CONF-790209

MILLS, W.A.

790101

NTIS. 536 P.

U.S. EPA

LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT. PROC. HEALTH PHYS. SOC. 12TH MIDYK. TOP. SYMP. PP. 260-263.

E,5,D;E,5,L;E,9,D;E,9,L;D,5,D;D,5,L;D,9,D;D,9,L

RADIOLOGICAL CONCERNS WITH THE DISPOSAL AND USE OF MINING AND MILLING RESIDUES HAVE HEIGHTENED TO THE POINT THAT FEDERAL AGENCIES ARE ASKING OF BEING ASKED TO FORMULATE NEW REGULATIONS FOR CONTROLLING RADON DAUGHTERS FROM A VARIETY OF SOURCES - RADIOACTIVITY PREVIOUSLY CONSIDERED TO BE PART OF OUR NATURAL ENVIRONMENT. BASED ON INFORMATION DERIVED FROM EPIDEMIOLOGIC STUDIES OF UNDERGROUND MINERS, PARTICULARLY URANIUM MINERS, THE HEALTH IMPACT ON THE GENERAL PUBLIC IS BEING PROJECTED. DEPENDING ON THE ASSUMPTIONS MADE, THESE PROJECTIONS VARY WIDELY. BECAUSE OF THESE VARIATIONS IN HEALTH RISKS, DECISIONS ON CONTROL MEASURES HAVE EVEN WIDER IMPLICATIONS ON ECONOMIC AND SOCIAL CONSIDERATIONS. THUS THE QUESTION: IS RADON AN ENVIRONMENTAL POLLUTANT? WHILE NOT FULLY ANSWERING THE QUESTION, RECOGNIZING THE UNCERTAINTIES IN ASSESSING AND CONTROLLING RADON DAUGHTERS CAN PUT THE QUESTION IN BETTER PERSPECTIVE.

211

RADIOLOGICAL IMPACT OF URANIUM TAILINGS AND ALTERNATIVES FOR THEIR MANAGEMENT

EPA-520/3-79-002; PB-296947; CONF-790209

MCNENI, M.H.; KISIELESKI, W.B.; TYDER, S.; ZIELEN, A.; YUAN, Y.; ROBERTS, C.J.

790101

NTIS. 536 P.

ARGONNE NATIONAL LABORATORY

LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT. PROC. HEALTH PHYS. SOC. 12TH MIDYR. TOP. SYMP. PP. 307-328.

E,5,D;E,5,L;E,9,D;E,9,L;D,5,D;D,5,L;D,9,D;D,9,L

PROTOCOL FOR TAILING MANAGEMENT SHOULD BE BASED ON BOTH REDUCTION OF EXPOSURE PATHWAYS AND CONTAINMENT THROUGHOUT THE PREDICTABLE FUTURE. ISOLATION OF TAILINGS BY NATURAL MATERIALS SUCH AS CLAY LENSES AND COMBINATIONS OF OVERBURDEN, TOP SOIL, VEGETATION AND RIP-RAP MAY PROVIDE BOTH MINIMIZATION OF EXPOSURE

AND STABILITY. EXPERIMENTAL MEASUREMENT OF RADON FLUX OVER TWO INACTIVE TAILINGS, ACID AND CARBONATE LEACHED TAILINGS RESULTED IN AVERAGE SPECIFIC FLUX VALUES, THE AVERAGE DIFFUSION COEFFICIENT IS GIVEN. BY MEANS OF THE UDAO CODE DOSE COMMITMENTS WERE ESTIMATED FOR INHALATION OF PARTICULATES AND RADON AND FOR EXTERNAL EXPOSURE UNDER 3 DEGREES OF SURFACE MOISTURE ON THE TAILINGS. BASED ON THESE ANALYSIS AND ASSUMPTION THAT THE DOSE CONTRIBUTION FROM INGESTION PATHWAY IS COMPARABLE IN MAGNITUDE TO THAT OF INHALATION, BOTH COMPLIANCE WITH THE 25 MREM/YR LIMIT AND REDUCTION OF FLUX TO BACKGROUND LEVEL IS FEASIBLE. STABILITY OF ALTERNATIVE DECOMMISSIONED TAILINGS OVER THE PREDICTABLE FUTURE IS DISCUSSED.

212

ACCEPTABLE RESIDUAL RADIOACTIVE CONTAMINATION LEVELS FOR SITES OF DECOMMISSIONED NUCLEAR FACILITIES

EPA-520/3-79-002; PB-296 947; CONF-790209
KENNEDY, W.E., JR.; MCPHERSON, R.B.; WATSON, E.C.
790101

NTIS. 536 P.

PACIFIC NORTHWEST LABORATORY

LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT. PROC. HEALTH PHYS. SOC. 12TH MIDYR. TOP. SYMMP. PP. 373-384.

H,5,L;H,9,L;I,5,L;I,9,L;J,5,L;J,9,L

THE METHOD USED FOR THIS STUDY IS TO DETERMINE THESE ACCEPTABLE ENVIRONMENTAL LEVELS BASED ON A MAXIMUM ANNUAL DOSE TO AN INDIVIDUAL FROM THE RESIDUAL CONTAMINATION VIA ALL ENVIRONMENTAL PATHWAYS. THE REFERENCE FACILITIES CONSIDERED ARE FRP, PWR AND MOX. THE RESULTS OF THIS STUDY SHOW ARC LEVELS AT PLANT SHUTDOWN UNITS OF MICROCURIES /SQ M OF 5.0×10^{-3} FOR THE FRP, 1.2×10^{-2} FOR THE MOX.

213

RETENTION OF LOW-LEVEL RADIOACTIVE WASTE MATERIAL BY SOIL

EPA-520/3-79-002; PB-296 947; CONF-790209
ESSINGTON, E.H.; FOWLER, E.B.; POLZER, W.L.
790101

NTIS. 536 P.

LOS ALAMOS SCIENTIFIC LABORATORY

LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT. PROC. HEALTH PHYS. SOC. MIDYR. TOP. SYMMP. PP. 457-470.

N,5,D;N,5,L;N,9;L,5,D;L,5,L;L,9

IN SOIL COLUMN LEACHING STUDIES, RADWASTE SOLUTIONS WERE APPLIED TO 4 DIFFERENT SOIL TYPES; AM-241,Y-88, AND HF-172 WERE RETAINED IN THE TOP 4 CM OF SOIL WITH BETTER THAN 90% RETAINED BY A PROTECTIVE SURFACE SAND LAYER. LESS THAN 50% OF THE SR-85, CS-137, AND RB-83 WAS RETAINED BY THE SURFACE SAND. NO Y-88, HF-172, SR-85, CS-137, OR RB-83 WAS DETECTED BY GAMMA COUNTING IN THE LEACHATE SOLUTIONS. HOWEVER, USING A MORE SENSITIVE ANALYTICAL TECHNIQUE SMALL AMOUNTS OF PU-238, PU-239,-240 AND

AM-241 WERE FOUND IN LEACHATES FROM ALL SOILS. IT APPEARS THAT RELEASE OF THIS SMALL FRACTION OF MOBILE RADIONUCLIDE MAY HAVE A SIGNIFICANT LONG-TERM IMPACT ON THE ENVIRONMENT. IT ALSO APPEARS THAT RELIANCE FOR ATTENUATION OF SOME RADIONUCLIDES CAN NOT BE PLACED SOLELY ON CHARACTERISTICS OF THE SOIL MATRIX.

214

AN ASSESSMENT OF THE ENVIRONMENTAL TRANSPORT OF RADIOIODINE
IN THE AIR-GRASS-COW-MILK PATHWAY USING REPORTED
ENVIRONMENTAL MONITORING DATA

EPA-520/3-79-002; PB-296 947; CONF-790209

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790101

NTIS, 536 P.

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LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT. PROC. HEALTH PHYS. SOC.
MIDYR. TOP. SYMP. PP. 504-514.

C,5;C,9;P,5,D;P,9

THIS PAPER PRESENTS AN ATTEMPT TO ANALYZE THE PATHWAY BY
USING DATA ROUTINELY REPORTED TO NRC FROM THE EFFLUENT AND OTHER
MONITORING PROGRAMS MAINTAINED AT NUCLEAR POWER STATIONS. THIS
DATA IS USED IN CURRENTLY ACCEPTED TRANSPORT MODELS TO MAKE A
COMPARISON OF COMPUTER PREDICTED VERSUS ACTUAL MEASURED VALUES
OF THE RESULTANT CONCENTRATION OF I-131 IN MILK SAMPLES.

215

REVIEW AND ASSESSMENT OF PACKAGE REQUIREMENTS (YELLOWCAKE)
AND EMERGENCY RESPONSE TO TRANSPORTATION ACCIDENTS

NUREG-0535

JOINT STUDY GROUP: U.S. NRC, U.S. DOT

800101

U.S. GPO, NRC; NTIS. 275 P.

U.S. NRC

O,170,9,6

FOLLOWING THE ACCIDENTAL SPILL OF YELLOWCAKE IN COLORADO IN
SEPTEMBER 1977, THE NRC/DOT STUDY GROUP MET TO CONSIDER TOPICS
ON YELLOWCAKE PACKAGING AND RESPONSE TO TRANSPORTATION ACCIDENTS
INVOLVING ANY RADIOACTIVE MATERIAL. THE GROUP CONCLUDED THAT IN
AN ACCIDENT THE STATE AND LOCAL GOVERNMENT AGENCIES ARE
RESPONSIBLE FOR CONTROLLING THE SCENE, THAT CARRIERS ARE
RESPONSIBLE FOR NOTIFYING AUTHORITIES AND ISOLATING AND CLEANING
UP ANY SPILLED RADIOACTIVE MATERIAL, AND THAT SHIPPERS ARE
RESPONSIBLE FOR INFORMING OTHERS OF HAZARDS OF ANY CARGO. THE
GROUP RECOMMENDED THAT THESE PARTIES PREPARE PLANS FOR CARRYING
OUT THESE RESPONSIBILITIES. THE GROUP ALSO RECOMMENDED
TRANSPORTATION DATA GATHERING PROGRAMS, BUT, BASED ON COST
EFFECTIVENESS ARGUMENTS, DID NOT RECOMMEND ADDITIONAL PACKAGE
REQUIREMENTS FOR YELLOWCAKE SHIPMENTS.

216

NUCLEAR WASTE IN A REPOSITORY: AMOUNT AS A FACTOR IN RISK
DURATION

ZEN, E.

800101

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USGS

TRANS. AM. GEOPHYS. UNION 61(27):1-2.

L,1;L,5,B;L,5,D;L,9;L,0

THE RELATIONSHIP BETWEEN THE AMOUNT OF NUCLEAR WASTE IN A NUCLEAR REPOSITORY AND THE SAFETY OF THE REPOSITORY IS EXAMINED. IT IS SHOWN THAT THE AMOUNT OF A GIVEN HAZARDOUS NUCLIDE THAT IS POTENTIALLY LEACHABLE DEPENDS ON THE INITIAL AMOUNT OF WASTE IN THE REPOSITORY AND THE TIME THAT HAS ELAPSED SINCE THE REPOSITORY WAS PUT INTO OPERATION. NUCLEAR REPOSITORY SAFETY CAN BE ENHANCED IF REPOSITORIES ARE DESIGNED AS MODULAR UNITS WITH LEACH-RESISTANT WATERTIGHT COMPARTMENTS.

217

FUZZY SET THEORETIC APPROACH TO SYSTEMS ANALYSIS

SHINOHARA, Y.

770601

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TRANS. AM. NUCL. SOC. 26:265-266.

C,1;C,3;C,0

ONE OF THE PROBLEMS WE MUST TAKE INTO CONSIDERATION IN THE ANALYSIS OF COMPLEX PROBLEMS SUCH AS RISK ASSESSMENT IS HOW TO DEAL WITH VARIOUS TYPES OF UNCERTAINTIES WE ENCOUNTER IN THE COURSE OF THE ANALYSIS. THE UNCERTAINTIES CAN BE DIVIDED INTO TWO MAJOR CATEGORIES; NAMELY, THOSE DUE TO RANDOMNESS AND THOSE DUE TO AMBIGUITY. VERY OFTEN THEY EXIST IN A MIXED FORM AND ARE NOT ALWAYS EASILY SEPARABLE. CONVENTIONAL METHODS FOR TREATING UNCERTAINTY INCLUDE DETERMINISTIC AND PROBABILISTIC ONES. THE PRINCIPAL OBJECTIVES OF INTRODUCING THE FUZZY SET CONCEPT INTO THE SYSTEMS ANALYSIS ARE TO: (1) TAKE INTO ACCOUNT THE AMBIGUITY AND THE SUBJECTIVITY IN AN EXPLICIT MANNER BY DEVELOPING FLEXIBLE CONCEPTS SUITABLE FOR TREATING IMPRECISELY DEFINED PROBLEMS; AND (2) DEVELOP PRACTICAL METHODS FOR EVALUATING THE GRADE OF QUALITY OF THE ANALYSIS (UNCERTAINTY, IMPORTANCE, ETC.) BY APPLYING THE FUZZY SET THEORY. THE CRUCIAL POINTS FOR SUCCESSFUL APPLICATION OF THE FUZZY SET THEORY TO SYSTEMS ANALYSIS ARE HOW TO DETERMINE THE MEMBERSHIP FUNCTIONS AND HOW TO INTERPRET THE FUZZY RELATIONS IN CONCRETE PROBLEMS.

218

RISK ANALYSIS OF RADIOACTIVE WASTE MANAGEMENT SYSTEMS IN
GERMANY

WINGENDER, H.J.

780101

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NUKEM GMBH, GERMANY

NUCL. TECHNOL. 39(1):18-24.

K,1;K,2;K,3,A;K,3,B;K,3,C;K,3,D;K,3,E;K,3,F;K,5,A;K,5,B;K,5,C;K,5,D;K,5,E;K,5,F

WITHIN THE SCOPE OF A SYSTEM STUDY, "RADIOACTIVE WASTES IN THE FEDERAL REPUBLIC OF GERMANY," PERFORMED FROM 1974-1976, THE QUESTIONS OF RISK ASSESSMENT WERE INVESTIGATED. A RISK ANALYSIS OF HLW MANAGEMENT SYSTEM WAS PERFORMED. THE RESULTS OF THE HLW TANK STORAGE ARE THAT RISK EXPECTATION VALUE IS 700 NJ/KG X RBE (7×10^{-5} REM)/YR FOR ATMOSPHERIC RELEASE. THE RISK ANALYSIS ACTIVITIES HAVE LEAD TO A COMPREHENSIVE RISK ASSESSMENT PROJECT. A CONDENSED VERSION OF THIS PAPER APPEARS IN TRANS. AM. NUCL. SOC. 26:267-266.

219

PROBABILISTIC ASSESSMENT OF AIRCRAFT RISK FOR NUCLEAR POWER PLANTS

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NUCL. SAF. 15(3):276-284.

P,3;P,5,A;P,5,B;P,7;P,8

THE RISK TO THE PUBLIC FROM AN AIRCRAFT STRIKING A NUCLEAR POWER PLANT HAS BEEN EVALUATED IN A QUANTITATIVE MANNER. AIRCRAFT ACCIDENT DATA HAVE BEEN ANALYZED TO ESTIMATE THE PROBABILITY OF AN AIRCRAFT STRIKING A TYPICAL NUCLEAR PLANT AT SITES ADJACENT AND REMOTE FROM AN AIRPORT. TWO MODES OF SIGNIFICANT DAMAGE ARE DELINEATED: PERFORATION AND LOCAL COLLAPSE. METHODS HAVE BEEN DEVELOPED TO ESTIMATE THE CONDITIONAL PROBABILITIES OF SUCH STRUCTURAL DAMAGE GIVEN AN AIRCRAFT STRIKE AND PROBABILITY VALUES CALCULATED FOR A REPRESENTATIVE STRUCTURE. COMPARISON OF THESE RISKS TO SOCIALLY ACCEPTABLE RISK LEVELS SHOWS THAT REACTOR SITES BEYOND 5 MILES FROM AN AIRPORT OR AWAY FROM A BUSY AIR CORRIDOR SHOULD BE ACCEPTABLE.

220

RADIATION PROTECTION PRINCIPLES UNDERLYING THE IAEA TRANSPORT REGULATIONS AND TRANSPORT EXPERIENCE UNDER NORMAL AND ACCIDENT CONDITIONS

TSE, A.N.

790101

IAEA, VIENNA

U.S. NRC
INT. AT. ENERGY AGENCY BULL. 21(6):40-47.
U,1;D,3;O,5

THE EXPERIENCE OBTAINED OVER THE PAST 30 YRS DEMONSTRATES THAT THE TRANSPORT OF RADIOACTIVE MATERIALS HAS ACHIEVED A HIGH STANDARD OF SAFETY. ALTHOUGH ACCIDENTS HAVE OCCURRED, THE RESULTING CONSEQUENCES WERE NOT SERIOUS. REVISION OF THE TRANSPORT REGULATIONS IS PLANNED FOR 1983 AND WORK HAS ALREADY BEGUN.

221
NUCLEAR SAFETY IN FRANCE

TANGUY, P.
790101
PERGAMON PRESS, NEW YORK
CEA, FRANCE
ANN. NUCL. ENERGY 6(5):299-304.
C,1;C,2;P,1

A BRIEF DESCRIPTION OF THE MAIN SAFETY ASPECTS OF THE FRENCH NUCLEAR ENERGY PROGRAM AND OF THE GENERAL SAFETY ORGANIZATION IS FOLLOWED BY A DISCUSSION ON THE CURRENT THINKING IN CEA ON SOME IMPORTANT SAFETY ISSUES. AS FAR AS METHODOLOGY IS CONCERNED, THE USE OF PROBABILISTIC ANALYSIS IN THE LICENSING PROCEDURE IS BEING EXTENSIVELY DEVELOPED. REACTOR SAFETY RESEARCH IS AIMED AT A BETTER KNOWLEDGE OF THE SAFETY MARGINS INVOLVED IN THE PRESENT DESIGNS OF BOTH PWRs AND LMFBRs. A GREATER EMPHASIS SHOULD BE PUT DURING THE NEXT YRS IN THE SAFETY OF THE NFC INSTALLATIONS, INCLUDING WASTE DISPOSALS. IT IS SUGGESTED THAT FURTHER INTERNATIONAL COOPERATION IN THE FIELD OF SAFETY SHOULD BE DEVELOPED IN ORDER TO INSURE FOR ALL COUNTRIES THE VERY HIGH SAFETY LEVEL WHICH HAS BEEN ACHIEVED UP TILL NOW.

222
A HAZARD INDEX FOR UNDERGROUND TOXIC MATERIAL

SMITH, C.F.; COHEN, J.J.; MCKONE, T.E.
800601
AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
LAWRENCE LIVERMORE LABORATORY
TRANS. AM. NUC. SOC. 34:130-131.
C,5;L,5,B;L,5,D;R,5,B;R,5,D;P,5,B;P,5,D

MOST ALTERNATIVE METHODS FOR DISPOSAL OF RADIOACTIVE WASTE INVOLVE ITS BURIAL IN GEOLOGIC MEDIA. TO CHARACTERIZE THE RELATIVE HAZARD INVOLVED, A GEOTOXICITY HAZARD INDEX HAS BEEN DEVELOPED. SINCE THE LONG-TERM CHRONIC EFFECTS RESULTING FROM INGESTION OF MATERIAL RELEASED VIA WATERBORNE PATHWAYS WAS OF OVERRIDING IMPORTANCE ONLY THE EFFECTS DUE TO CHRONIC INGESTION WERE CONSIDERED IN DEVELOPING THIS INDEX. SOME SAMPLE CASES WERE

CALCULATED TO DEMONSTRATE APPLICATION OF THE GHI: A HIGH-LEVEL WASTE REPOSITORY, A LOW-LEVEL WASTE REPOSITORY, AND NATURAL U, PB, AND HG ORE DEPOSITS WERE EVALUATED. RESULTS INDICATE THAT THE LOW-LEVEL WASTE REPOSITORY HAS A GEOTOXIC HAZARD WHICH IS SIGNIFICANTLY LOWER THAN THAT OF THE OTHER SAMPLE CASES CONSIDERED. THE CURSORY EXAMPLES WERE ASSESSED PRIMARILY TO EVALUATE THE METHODOLOGY AND PROVIDE SOME INSIGHT TO THE RELATIVE IMPORTANCE OF THE COMPONENTS OF THE INDEX. FURTHER REFINEMENT OF THE CALCULATIONAL PARAMETERS CAN BE READILY ACCOMMODATED TO PROVIDE INCREASED CONFIDENCE IN THE RESULTS.

223

MIGRATORY PROPERTIES OF SOME NUCLEAR WASTE ELEMENTS IN
GEOLOGIC MEDIA

SEITZ, M.G.; RICKERT, P.G.; FRIED, S.; FRIEDMAN, A.M.; STEINDLER,
J.J.

790101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
ARGONNE NATIONAL LABORATORY
NUCL. TECHNOL. 44:284-296.
L,1;L,2;L,5,D;L,9

TO AID IN ASSESSING THE SUITABILITY OF GEOLOGIC DISPOSAL, THE INTERACTIONS OF TRACE QUANTITIES OF CS, PU, NF, AND AM IN AQUEOUS SOLUTIONS WITH ROCKS FROM FORMATIONS THAT MAY BE SUITABLE FOR WASTE REPOSITORIES HAVE BEEN EXAMINED. REACTIONS THAT RETARD ELEMENT MIGRATION ARE VARIED AND DO NOT LEND THEMSELVES TO SIMPLIFIED DESCRIPTIONS.

224

PREPROPOSAL TO ESTIMATE THE RISKS IN THE LWR FUEL CYCLE

SCIENCE APPLICATIONS, INC.
800101

SCIENCE APPLICATIONS, INC.,, PALO ALTO, 27 P.
SCIENCE APPLICATIONS, INC.
P,1;P,2;P,4;P,5;P,7;P,8;C,3;C,4;C,5

THIS PREPROPOSAL WAS PRESENTED TO THE U.S. NRC. WASH-1400 ADDRESSED LWR POWER PLANT RISKS IN SOMEWHAT A GENERIC SENSE; IT DID NOT ADDRESS THE NEC RISK. TAKEN TOGETHER, THESE RISKS WOULD PROVIDE A MEASURE OF THE TOTAL RISK OF NUCLEAR POWER. THE AIM OF THIS PREPROPOSAL IS TO PROVIDE A BACKGROUND TO SOME OF THE SIGNIFICANT WORK THAT HAS BEEN PERFORMED IN ADDRESSING THIS QUESTION AND TO PROPOSE THOSE STEPS NEEDED FOR COMPLETION.

225

A MULTI-ATTRIBUTE APPROACH TO THE REALIZATION OF
RADIOLOGICAL PROTECTION

00012, A.; LOMBARD, J.; FAGNANI, F.

810101

HEALTH PHYS. 40(6):783-799.

CEA CENTRE D'ETUDES NUCLEAIRES DE FONTENAY-AUX-ROSES, FRANCE

C,1;C,3;C,5;C,6

A MULTI-ATTRIBUTE METHOD IS USED IN THE CONTEXT OF THE OPTIMIZATION OF RELEASE FROM PWR FUEL CYCLE PLANTS. THIS EXAMPLE OF METHODOLOGIC NATURE ESSENTIALLY AIMS TO SHOW THAT SEVERAL DIMENSIONS OF HEALTH RISK CAN BE TAKEN INTO ACCOUNT IN THE PROCESS OF OPTIMIZATION INSTEAD OF RESTRICTING ONESELF ONLY TO THE COLLECTIVE DIMENSION. THE RESULTS OBTAINED SHOW THAT THE MULTI-ATTRIBUTE APPROACH ALLOWS THE COLLECTIVE HEALTH RISK AND THE RISK ASSOCIATED WITH CRITICAL GROUPS TO BE TAKEN INTO ACCOUNT SIMULTANEOUSLY. THIS APPROACH ALLOWS THE REALIZATION OF A SATISFACTORY SYNTHESIS BETWEEN THE TRADITIONAL INDIVIDUAL CONCEPTION OF RADIOLOGICAL PROTECTION AND THE MORE RECENT COLLECTIVE APPROACH.

226

CRITERIA FOR THE DESIGN OF PLANTS FOR THE MANUFACTURE OF MIXED OXIDE (U-PU)FUELS

ANSI N287-1976

AMERICAN NATIONAL STANDARDS INSTITUTE

780101

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, NEW YORK. 14 P.

AMERICAN NATIONAL STANDARDS INSTITUTE

C,1;C,3;C,4;C,5;I,1;I,2;I,4,A;I,4,C;I,5,B;I,5,D;I,9

THIS STANDARD ESTABLISHES A NUMBER OF SITING, DESIGN, FABRICATION, TESTING, AND PERFORMANCE CRITERIA FOR STRUCTURES, SYSTEMS, AND COMPONENTS IMPORTANT TO SAFETY, TO THE PHYSICAL SECURITY AND ACCOUNTABILITY OF SPECIAL NUCLEAR MATERIALS, AND TO THE PROTECTION OF THE ENVIRONMENT. IT THEREBY PROVIDES REASONABLE ASSURANCE THAT A FACILITY MEETING THESE CRITERIA CAN BE OPERATED WITHOUT UNDUE RISK TO HEALTH AND SAFETY OF EMPLOYEES AND THE PUBLIC, TO THE NATIONAL SECURITY, AND TO THE ENVIRONMENT. THIS STANDARD RECOMMENDS BASIC CRITERIA FOR THE DESIGN OF FACILITIES AND SYSTEMS FOR THE MANUFACTURE OF MIXED-OXIDE FUEL BY USE OF NONPYROPHORIC FORMS OF U AND PU. THIS STANDARD ALSO PROVIDES GENERAL GUIDANCE FOR SITING AND OPERATIONAL PLANING.

227

SENSITIVITY AND UNCERTAINTY ANALYSIS OF A SIMPLE NEAR-FIELD GRANITE NUCLEAR WASTE REPOSITORY

ORNL/TM-7514

RONEN, Y.; LUCIUS, J.L.; OBLON, E.M.

810101

U.S. DOE, TECHNICAL INFORMATION CENTER, OAK RIDGE, TN. 59 P.

OAK RIDGE NATIONAL LABORATORY

C,3;C,8;L,3;L,8

THIS METHODOLOGY WAS APPLIED TO A SIMPLE SINGLE LEVEL GRANITE REPOSITORY MODEL TO DETERMINE THE UNCERTAINTIES IN SEVERAL IMPORTANT REPOSITORY TEMPERATURES. IN THIS SIMPLE MODEL USED IN THIS ANALYSIS, 62 INPUT PARAMETERS ARE CONSIDERED; HOWEVER, ONLY 33 INPUT PARAMETERS ARE IMPORTANT. AMONG THE 33 IMPORTANT INPUT PARAMETERS, ONLY 9 HAVE A NONLINEAR EFFECT ON RESPONSE. WITH THE ESTIMATED UNCERTAINTIES ASSIGNED TO THE INPUT DATA, IT WAS FOUND THAT THE UNCERTAINTIES IN THE IMPORTANT TEMPERATURES IN THE REPOSITORY WERE ABOUT 4% AT THE BEGINNING OF LIFE OF THE REPOSITORY AND ABOUT 10% AFTER 50 YRS WHEN THE HIGHEST TEMPERATURE IN THE REPOSITORY WAS REACHED.

228

GEOLOGIC WASTE DISPOSAL AND A MODEL FOR THE SURFACE
MOVEMENT OF RADIONUCLIDES

CONF-791112

HELTON, J.; IMAN, R.; BROWN, J.; SCHREURS, S.

800101

PLENUM PRESS, NEW YORK

SANDIA LABORATORIES

SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT. VOL. 2, PP.
795-802.

L,3;L,5,B;L,5,D;L,8,B;L,8,D

A MODEL FOR THE SURFACE MOVEMENT OF RADIONUCLIDES IS PRESENTED. THIS PATHWAYS MODEL WAS CONSTRUCTED IN A NRC PROJECT TO DEVELOP A METHODOLOGY TO ASSESS THE RISK ASSOCIATED WITH THE GEOLOGIC DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTE. THE METHODOLOGY DEVELOPMENT INVOLVES WORK IN TWO MAJOR AREAS: (1) MODELS FOR PHYSICAL PROCESSES, AND (2) STATISTICAL TECHNIQUES FOR THE USE AND ASSESSMENT OF THESE MODELS. THE PRESENTATION OF THE PATHWAYS MODEL INVOLVES TOPICS FROM BOTH AREAS.

229

A STOCHASTIC MODEL OF RADIONUCLIDE MIGRATION FROM NATURAL
AND ENGINEERED REPOSITORIES

CONF-791112

KIREMIDJIAN, A.S.; KRUGER, P.

800101

PLENUM PRESS, NEW YORK

STANFORD UNIV.

SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT. VOL. 2, PP.
779-795.

L,2,1;L,2,N;L,3;L,5,I;L,5,N;L,7;L,8

SEVEN MAJOR STEPS IN THE MODEL ARE: GEOLOGY AND HYDROLOGY; REPOSITORY ATTRIBUTES; PROBABILITY OF DISTRIBUTION OF ATTRIBUTES, EVENT PATHS; PROBABILITY OF TIME TO EVENT; UPDATING ATTRIBUTE PROBABILITIES, AND SIMULATION OF SEQUENTIAL EVENTS. AFTER THE OCCURRENCE OF EACH EXTREME EVENT, SOME OF THE REPOSITORY CHARACTERISTICS WILL CHANGE. THE BAYESIAN STATISTICAL TECHNIQUES PROVIDE THE NECESSARY TOOLS FOR THIS MODIFICATION OF PARAMETER

PROBABILITIES.

230

MONITORING AND CHARACTERIZATION OF RADIONUCLIDE TRANSPORT
IN THE HYDROLOGIC SYSTEM

BNWL-SA-5494, PT. 1; CONF-750967-15

PHILLIPS, S.J.; KAYMUND, J.R.

750901

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 23 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

L,5;L,9;L,0

SEE ACK=282, PT. 2. THESE PAPERS WERE PREPARED FOR THE
PROC. 3RD ERDA CONF. THE GROUNDWATER MONITORING PROGRAM PROVIDES
INFORMATION AND DATA ON GROUNDWATER QUALITY REQUIRED TO EVALUATE
THE IMPACT OF WASTE DISPOSAL PRACTICES ON THE HANFORD
RESERVATION. THE PROGRAM INCLUDES: COLLECTION AND ANALYSIS OF
GROUNDWATER SAMPLES ON A ROUTINE BASIS; DATA PROCESSING,
ANALYSIS AND REPORTING; DESIGN, CONSTRUCTION AND MAINTENANCE OF
WELL SAMPLING STRUCTURES; AND DESIGN AND IMPLEMENTATION OF
SUPPORTING RESEARCH.

231

ALTERNATIVES FOR LONG-TERM MANAGEMENT OF TRANSURANIC WASTE
AT THE SAVANNAH RIVER PLANT

CONF-810217

TOOLEY, O.A., JR.; MOLEN, G.F.

810101

UNIV. OF ARIZONA, TUCSON, AZ

SAVANNAH RIVER LABORATORY

WASTE MANAGEMENT '81. VOL. 1. PP. 399-412.

K,1;K,2;K,3;K,4,A;K,4,C;K,4,I;K,4,K;K,5,B;K,5,D;K,5,J;K,5,L;K,6;
K,7;K,0;L,1;L,2;L,3;L,4,A;L,4,C;L,4,I;L,4,K;L,5,B;L,5,D;L,5,
J;L,5,L;L,6;L,7;L,0

THE REPORT FORM OF THIS PAPER IS DP-MS-80-77. THE SIX
ALTERNATIVES PROPOSED CONSIDER THE EFFECTS OF MAKING NO DECISION,
DELAYING A DECISION FOR UP TO 100 YRS, OR TAKING SIGNIFICANT
ACTION. THE CASES DESCRIBED, EXCLUDING THE NO-ACTION CASE,
REPRESENT THE BETTER ALTERNATIVES OF THE 34 THAT HAVE BEEN
STUDIED. THEIR COSTS RANGE FROM 80 TO 270 MILLION DOLLARS, WHILE
THE SUM OF THE POPULATION RISK AND WORKER DOSE RANGES FROM 95 TO
13,600 MAN-REM. THE NATURALLY OCCURRING DOSE FROM COSMIC RAYS AND
TERRESTRIAL ACTIVITY TO THE SAME POPULATION OVER THE SAME PERIOD
IS MANY TIMES LARGER.

232

THE PRESTO LOW-LEVEL WASTE TRANSPORT AND RISK ASSESSMENT
CODE

CONF-810217

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OAK RIDGE NATIONAL LABORATORY

WASTE MANAGEMENT '81, VOL. 2, PP. 643-655.

N,2;N,5,B;N,5,D;N,6;N,8,B;N,8,D;N,7;C,2;C,5;C,6;C,7

PRESTO (PREDICTION OF RADIATION EFFECTS FROM SHALLOW TRENCH OPERATIONS) IS A COMPUTER CODE DEVELOPED UNDER U.S. EPA FUNDING TO EVALUATE THE POSSIBLE HEALTH EFFECTS FROM SHALLOW LAND BURIAL TRENCHES. THE MODEL IS INTENDED TO BE GENERIC AND TO ASSESS RADIONUCLIDE TRANSPORT, ENSUING EXPOSURE, AND HEALTH IMPACT TO A STATIC LOCAL POPULATION FOR A 1000 YR PERIOD FOLLOWING THE END OF BURIAL OPERATIONS. CUMULATIVE HEALTH EFFECTS IN TERMS OF DEATHS FROM CANCER ARE CALCULATED FOR THE POPULATION OVER THE 1000 YR PERIOD USING A LIFE-TABLE APPROACH. DATA BASES ARE BEING DEVELOPED FOR THREE EXTANT SHALLOW LAND BURIAL SITES: BARNWELL, BEATY AND WEST VALLEY.

233

THE COMPLEX RELATIONSHIP BETWEEN GROUNDWATER VELOCITY AND
CONCENTRATION OF RADIOACTIVE CONTAMINANTS

CONF-791112

KASZETA, F.E.; BOND, F.W.

800101

PLENUM PRESS, NEW YORK

PACIFIC NORTHWEST LABORATORIES

SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT, VOL. 2, PP.
739-745.

C,5;C,7;L,5;L,7

THE RESULTS FROM THE MULTI-COMPONENT MASS TRANSPORT MODEL ARE USED TO EXAMINE THE COMPLEX INTERRELATIONSHIP BETWEEN GROUNDWATER VELOCITY AND CONTAMINANT DISPERSION, DECAY, AND RETARDATION WITH REGARD TO THEIR INFLUENCE ON THE CONTAMINANT CONCENTRATION DISTRIBUTION AS IT TRAVELS THROUGH THE GEOSPHERE TO THE BIOSPHERE. SIMPLE RELATIONSHIPS BETWEEN INDIVIDUAL PARAMETERS AND GROUNDWATER VELOCITY AS THEY INFLUENCE PEAK CONCENTRATION DO NOT EXIST. FOR THOSE CASES WHERE THE SOURCE TERM IS NOT SOLUBILITY-LIMITED AND THE FLOW PAST THE WASTE IS INDEPENDENT OF REGIONAL HYDROLOGIC CONDITIONS, A THRESHOLD CONCENTRATION OCCURS AT A SPECIFIC GROUNDWATER VELOCITY WHERE THE EFFECTS OF DILUTION BALANCE THOSE OF DISPERSION AND DECAY.

234

THE PERSPECTIVE OF WASTE ISOLATION RESEARCH ISSUES AND
ASSESSMENT OF CONSEQUENCES FOR RADIONUCLIDE RELEASE

CONF-791112

HUNTER, T.O.

800101

PLENUM PRESS, NEW YORK

SANDIA LABORATORIES

SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT, VOL. 2, PP. 61-68.

C,3;C,5;C,8;L,3;L,5,C;L,5,D;L,8

THE REPORT FORM OF THIS PAPER IS SAND79-10760. THE FINITENESS OF RESEARCH RESOURCES TO ADDRESS TECHNICAL ISSUES FOR NUCLEAR WASTE MANAGEMENT REQUIRES A REALISTIC ASSESSMENT OF THEIR IMPORTANCE. THE MOST APPROPRIATE METHOD FOR MAKING THIS ASSESSMENT IS THE COMBINATION OF SYSTEM STUDIES, WHICH INCLUDE CONSIDERATION OF THE ROLE OF ALL PROTECTIVE BARRIER, AND CONSEQUENCE ASSESSMENT MODELS THAT CAN ESTIMATE THE POTENTIAL HAZARD IMPOSED UPON MAN FOR ASSUMED VIOLATIONS OF THESE BARRIERS. SENSITIVITY ANALYSES ON CERTAIN ISSUES CAN THEN BE PERFORMED TO DETERMINE THE IMPACT OF VARIOUS DESCRIPTIVE PARAMETERS. SOME CONCLUSIONS DRAWN FROM THESE SANDIA STUDIES SPECIFICALLY APPLICABLE TO WIPP FOR THE SCENARIOS CONSIDERED ARE THAT: WASTE FORM AND PROTECTIVE CANISTERS ARE NOT ESSENTIAL AS BARRIERS. ASSUMED RADIONUCLIDE DISSOLUTIONING IS FAR IN EXCESS OF THAT POSSIBLE WITH DEVELOPMENTAL WASTE FORMS. BRINE MIGRATION PLAYS NO SIGNIFICANT ROLE IN LONG-TERM ISOLATION; COMPLICATIONS TO RETRIEVABILITY CAN BE AVOIDED WITH NUMEROUS TECHNICAL ALTERNATIVES. RADIONUCLIDE SORPTION IN GEOMEDIA NEAR REPOSITORIES PLAYS AN IMPORTANT ROLE IN REDUCING CONSEQUENCES, BUT SITES WITH FAVORABLE GEOLOGIC AND HYDROLOGIC SETTINGS SUCH AS WIPP CAN TOLERATE ESSENTIALLY NO RELIANCE ON SORPTION AND STILL ACHIEVE INCONSEQUENTIAL PREDICTED DOSES.

235

THE EFFECT OF VARIATIONS IN PARAMETER VALUES ON THE
PREDICTED RADIOLOGICAL CONSEQUENCES OF GEOLOGIC
DISPOSAL OF HIGH-LEVEL WASTE

CONF-791112

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PLENUM PRESS, NEW YORK

UK NATIONAL RADIOLOGICAL PROTECTION BOARD

SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT, VOL. 2, PP.
753-762.

L,5,D;L,7;L,8;L,9

AN ANALYSIS OF THE SENSITIVITY OF THE RESULTS OF THE PRELIMINARY ASSESSMENT TO THE ASSUMPTIONS MADE AND THE VALUES OF THE PARAMETERS USED IS SUMMARIZED. THE PURPOSE OF THE ANALYSIS WAS TO CLARIFY RESEARCH OBJECTIVES RATHER THAN TO DERIVE THE POSSIBLE RANGE OF POTENTIAL DOSES. BOTH THE PRELIMINARY ASSESSMENT AND THE SENSITIVITY ANALYSIS DEAL ONLY WITH DISPOSAL OF VITRIFIED REPROCESSING WASTE. IT CAN BE CONCLUDED THAT THE MAIN BARRIER TO THE RETURN OF ACTIVITY TO MAN'S ENVIRONMENT IS THAT PROVIDED BY SLOW MIGRATION THROUGH THE GEOSPHERE WHILE THE LEACH RESISTANCE OF THE WASTE FORM IS RELATIVELY UNIMPORTANT.

236

RADIOACTIVE WASTE DISPOSAL INTO A PLASTIC CLAY FORMATION:
PROBABILISTIC ASSESSMENT OF THE GEOLOGICAL CONTAINMENT

CONF-791112

D'ALESSANDRO, M.; BONNE, A.

800101

PLENUM PRESS, NEW YORK

COMMISSION OF EUROPEAN COMMUNITIES

SCIENTIFIC BASES FOR NUCLEAR WASTE MANAGEMENT. VOL. 2. PP.
711-720.

L,3;L,5;L,7;L,8

THE FAULT TREE BINARY LOGIC CAN BE UTILIZED PROVIDED SOME BASIC HYPOTHESIS BE MADE TO ASSESS PROBABILITIES OF ALL GEOLOGICAL EVENTS WHICH COULD LEAD TO BREACHING OF GEOLOGICAL CONTAINMENT. ASPECTS AND PROPERTIES OF THE GEOLOGICAL FORMATION AS WELL AS PROBLEM AREAS THAT GOVERN THE RELEASE PROBABILITIES AND THE OVERALL CONCEPT ACCEPTABILITY HAVE BEEN IDENTIFIED.

237

TRANSPORT THROUGH DEEP AQUIFERS OF TRANSURANIC NUCLIDES
LEACHED FROM VITRIFIED HIGH-LEVEL WASTES

CONF-791112

AVOGADRO, A.; MURRAY, C.N.; DE PLAND, A.

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PLENUM PRESS, NEW YORK

COMMISSION OF EUROPEAN COMMUNITIES

SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT, VOL. 2. PP.
665-671.

L,2;L,5,C;L,5,D ;L,7

THE RESULTS PRESENTED IN THIS PAPER ARE THE FIRST OUTPUT OF A NEW PROGRAM CARRIED OUT AT THE JOINT RESEARCH CENTRE OF ISPRA ON UNDERGROUND MIGRATION OF ACTINIDES RELATED TO RISK EVALUATION OF THE GEOLOGICAL WASTE DISPOSAL OPTION. IN ORDER TO SIMULATE THE EXPECTED CONDITIONS OF GLASS LEACHING AND UNDERGROUND TRANSPORT IN THE LABORATORY, A WATER PATHWAY IS ESTABLISHED WHICH FLOWS OVER THE ACTINIDE BEARING BORO-SILICATE GLASS, THROUGH A FILTER AND THEN UP THROUGH COLUMNS CONTAINING SOIL SAMPLES. THE RESULTS INDICATE A CONCENTRATION OF ABOUT FOUR ORDERS OF MAGNITUDE LOWER THAN THE MAXIMUM PERMISSIBLE CONCENTRATION FOR DRINKING WATER.

238

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE
ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR
FUEL CYCLE - REPROCESSING OF HIGH-TEMPERATURE
GAS-COOLED REACTOR FUEL CONTAINING U-233 AND THORIUM

ORNL/NUREG/TM-4

DAVIS, W., JR.; BLANCO, R.E.; FINNEY, B.C.; HILL, G.S.; MOORE,
R.E.; WITHERSPOON, J.P.

760101

NIIS. 182 P.

OAK RIDGE NATIONAL LABORATORY

J,1;J,2;J,5,D;J,6;J,8,D;J,9,D

A COST/BENEFIT STUDY WAS MADE TO DETERMINE THE COST AND EFFECTIVENESS OF VARIOUS RADWASTE TREATMENT SYSTEMS FOR DECREASING THE RELEASE OF RADIOACTIVE MATERIALS FROM A MODEL HIGH-TEMPERATURE-GAS-COOLED REACTOR (HTGR) FUEL REPROCESSING PLANT AND TO DETERMINE THE RADIOLOGICAL IMPACT (DOSE COMMITMENT) OF THE RELEASED MATERIALS ON THE ENVIRONMENT. IN THE FINAL ANALYSIS, THE COST/BENEFIT OF EACH CASE, CALCULATED AS ADDITIONAL COST OF RADWASTE SYSTEM DIVIDED BY THE REDUCTION IN DOSE COMMITMENT, IS TABULATED OR THE DOSE COMMITMENT IS PLOTTED WITH COST AS THE VARIABLE. THE METHODOLOGY USED IN ESTIMATING THE COSTS IS PRESENTED IN APPENDIX A.

239

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE - FABRICATION OF HIGH-TEMPERATURE GAS-COOLED REACTOR FUEL CONTAINING URANIUM-233 AND THORIUM

ORNL/NURET/14-5

RODDY, J.W.; BLANCO, R.E.; HILL, G.S.; MOORE, R.E.; SEAGREN, R.D.; WITHERSPOON, J.P.

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NTIS. 217 P.

OAK RIDGE NATIONAL LABORATORY

H,1;H,2;H,5,D;H,6;H,8,D;H,9,D;1,1;1,2;1,5,D;1,6;1,8,D;1,9,D
SEE ACN=238.

240

COMPARATIVE RISK - BENEFIT - COST EFFECTIVENESS IN NUCLEAR AND ALTERNATIVE POWER SOURCES: METHODOLOGY, PERSPECTIVE, LIMITATIONS

CONF-800403

VINCK, W.; VAN REIJEN, G.; MAURER, H.; VOLTA, G.

800101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

COMMISSION OF EUROPEAN COMMUNITIES, BRUSSELS

THERMAL REACTOR SAFETY. VOL. 1. PP. 320-329.

C,6;P,1

A CRITICAL SURVEY IS GIVEN OF THE USE OF QUANTITATIVE RA IN DEFINING ACCEPTABLE LIMITS OF SAFETY AND OF ITS USE TOGETHER WITH COST-BENEFIT ANALYSES FOR DECISION MAKING. THE PAPER INDICATES UNCERTAINTIES AND EVEN UNKNOWNNS IN RA IN PARTICULAR IF THE WHOLE FUEL CYCLE FOR ENERGY PRODUCTION IS CONSIDERED. IT IS MADE CLEAR THAT FOR DECISIONS ON ACCEPTANCE OF RISK ALSO THE RISK PERCEPTION FACTOR MUST BE CONSIDERED. A DIFFICULT ISSUE HERE IS THE POTENTIAL FOR LOW-PROBABILITY/LARGE CONSEQUENCE ACCIDENTS. EXAMPLES ARE GIVEN, SUGGESTIONS FOR IMPROVEMENT ARE MADE AND PERSPECTIVES ARE OUTLINED.

241

ESTIMATING PROBABILITIES OF DISPOSAL SYSTEM FAILURE - A
STATUS REPORT

CONF-770565

TIERNEY, M.S.

770101

OECD, PARIS

SANDIA LABORATORIES

RISK ANALYSIS AND GEOLOGIC MODELLING, PP. 180-182.

L,3;L,5;L,7

THE PRESENT STUDY IS PART OF A LARGER PROJECT WHOSE INTENT IS TO DEVELOP METHODOLOGIES FOR ASSESSING THE LONG-TERM RISKS OF RADWASTE DISPOSAL IN DEEP GEOLOGIC MEDIA (BEDDED SALT).

242

MATHEMATICAL MODELING OF RADIONUCLIDE MIGRATION IN A
HOMOGENEOUS CLAY FORMATION, RISK ANALYSIS AND GEOLOGIC
MODELLING IN RELATION TO THE DISPOSAL OF RADIOACTIVE
WASTES INTO GEOLOGICAL FORMATIONS.

CONF-770565

PUT, M.; HEREMANS, K.

770101

OECD, PARIS

C.E.N./S.C.K. MOL, BELGIUM

RISK ANALYSIS AND GEOLOGIC MODELLING, PP. 116-129.

L,3;L,5;L,7

THE GEOLOGICAL AND GEOCHEMICAL BARRIERS ARE INVESTIGATED AND THE GEOLOGICAL, SEISMIC AND TECTONIC DATA OF THE AREA AROUND MOL ARE ANALYZED. THIS STUDY ENABLES AN EVALUATION OF THE FAILURE OF THE BARRIER BY FAULT TREE ANALYSIS. IT IS POSSIBLE TO INVESTIGATE THE MIGRATION OF THE MOST IMPORTANT RADIONUCLIDES IN FUNCTION OF TIME. (IN FRENCH)

243

SAFETY ANALYSIS OF THE PROPOSED CANADIAN GEOLOGIC NUCLEAR
WASTE REPOSITORY

CONF-770565

PROUSE, D.K.

770101

OECD, PARIS

AECL, OTTAWA

RISK ANALYSIS AND GEOLOGIC MODELLING, PP. 185-198.

L,1;L,2;L,5;L,7

THE CANADIAN PROGRAM FOR DEVELOPMENT AND QUALIFICATION OF A GEOLOGIC REPOSITORY FOR EMPLACEMENT OF HIGH-LEVEL AND LONG-LIVED, ALPHA-EMITTING WASTE FROM IRRADIATED NUCLEAR FUEL HAS BEEN INITIATED AND IS IN ITS INITIAL DEVELOPMENT STAGE. FIELDWORK PROGRAMS TO LOCATE CANDIDATE SITES WITH SUITABLE GEOLOGICAL CHARACTERISTICS HAVE BEGUN. LAB STUDIES AND DEVELOPMENT OF MODELS FOR USE IN SAFETY ANALYSIS OF THE EMPLACED NUCLEAR WASTE

HAVE BEEN INITIATED.

244

PREVIOUS RESULTS OF RISK ANALYSIS OF REPOSITORIES FOR
RADIOACTIVE WASTES IN GEOLOGIC SALT FORMATIONS IN THE
FEDERAL REPUBLIC OF GERMANY

CONF-770565

PROSKE, R.

770101

OECD, PARIS

GESELLSCHAFT FUER STRAHLEN- UND UMWELTFORSCHUNG M.B.H.
RISK ANALYSIS AND GEOLOGIC MODELLING. PP. 34-49.

K,1;K,3;K,5;L,1;L,3;L,5;O,1;O,3;O,5

THE METHODOLOGY OF RISK ANALYSIS WAS APPLIED TO A
HYPOTHETICAL WASTE MANAGEMENT SYSTEM AND REPOSITORY IN THE ASSE
SALT MINE. A PRELIMINARY ANALYSIS WAS CARRIED OUT AND FAULT
TREES AND RELEASE MODELS FOR THE REPOSITORY WERE DEVELOPED FOR
THREE TIME PHASES.

245

STATUS AND FUTURE DEVELOPMENTS OF RISK ANALYSIS FOR
REPOSITORIES OF RADIOACTIVE WASTES IN SALT FORMATIONS
IN THE FEDERAL REPUBLIC OF GERMANY

CONF-770565

PROSKE, R.

770202

OECD, PARIS

GESELLSCHAFT FUER STRAHLEN- UND UMWELTFORSCHUNG, M.B.H.
RISK ANALYSIS AND GEOLOGIC MODELLING. PP. 156-165.

L,1;L,2;L,3;L,5

SEVERAL INSTITUTIONS WERE ENGAGED IN DRAWING UP FAULT TREES,
DEVELOPMENT OF RELEASE MODELS AND CALCULATION OF THE RISK.

246

GEOLOGIC MODELING IN RISK ASSESSMENT METHODOLOGY FOR
RADIOACTIVE WASTE MANAGEMENT

CONF-770565

LOGAN, S.E.; BERBANO, M.C.

770101

OECD, PARIS

UNIV. OF NEW MEXICO

RISK ANALYSIS AND GEOLOGIC MODELLING. PP. 77-115.

L,2;L,3;L,5;L,6;D;L,7;C,3;C,5;C,7

A COMPUTER BASED ASSESSMENT METHODOLOGY FOR EVALUATING
PUBLIC HEALTH AND ENVIRONMENTAL IMPACTS FROM THE DISPOSAL OF
RADWASTE IN GEOLOGIC FORMATIONS IS BEING DEVELOPED. METHODOLOGY
INCORPORATES A RELEASE OR FAULT TREE MODEL, AN ENVIRONMENTAL
MODEL, AND AN ECONOMIC MODEL.

247

STATUS REPORT ON RADIOACTIVE WASTE RISK ASSESSMENT
METHODOLOGY DEVELOPMENT SUPPORTED BY THE U.S.
ENVIRONMENTAL PROTECTION AGENCY

CONF-770565

LOGAN, S.E.

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OECD, PARIS

UNIV. OF NEW MEXICO

RISK ANALYSIS AND GEOLOGIC MODELLING, PP. 178-179.

L,1;L,2;L,3;L,5

ONGOING WORK IS REFINING THE MODEL AND COMPUTER CODE,
PERFORMING SENSITIVITY ANALYSIS FOR PURPOSE OF: IDENTIFICATION
OF THE MORE SIGNIFICANT CONTRIBUTORS TO LONG-TERM RISK, AND
DETERMINATION OF THE MOST SIGNIFICANT GEOLOGIC PARAMETERS AND
DATA ACCURACY REQUIRED.

248

STATUS AND PROGRAMME OF THE AUSTRIAN ACTIVITIES FOR FINAL
DISPOSAL OF RADIOACTIVE WASTES IN GEOLOGICAL FORMATIONS

CONF-770565

KREJSA, P.

770202

OECD, PARIS

OESTERREICHISCHE STUDIENGESellschaft FÜR ATOMENERGIE G.M.B.H.,
VIENNA

RISK ANALYSIS AND GEOLOGIC MODELLING, PP. 149-155.

L,3;L,5;L,7;L,8;C,3;C,5;C,7;C,8

AN EFFORT IS MADE TO CALCULATE THE PROBABILITIES OF
DESIGNED FAULT TREES. MANY EVENTS CAN BE CALCULATED ON A BASIS
OF STATISTICS OF RELATED EVENTS (E.G. SABOTAGE, WAR, DRILLING,
WATER FLOW). BUT THERE ARE ALSO EVENTS WHICH CAN BE DESCRIBED ON
A BASIS OF FUNCTIONS. SO FOR THE BUILDUP OF HYDROGEN
CONCENTRATIONS FROM BITUMEN, THE RELEASE OF STORED ENERGY, THE
CALCULATION OF THE INFLUENCE OF DIFFERENT PARAMETERS CAN BE
DONE. THE PROBLEM IS TO CONVERT THE FUNCTIONAL DATA INTO
PROBABILITIES. THE PRINCIPLE OF THE METHOD IS SHOWN USING A
LINEAR FUNCTION WITH THE ASSUMPTION THAT THERE IS NO IDEALISTIC
KNOWLEDGE OF THE SYSTEM.

249

STATUS REPORT FOR THE UNITED KINGDOM

CONF-770565

HILL, M.D.; MATHER, J.D.

770101

OECD, PARIS

UK NATIONAL RADIOLOGICAL PROTECTION BOARD, HARWELL

RISK ANALYSIS AND GEOLOGIC MODELLING, PP. 183-184.

L,5;L,7

THIS IS A VERY GENERAL PAPER ABOUT THE RESEARCH PROGRAM THAT WAS BEGUN IN 1976 IN THE UK ON PROBLEMS ASSOCIATED WITH THE DISPOSAL OF HLW TO GEOLOGICAL FORMATIONS WITH INITIAL EMPHASIS ON CRYSTALLINE ROCKS.

250

RISKS OF PLUTONIUM FUEL FACILITY DAMAGE FROM HIGH WINDS

CONF-791103

JOHNSON, J.; OH, C.; GOLDBERG, F.

791101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

U.S. NRC

TRANS. AM. NUCL. SOC. 33:572-574.

C,3;I,3;I,7;I,8;P,3;P,5;P,7

WIND DAMAGE TO PU FUEL PROCESSING FACILITIES COULD RELEASE AND DISPERSE PUO2 CAUSING A RADIOLOGICAL HAZARD TO THE POPULATION. AS A RESULT OF THIS POTENTIAL HAZARD, NRC RULES REQUIRE THAT EXISTING PU FABRICATION FACILITIES BE EXAMINED TO DETERMINE THEIR ABILITY TO WITHSTAND ADVERSE NATURAL PHENOMENA SUCH AS HIGH WINDS. IN CONNECTION WITH THIS REQUIREMENT, THE PROBABILISTIC ANALYSIS STAFF CONDUCTED A RA TO AID IN CHARACTERIZING HEALTH HAZARDS ASSOCIATED WITH POSTULATED WIND DAMAGE TO A SPECIFIC FUEL FABRICATION FACILITY. THE TECHNIQUES UTILIZED IN THE RA TO HELP SUPPLY INFORMATION TO THE LICENSING DECISION PROCESS IS DESCRIBED. THE RA UTILIZED EXTREME VALUE THEORY AND ISOTONIC REGRESSION. EXTREME VALUE THEORY PROVIDED A TECHNIQUE TO DERIVE POINT AND INTERVAL ESTIMATES OF HIGH WIND PROBABILITIES WHILE ISOTONIC REGRESSION PROVIDED A NONPARAMETRIC METHOD TO SMOOTH THE RISK CURVES DERIVED FROM EXTREME VALUE THEORY.

251

SHORT-TERM RISK OF ACTINIDE PARTITIONING

FULLWOOD, R.R.; JACKSON, R.R.

800601

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

SCIENCE APPLICATIONS, INC., PALO ALTO

TRANS. AM. NUCL. SOC. 34:415-416.

I,3;I,4,A;I,4,C;I,4,E;I,4,G;I,5,B;I,5,D;I,5,F;I,5,H;I,8;I,0;J,3;J,4,A;J,4,C;J,4,E;J,4,G;J,5,B;J,5,D;J,5,F;J,5,H;J,8;J,0;O,3;O,4,A;O,4,C;O,4,E;O,4,G;O,5,B;O,5,D;O,5,F;O,5,H;O,8;O,0

THE RADIOLOGICAL AND NONRADIOLOGICAL RISKS TO THE WORKERS AND TO THE PUBLIC HAVE BEEN ESTIMATED, IN FIFTH RECYCLE, FOR TWO FUEL CYCLES: A REFERENCE CYCLE AND A PARTITIONING-TRANSMUTATION (P-T) CYCLE. THE RESULT OF THIS STUDY OF THE RELATIVE SHORT-TERM (NOT INCLUDING WASTE DISPOSAL) RISKS IS THAT THE P-T CYCLE IMPOSES A PENALTY OF 2.8 TIMES THE RISK OF THE REFERENCE CYCLE. THIS RESULT IS SIMPLY UNDERSTOOD BECAUSE THE NONRADIOLOGICAL RISK IS ABOUT 200 TIMES THE RADIOLOGICAL RISK AND THE 2.8 TIMES

INCREASE RESULTS FROM THE ADDITIONAL FACILITIES AND MANPOWER INVOLVED IN THE P-I CYCLE. THE INCREASED RADIOACTIVITY OF THE P-T MATERIAL ONLY AFFECTS THE RISK SECONDARILY. FOR DETAILS OF THE STUDY SEE ORNL/TM-6986; SAI-199-78 PA (ACN=172). FOR PAPER PRESENTING LONG-TERM RISKS SEE ACN=104.

252

GUIDANCE FOR THE CONTROL OF RADIATION HAZARDS IN URANIUM MINING

EPA REPORT NO. 8, REV.
FEDERAL RADIATION COUNCIL
670101
U.S. GPO. 60 P.
FEDERAL RADIATION COUNCIL
D,1;D,4,C;D,9;D,0

TO PROVIDE A FEDERAL POLICY ON HUMAN RADIATION EXPOSURE, THE FRC WAS FORMED IN 1959 (PL 66-373) TO "...ADVISE THE PRESIDENT WITH RESPECT TO RADIATION MATTERS, DIRECTLY OR INDIRECTLY AFFECTING HEALTH, INCLUDING GUIDANCE FOR ALL FEDERAL AGENCIES IN THE FORMULATION OF RADIATION STANDARDS AND IN THE ESTABLISHMENT AND EXECUTION OF PROGRAMS OF COOPERATION WITH STATES." THE PRESENT REPORT FULFILLS THIS RESPONSIBILITY WITH REGARD TO A FEDERAL POLICY RELATING TO THE PROTECTION OF UNDERGROUND U MINERS AGAINST DELETERIOUS HEALTH EFFECTS RESULTING FROM THE INHALATION OF THE RADIOACTIVE DAUGHTERS OF RA-222.

253

THE UNITED STATES PROGRAM FOR THE SAFETY ASSESSMENT OF GEOLOGIC DISPOSAL OF COMMERCIAL RADIOACTIVE WASTES

CONF-770565
CLAIBORNE, H.C.
770101

OECD, PARIS
UNION CARBIDE, OFFICE OF WASTE ISOLATION, OAK RIDGE, TN
RISK ANALYSIS AND GEOLOGIC MODELLING. PP. 199-215.

L,1;L,2;L,3;L,5;L,7

THE SAFE DISPOSAL OF COMMERCIAL RADWASTES IN DEEP GEOLOGIC FORMATIONS IS THE GOAL OF THE NATIONAL WASTE TERMINAL STORAGE (NWTS) PROGRAM. SAFETY ASSESSMENT BEGINS WITH SELECTION OF A DISPOSAL SITE. ALL GEOLOGIC AND HYDROLOGIC FACTORS MUST INDICATE LONG-TERM STABILITY OF THE FORMATION AND PROSPECTIVE ISOLATION OF WASTES FROM CIRCULATING GROUNDWATER FOR HUNDREDS OF THOUSANDS OF YRS. THE LONG-TERM STABILITY OF EACH SITE UNDER THERMAL LOADING MUST THEN BE DEMONSTRATED BY SOPHISTICATED ROCK MECHANIC ANALYSES. IT CAN BE EXPECTED THAT THE SITES THAT ARE CHOSEN WILL EFFECTIVELY ISOLATE THE WASTE FOR A VERY LONG PERIOD OF TIME. BOTH DETERMINISTIC AND PROBABILISTIC APPROACHES WILL BE USED, AND THE ENTIRE SPECTRUM OF PHENOMENA THAT COULD INFLUENCE GEOLOGIC ISOLATION WILL BE CONSIDERED.

254

SAFETY ASSESSMENT AND GEOSPHERE TRANSPORT METHODOLOGY FOR
THE GEOLOGIC ISOLATION OF NUCLEAR WASTE MATERIALS

CONF-770565

BURKHOLDER, H.C.; STOTTLEMYRE, J.A.; RAYMOND, J.R.

770101

OECD, PARIS

BATTELLE, PACIFIC NORTHWEST LABORATORIES

RISK ANALYSIS AND GEOLOGIC MODELING. PP. 216-229.

L,2;L,3;L,5;L,7;C,5

THE REPORT FORM OF THIS PAPER IS BNWL-SA-6319. AS PART OF THE NMTS PROGRAM IN THE U.S., THE WISAP IS UNDERWAY TO DEVELOP AND DEMONSTRATE THE METHODS AND OBTAIN THE DATA NECESSARY TO ASSESS THE SAFETY OF GEOLOGIC ISOLATION REPOSITORIES AND TO COMMUNICATE THE ASSESSMENT RESULTS TO THE PUBLIC. THIS PAPER REVIEWS PAST ANALYSIS EFFORTS, DISCUSSES THE WISAP APPROACH TO THE PROBLEM, AND POINTS OUT AREAS WHERE WORK IS NEEDED. THE COMPUTER CODE GETOUT II, WHICH MODELS THE NUCLIDE TRANSPORT IN GEOLOGIC MEDIA, IS DESCRIBED.

255

GEOSPHERE TRANSPORT MODEL FOR RISK EVALUATION: CALCULATION
OF MAXIMUM CONCENTRATION OF ACTIVITY AT GIVEN
DISTANCES FROM THE WASTE DISPOSAL SITE DUE TO WATER
INVASION

CONF-770565

BUETZER, P.; CHAKRABORTY, S.

770101

OECD, PARIS

SWISS NUCLEAR SAFETY DIVISION

RISK ANALYSIS AND GEOLOGIC MODELLING. PP. 130-148.

L,2;L,5;L,8

A SIMPLIFIED MODEL FOR THE CALCULATION OF RADIOACTIVITY CONCENTRATION IN WATER DUE TO INVASION OF WATER IN AN UNDERGROUND DISPOSAL AREA OF RADWASTE IS DESCRIBED. THE METHODOLOGICAL FRAMEWORK FOR COMPUTATION IS BASED ON PROCESSES LIKE LEACHING, HYDRODYNAMIC DISPERSION AND DIFFUSION AND PHYSICO-CHEMICAL SORPTION. A COMPUTER PROGRAM LEDIRE IS WRITTEN IN FORTRAN LANGUAGE FOR THE PURPOSE OF A PARAMETRIC STUDY. THE RESULTS OF AN EXAMPLE CALCULATION ARE SHOWN.

256

RADIOACTIVE WASTE DISPOSAL IN GEOLOGICAL FORMATIONS:
RESEARCH ACTIVITIES OF THE COMMISSION OF THE EUROPEAN
COMMUNITIES

CONF-791112

BRESESTI, M.; GIRARDI, F.; ORLOWSKI, S.; VENET, P.

800101

PLENUM PRESS, NEW YORK
COMMISSION OF EUROPEAN COMMUNITIES, BRUSSELS
SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT. VOL. 2. PP. 31-37.
L,1

THE JOINT RESEARCH CENTER, WHICH IS DIRECTLY OPERATED BY
THE COMMISSION, HAS CARRIED OUT A RADWASTE MANAGEMENT PROGRAM
SINCE 1973 UNDER A 4-YR PROGRAM PLAN SEQUENCE.

257
EVALUATION OF THE SAFETY OF STORING RADIOACTIVE WASTES IN
GEOLOGICAL FORMATIONS: A PRELIMINARY APPLICATION OF
THE FAULT TREE ANALYSIS TO SALT FORMATIONS.

CONF-770565

BERTOZZI, G.; D'ALESSANDRO, M.; GIRARDI, F.; VANOSSE, M.
770101

OECD, PARIS

COMMISSION OF EUROPEAN COMMUNITIES, ISPRA
RISK ANALYSIS AND GEOLOGIC MODELLING. PP. 13-33.

L,3;L,4;L,5;L,6;L,7;L,9;L,0

TWO IMAGINARY FORMATIONS WERE SELECTED: SALT BED AND SALT
DOME. HYPOTHESES ON THEIR STRATIGRAPHIC, HYDROLOGIC, AND
GEOMORPHOLOGIC CONDITIONS WERE MADE. FAULT TREE ANALYSIS WAS
USED ON THE VARIOUS GROUPS OF PHENOMENA WHICH COULD CAUSE THE
GEOLOGICAL BARRIER TO FAIL. THE TYPES OF FAILURES AND THEIR
PROBABILITIES WERE EVALUATED ON THE BASIS OF FOUR TIME PERIODS.
(ENGLISH TRANSL. IS AVAIL. AS BNWL-TR-272.)

258
SAFETY AND RELIABILITY ASSESSMENT FOR MAJOR HAZARD PLANTS

HENSLEY, G.

800101

MACLAREN PUBL. LTD., CROYDON, ENGLAND

SAFETY, AVAILABILITY AND RELIABILITY ASSESSMENTS (SARA) LTD.

HEALTH SAF. WORK 2(5):62-67.

C,1;C,3;C,5;C,9

THIS PAPER REVIEWS THE EVOLUTION OF CRITERIA OF RISK, HOW
THEY CAN BE APPLIED TO PROCESSING PLANTS AND HOW, THROUGH THE
USE OF RELIABILITY ASSESSMENT AND HAZARD ANALYSIS, IT CAN BE
SUBSTANTIATED THAT ADEQUATE SAFETY HAS BEEN PROVIDED. THE
SUBJECT IS DEALT WITH IN SECTIONS: INTRO.; THE CONSIDERATION OF
MAJOR RISKS - AN EVOLUTION; SUMMARY OF PLANT AND MAJOR HAZARD
RISKS; HAZARD ANALYSIS, OPERABILITY STUDY; FAULT AND EVENT TREES;
RELIABILITY ASSESSMENT; EQUIPMENT FAILURE RATE PREDICTION;
SYSTEM FRACTIONAL DEAD TIME; HAZARD RATE 'ACCEPTABILITY'; THE
CONTROL OF HAZARDOUS INSTALLATIONS; NUCLEAR INDUSTRY PRACTICE;
CONCLUSIONS.

"STOP": A FAST PROCEDURE FOR THE EXACT COMPUTATION OF THE
PERFORMANCE OF COMPLEX PROBABILISTIC SYSTEMS

UCRL-53230

CORRYNEN, G.C.

820101

LAWRENCE LIVERMORE NATIONAL LABORATORY, LIVERMORE, CA. 13 P.

LAWRENCE LIVERMORE NATIONAL LABORATORY

C,2;C,3

A NEW SET-THEORETIC METHOD FOR THE EXACT AND EFFICIENT
COMPUTATION OF THE PROBABILISTIC PERFORMANCE OF COMPLEX SYSTEMS
HAS BEEN DEVELOPED. THE CORE OF THE METHOD IS A FAST ALGORITHM
FOR DISJOINTING A COLLECTION OF PRODUCT SETS WHICH INTEND FOR
SYSTEMS WITH MORE THAN 1,000 CUT SETS. THE METHOD IS BASED ON A
"DIVIDE-AND-CONQUER" APPROACH, IN WHICH A MULTIDIMENSIONAL
PROBLEM IS PROGRESSIVELY DECOMPOSED INTO LOWER-DIMENSIONAL
SUBPROBLEMS ALONG ITS DIMENSIONS. THE METHOD ALSO USES A
PARTICULAR POINTER SYSTEM THAT ELIMINATES THE NEED TO STORE THE
SUBPROBLEMS BY ONLY REQUIRING THE STORAGE OF POINTERS TO THOSE
PROBLEMS. EXAMPLES OF THE ALGORITHM AND THE DIVIDE-AND CONQUER
STRATEGY ARE PROVIDED, AND COMPARISONS WITH OTHER SIGNIFICANT
METHODS ARE MADE.

260

REPORT TO THE PRESIDENT BY THE INTERAGENCY REVIEW GROUP ON
NUCLEAR WASTE MANAGEMENT

T10-29442

DEUTCH, J.M., CHMN.

790101

NTIS. 253 P.

U.S. DOE

C,1;E,1;E,9;K,1;K,9;N,1;N,9;D,1

THE IRG HAS DESIGNED MOST OF THIS REPORT TO INCLUDE:
NATIONAL GOALS, PLANNING OBJECTIVES, CRITERIA AND PROCEDURES FOR
NUCLEAR WASTE MANAGEMENT TO GUIDE POLICY, PLANNING, PROGRAM,
REGULATORY AND RESEARCH AND DEVELOPMENT ACTIVITIES. IT ALSO
INCLUDES DISCUSSIONS OF TECHNICAL ISSUES AND RECOMMENDATIONS FOR
KEY ELEMENTS OF INTERIM STRATEGIC PLANNING BASES FOR DISPOSAL OF
HIGH LEVEL AND TRU WASTES, LOW LEVEL WASTE, U-MILL TAILINGS, AND
WASTE FROM D&D ACTIVITIES. WORK PLANS ARE SUGGESTED FOR EACH
MAJOR TYPE OF WASTE, BASED ON THE GOALS, DECISIONS, AND INTERIM
STRATEGIC PLANNING BASES.

261

WORKING PAPER FOR A PROBABILITY/CONSEQUENCE ANALYSIS OF A
NUCLEAR FUELS RECOVERY AND RECYCLING CENTER

SAI-054-77-PA

FULLWOOD, R.R.; RITZMAN, R.; MENDOZA, Z.

770101

SCIENCE APPLICATIONS, INC., PALO ALTO, CA. 80 P.

SCIENCE APPLICATIONS, INC.

C,3;J,1;J,2;J,3;J,5,B

THIS REPORT IS THE PRELIMINARY DRAFT FOR THE SECOND FUEL CYCLE PROCESS STEP IN A STUDY OF ACCIDENTAL RISK ASSESSMENT IN THE FUEL CYCLE LWR SPENT FUEL REPROCESSING.

262

AVAILABILITY ANALYSIS OF FREON ABSORPTION SYSTEM FOR TREATING EFFLUENTS FROM REPROCESSORS

ORNL/TM-5797

WOOD, D.E.

770101

U.S. ERDA, TECHNICAL INFORMATION CENTER, OAK RIDGE, TN. 80 P. OAK RIDGE NATIONAL LABORATORY

C,3;C,5;J,1;J,3;J,5;J,6;J,8;J,9

THE AVAILABILITY OF THE FLUOROCARBON ABSORPTION SYSTEM FOR TREATING EFFLUENTS FROM REPROCESSORS (FASTER) AT CRGDP HAS BEEN ANALYZED WITH THE GO METHODOLOGY. THE OBJECTIVE OF THE SYSTEM IS TO REMOVE KF FROM THE OFF-GAS OF A FUEL REPROCESSING PLANT. POSSIBLE REDUNDANCIES AND BYPASSES HAVE BEEN ADDED AND ANALYZED TO PROVIDE DESIGN INFORMATION FOR A FUTURE DEMONSTRATION PLANT. FAILURE RATES AND REPAIR TIMES FOR GENERIC COMPONENTS WERE USED FOR THE PROBABILISTIC CALCULATION OF AVAILABILITY. SENSITIVITIES AND SYSTEM IMPACTS WERE CALCULATED FOR THE VARIOUS COMPONENT KINDS TO SHOW THE EFFECT OF COMPONENT CHANGES OR DATA UNCERTAINTIES. HUMAN OPERATOR EFFECTS ON STARTUP OF STANDBY UNITS AND BYPASSES HAVE BEEN INCLUDED.

264

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT.

I. OVERALL ASSESSMENT

ORNL-5566

CHOFF, A.G.; BLOMEKE, J.O.; FINNEY, B.C.

800101

NTIS. 135 P.

OAK RIDGE NATIONAL LABORATORY

I,1;I,2;I,3;I,4,A;I,4,C;I,4,E;I,4,G;I,5,B;I,5,D;I,5,F;I,5,H;I,6;I,7;I,8;I,9;J,1;J,2;J,3;J,4,A;J,4,C;J,4,E;J,4,G;J,5,B;J,5,D;J,5,F;J,5,H;J,6;J,7;J,8;J,9;L,1;L,2;L,3;L,4,A;L,4,C;L,4,E;L,4,G;L,5,B;L,5,D;L,5,F;L,5,H;L,6;L,7;L,8;L,9;O,1;O,2;O,3;O,4,A;O,4,C;O,4,E;O,4,G;O,5,B;O,5,D;O,5,F;O,5,H;O,6;O,7;O,8;O,9

THIS REPORT IS CONCERNED WITH AN OVERALL ASSESSMENT OF THE FEASIBILITY OF AND INCENTIVES FOR PARTITIONING (RECOVERING) LONG-LIVED NUCLIDES FROM FUEL REPROCESSING AND FUEL REFABRICATION PLANT RADIOACTIVE WASTES AND TRANSMUTING THEM TO SHORTER-LIVED OR STABLE NUCLIDES BY NEUTRON IRRADIATION. THE PRINCIPAL CLASS OF NUCLIDES CONSIDERED IS THE ACTINIDES, ALTHOUGH A BRIEF ANALYSIS IS GIVEN ON THE P-1 OF IC-99 AND I-129. IT IS ESTIMATED THAT P-T WOULD TAKE 20 YRS TO IMPLEMENT ON A COMMERCIAL SCALE, ASSUMING A WELL-SUPPORTED DEVELOPMENT

PROGRAM AND NO LICENSING DELAYS. THE DEVELOPMENT PROGRAM WOULD COST ABOUT \$900 MILLION (1979 DOLLARS), WITH THE LARGEST FRACTION BEING REQUIRED FOR A HOT PARTITIONING PILOT PLANT. FURTHER R&D IN SUPPORT OF P-T IS NOT WARRANTED.

265

PSE - RELEASE SCENARIO ANALYSIS

ON*1-88; CONF-791087

STORCK, R.

790101

OFFICE OF NUCLEAR WASTE ISOLATION, COLUMBUS, OH
TECHNISCHE UNIV. BERLIN, INSTITUT FUER KERNTECHNIK
WASTE ISOLATION PERFORMANCE ASSESSMENT AND IN-SITU TESTING. PP.
186-196.

C,2;C,3;C,5;L,2;L,3;L,5,8;L,5,D

THE PROJECT SAFETY STUDIES ENTSGUNG (PSE) IS CONCERNED WITH RISK TYPE ANALYSIS OF ENGINEERED AND GEOLOGICAL SYSTEMS. A GENERALIZED METHOD HAS BEEN DEVELOPED WHICH IS APPLICABLE TO BOTH. THE ESSENTIAL ELEMENT OF THIS METHOD IS THE SO-CALLED RELEASE TREE. THIS PAPER PRESENTS A SHORT DESCRIPTION OF THE GENERAL METHOD AND SHOWS ITS APPLICATION TO THE FINAL REPOSITORY. DURING EXECUTION OF THE ANALYSIS, MANY DIFFICULTIES AROSE, ESPECIALLY IN THE UNDERSTANDING OF SOME PHYSICAL PROCESSES. THESE DIFFICULTIES ARE MENTIONED AND WILL BE SUBJECT TO DETAILED INVESTIGATION IN THE FUTURE.

266

DATA BASE FOR RADIATION EVENTS IN THE COMMERCIAL NUCLEAR

FUEL CYCLE 1959-1978

NUREG/CR-2429; ANL/ES-123

BODEAU, D.J.; JULLEN, B.J.; LUNER, C.; MILSTED, J.; SANATHANAN,
L.F.

810101

U.S.GPO, NRC; NTIS. 78 P.

ARGONNE NATIONAL LABORATORY

D,9;E,9;F,9;G,9;H,9;I,9;J,9;K,9;L,9;M,9;N,9

INFORMATION REPORTED TO THE U.S. NRC BY COMMERCIAL LICENSE HOLDERS THROUGH 1978 ON 1634 INCIDENTS INVOLVING ANY LEVEL OF RADIOACTIVE RISK TO EITHER WORKERS OR THE PUBLIC HAS BEEN COMPILED. THESE INCIDENT HAVE BEEN CODED AND REDUCED TO A COMPUTER FORMAT THAT PERMITS QUICK ACCESS TO MANY DETAILS OF EACH EVENT, AS WELL AS A SHORT NARRATIVE SUMMARY. INCIDENTS AT REACTOR SITES ARE EXCLUDED, AS THESE ARE COVERED EXTENSIVELY ELSEWHERE. THE DATA BASE INCLUDES ALL AMERICAN INCIDENTS INVOLVING RADIOACTIVITY AT ANY POINT IN THE FUEL CYCLE, EXCEPT FOR INCIDENTS AT REACTOR SITES AND GOVERNMENT FACILITIES. THIS REPORT PROVIDES INSTRUCTION IN THE TECHNIQUES OF ACCESSING THE DATA BASE.

267

DRAFT ENVIRONMENTAL STATEMENT RELATED TO THE OPERATION OF
SAND ROCK HILL PROJECT, DOCKET NO. 40-8743, CONOCO,
INC.

NUREG-0889

U.S. NRC, OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
820101

U.S. NRC, WASHINGTON, DC. 250 P.

U.S. NRC

D,1;D,2;D,4,A;D,4,C;D,4,E;D,5,B;D,5,D;D,5,F;D,9; E,1;E,2;E,4,A;E,
4,C;E,4,E;E,5,B;E,5,E;E,5,F;E,9;O,1;O,3;O,9

AFTER AN ASSESSMENT OF CONCERNS, ALTERNATIVES, AND THE
ADDITION OF LICENSE CONDITIONS AS DISCUSSED IN THE REPORT, THE
PROPOSED ACTION IS THE ISSUANCE OF A SOURCE AND BYPRODUCT
MATERIAL LICENSE TO CONOCO, INC. IN JULY 1980, CONOCO APPLIED TO
THE NRC FOR AN NRC SOURCE AND BYPRODUCT MATERIAL LICENSE TO
CONSTRUCT AND OPERATE IN CAMBELL CO., WY, A URANIUM MILL,
ASSOCIATED WITH AN OPEN-PIT MINE, WITH AN ANNUAL UO2 PRODUCTION
RATE OF 715 MT PER YR. THE PROPOSED PROJECT WOULD BE LOCATED ON
A 1604 HA SITE APPROX. MIDWAY BETWEEN CASPER AND GILLETTE AND
WOULD LIE ABOUT 0.8 KM SOUTH OF STATE HIGHWAY 387.

268

ALTERNATIVES FOR LONG-TERM DEFENSE HIGH-LEVEL RADIOACTIVE
WASTE. HANFORD RESERVATIONS, RICHLAND, WASHINGTON

ERDA 77-44

U.S. ERDA

770101

NIIS. 250 P.

U.S. ERDA

K,1;K,2;K,3;K,4;K,5;K,7;K,9;L,1;L,2;L,3;L,4;L,5;L,7;L,9

THE OBJECTIVE OF THIS DOCUMENT IS TO PROVIDE INFORMATION ON
ALTERNATIVES THAT ARE BEING CONSIDERED FOR LONG-TERM MANAGEMENT
OF DEFENSE H-L RADWASTE STORED AT HANFORD IN UNDERGROUND TANKS
AND IN STAINLESS STEEL-LINED CONCRETE BASINS. FOR PURPOSES OF
BASIC PROGRAMMATIC DECISION MAKING, 4 MAJOR ALTERNATIVES BASED
ON DISPOSAL LOCATION ARE CONSIDERED. A DESCRIPTION OF THE
TECHNOLOGY, A PRELIMINARY RA, AND PRELIMINARY COST ESTIMATES FOR
EACH OF THE 27 PLANS ARE PRESENTED. THE TECHNOLOGY REQUIRED TO
IMPLEMENT ANY OF THE 27 ALTERNATIVE PLANS HAS NOT BEEN DEVELOPED
TO THE POINT WHERE ANY PLAN CAN BE CONSIDERED COMPLETELY
TECHNICALLY SOUND AND FEASIBLE.

269

STATUS REPORT ON RISK ASSESSMENT FOR NUCLEAR WASTE DISPOSAL
EPRI NP-1197

KOPLIK, C.M.; OSTON, S.G.; BARTLETT, J.W.; KAPLAN, M.F.

790101

ANALYTIC SCIENCES CORP., READING, MA, 250 P.

ANALYTIC SCIENCES CORP.

L,1;L,2;L,3;L,5,D;L,6;L,7;L,8;L,9;L,0

THIS DOCUMENT REPORTS THE RESULTS OF A COMPARATIVE ANALYSIS AND EVALUATION OF REPORTED STUDIES ON LONG-TERM SAFETY FOR GEOLOGIC DISPOSAL OF NUCLEAR WASTES. THE SCOPE OF WORK INCLUDED CONSIDERATIONS OF UNCERTAINTY ISSUES AND THEIR IMPACT ON RESULTS;

ASSESSMENT OF THE EFFECTS OF DESIGN, SITING AND OPERATIONAL STRATEGY ALTERNATIVES ON SAFETY LEVELS; AND ASSESSMENT OF THE ADEQUACY OF SCOPE OF THE AVAILABLE RESULTS. RESULTS OBTAINED BY THE STUDIES REVIEWED ARE RECONCILED AND ANALYZED BY NORMALIZING THE RESULTS TO A COMMON BASIS OF REPOSITORY CONTENTS AT CLOSURE AND ENVIRONMENTAL SCENARIO CONDITIONS. THE SCOPE OF WORK ALSO INCLUDES A COMPARATIVE ANALYSIS OF SAFETY LEVELS FOR DISPOSAL OF SPENT FUEL AND VITRIFIED H-L WASTE. THE INHERENTLY HIGHER RISK LEVELS ASSOCIATED WITH SPENT FUEL DISPOSAL ARE DEMONSTRATED. THE REPORT CONCLUDES WITH A DISCUSSION OF SIGNIFICANT RESOLVED AND UNRESOLVED SAFETY ISSUES.

270

ENVIRONMENTAL ANALYSIS OF THE URANIUM FUEL CYCLE. PT. IV.

SUPPLEMENTARY ANALYSIS - 1976

EPA 520/7-76-017; PB-259 657

U.S. EPA, OFFICE OF RADIATION PROGRAMS

760101

NTIS. 130 P.

U.S. EPA

E,1;E,5;E,9;G,1;G,9;I,1;I,5;I,9;J,1;J,5,D;J,9

THE OBJECTIVE OF PT IV IS TO ADDRESS SEVERAL TECHNICAL AREAS IN WHICH NEW INFO IS AVAILABLE OR WHICH WERE DISCUSSED ONLY BRIEFLY IN PREVIOUS REPORTS. IN THE FORMER CATEGORY ARE SECTIONS PERTAINING TO U MILLING AND FUEL REPROCESSING, WHILE ITEMS SUCH AS TRU EFFLUENTS FROM RECYCLED U AND N-16 SKYSHINE AT BARS FALL INTO THE SECOND CATEGORY. AS IN THE ORIGINAL REPORTS, THE PRINCIPAL PURPOSES OF THESE ANALYSES ARE TO PROJECT THE IMPACT ON MAY OF THE ENVIRONMENTAL RELEASES OF RADIOACTIVE MATERIALS FROM THE FUEL CYCLE, AND TO ASSESS THE CAPABILITIES AND COSTS OF CONTROLS AVAILABLE TO MANAGE ENVIRONMENTAL RELEASES OF THESE MATERIALS.

271

RADIATION EXPOSURES FROM SOLIDIFICATION PROCESSES FOR HIGH-LEVEL RADIOACTIVE LIQUID WASTES

EPA-520/3-80-007; PB 80-222 508

HOLCOMB, W.F.; CROFFORD, W.N.; CLARK, R.L.; STURZ, F.C.

800101

NTIS. 68 P.

U.S. EPA, OFFICE OF RADIATION PROGRAMS

J,1;J,5,D;J,9;L,1;L,5,D;L,9

ORF/EPA HAS PREPARED THIS ANALYSIS AS TECHNICAL SUPPORT FOR EPA'S PROPOSED ENVIRONMENTAL RADIATION PROTECTION STANDARDS, 40 CFR 191, CONCERNING THE MANAGEMENT AND DISPOSAL OF H-L

RADWASTES. FOR SUBPART A OF 40 CFR 191, WASTE MANAGEMENT AND STORAGE OPERATIONS, EPA PROPOSES TO EXTEND THE LIMITATIONS OF 40 CFR 190 TO THESE OPERATIONS. EPA/OPR DEVELOPED A GENERIC H-L LIQUID WASTE SOLIDIFICATION PLANT AND ASSESSED THE POTENTIAL ENVIRONMENTAL IMPACT OF ATMOSPHERIC DISCHARGES DURING NORMAL OPERATIONS IN 4 SOLIDIFICATION PROCESSES: FLUIDIZED-BED CALCINATION, SPRAY CALCINATION AND GLASSIFICATION BY IN-CAN MELTING AND CONTINUOUS MELTING. THE AUTHORS USED AIRDOSE-EPA TO PERFORM THE ASSESSMENT.

272

POTENTIAL RADIOLOGICAL IMPACT OF AIRBORNE RELEASES AND DIRECT GAMMA RADIATION TO INDIVIDUALS LIVING NEAR INACTIVE URANIUM MILL TAILINGS PILES

EPA-520/1-76-001; PB-258 166

SWIFT, J.J.; HARDIN, J.M.; CALLEY, H.W.

760101

NTIS. 44 P.

U.S. EPA, OFFICE OF RADIATION PROGRAMS

E,5,L;E,8;E,9

THE ESTIMATED POTENTIAL ANNUAL DOSE FROM RADIOACTIVE RADON DECAY PRODUCTS TO INDIVIDUALS IN DWELLINGS IN THE VICINITY OF AN AVERAGE INACTIVE PILE IS APPROX 8 REM TO THE TRACHEOBRONCHIAL REGION OF THE LUNGS AT ABOUT 50 M FROM THE PILE, 0.3 REM AT 1 KM, AND 0.1 REM AT CA. 2.2 KM. THE CORRESPONDING DOSES TO THE PULMONARY REGION OF THE LUNGS FROM AIRBORNE URANIUM TH-230, AND RA-226 ARE ESTIMATED TO BE CA. ONE-THIRD AS LARGE, WITHIN 1 KM OF THE PILE. GAMMA EXPOSURE RATES ON THE TAILINGS ARE UP TO 1 MR/HR. ESTIMATED EXPOSURE RATES ARE IN REASONABLE AGREEMENT WITH THE LIMITED DATA FROM FIELD MEASUREMENTS. OTHER CALCULATIONS ARE PERFORMED.

273

A PRELIMINARY HAZARDS ANALYSIS OF A BREEDER FUEL REPROCESSING FACILITY

DP-1584

PERKINS, W.C.; DEXTER, A.H.

810101

NTIS. 261 P.

SAVANNAH RIVER LABORATORY

J,2;J,3;J,4;J,5,D;J,6;J,9

THE TOOLS USED AT SRL TO MAKE PRELIMINARY HAZARDS ANALYSES AS WELL AS SAFETY ANALYSES OF FACILITIES FOR PROCESSING SPENT NUCLEAR FUELS FROM BOTH POWER AND PRODUCTION REACTORS ARE DESCRIBED. THEY HAVE ALSO BEEN USED IN SAFETY STUDIES OF WASTE HANDLING OPERATIONS AT SRP. THE TOOLS ARE THE SRL INCIDENTS DATA BANK AND THE "WHAT IF" MEETING. THE APPLICATION OF THIS METHODOLOGY IS ILLUSTRATED FOR A PROPOSED FACILITY WHICH HAS BREEDER FUEL REPROCESSING CAPABILITY, THE HGT EXPERIMENTAL FACILITY.

274

SUPPLEMENTAL ALTERNATIVES FOR LONG-TERM MANAGEMENT OF
DEFENSE TRANSURANIC WASTE AT THE SAVANNAH RIVER PLANT,
AIKEN, SOUTH CAROLINA
DOE/SR-WM-79-1 (SUPPL.)

U.S. DOE

800101

U.S. DOE, WASHINGTON, DC. 50 P.

U.S. DOE

K,1;K,2;K,4,A;K,4,C;K,5,B;K,5,D;K,7;K,0

COSTS AND RISKS ARE ESTIMATED FOR 4 SUPPLEMENTAL
ALTERNATIVES FOR THE LONG-TERM MANAGEMENT OF RETRIEVABLY STORED
DEFENSE TRANSURANIC SOLID WASTE NOW STORED IN TRENCHES AND ON
PADS AT SRP. THESE ALTERNATIVES SUPPLEMENT THE 12 ALTERNATIVES
PREVIOUSLY DESCRIBED, BY ADDING THE USE OF THE PLANNED ALPHA
WASTE INCINERATOR AND ALPHA DISASSEMBLY AND DECONTAMINATION
FACILITIES TO PROCESS RETRIEVABLY STORED TRU SOLID WASTE.

275

PUBLIC DRAFT. NATIONAL PLAN FOR SITING HIGH-LEVEL
RADIOACTIVE WASTE REPOSITORIES AND ENVIRONMENTAL
ASSESSMENT

DOE/NWTS-4; DOE/EA-151

U.S. DOE, NATIONAL WASTE TERMINAL STORAGE PROGRAM

820101

NTIS. 206 P.

U.S. DOE

L,1;L,5

THE PLAN IS ONE ELEMENT IN NWTS PROGRAM BEING CONDUCTED BY
DOE TO DEVELOP THE NECESSARY TECHNOLOGY AND TO QUALIFY SITES TO
ESTABLISH MINED GEOLOGIC REPOSITORIES FOR THESE WASTES. THE PLAN
DESCRIBES EXISTING AND PLANNED ACTIVITIES FOR SCREENING
SUCCESSIVELY SMALLER PORTIONS OF LAND WITHIN THE U.S. TO
IDENTIFY SUITABLE CANDIDATE SITES, AND FOR SUBSEQUENTLY
SELECTING ONE OR MORE OF THESE SITES, FOR PERMANENT DISPOSAL OF
RADWASTE. ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION,
INCLUDING THE ANTICIPATED RANGE OF FIELD STUDIES TO CHARACTERIZE
VARIOUS LAND AREAS AND REASONABLE ALTERNATIVE SITING STRATEGIES,
ARE ASSESSED. THE EA PROVIDES THE BASIS FOR FINDING OF WHETHER
OR NOT IMPLEMENTATION OF THIS PLAN WILL RESULT IN SIGNIFICANT
ENVIRONMENTAL IMPACTS.

276

ENVIRONMENTAL DEVELOPMENT PLAN. LWR COMMERCIAL WASTE
MANAGEMENT

DOE/EDP-0063

U.S. DOE, ASSISTANT SECRETARY FOR NUCLEAR ENERGY, ASSISTANT
SECRETARY FOR ENVIRONMENT

800101

NTIS. 123 P.

U.S. DOE

J,1;J,2;M,1;M,2;N,1;N,2;K,1;K,2;L,1,L,2

THIS EDP IDENTIFIES PLANNING AND MANAGERIAL REQUIREMENTS AND SCHEDULES NEEDED TO EVALUATE AND ASSESS THE ENVIRONMENTAL, HEALTH AND SAFETY ASPECTS OF THE COMMERCIAL WASTE MANAGEMENT PROGRAM. THIS PLAN ADDRESSES CERTAIN PRESENT AND POTENTIAL FEDERAL RESPONSIBILITIES FOR THE STORAGE, TREATMENT, TRANSFER AND DISPOSAL OF RADWASTE MATERIALS PRODUCED BY THE NUCLEAR INDUSTRY.

277

DEFENSE WASTE PROCESSING FACILITY, SAVANNAH RIVER PLANT,
AIKEN, S.C. FINAL ENVIRONMENTAL IMPACT STATEMENT

DCE/EIS-0082 F

U.S. DOE, ASSISTANT SECRETARY FOR DEFENSE PROGRAMS, OFFICE OF
DEFENSE WASTE AND BYPRODUCTS MANAGEMENT

820101

NTIS. 500 P.

U.S. DOE

L,1;L,3;L,5,B;L,5,D;L,5,F;L,5,H;L,7;N,1;N,3;N,5,B;N,5,D;N,5,F;N,
5,H;N,7;O,1;O,3;O,5,B;O,5,D;O,5,F;O,5,H;O,7;F,1

THE PURPOSE OF THIS EIS IS TO PROVIDE INPUT INTO BOTH THE SELECTION OF AN APPROPRIATE STRATEGY FOR THE PERMANENT DISPOSAL OF HLW CURRENTLY STORED AT THE SRP AND THE SUBSEQUENT DECISION TO CONSTRUCT AND OPERATE A DWPF AT THE SRP SITE. THE SRP IS A MAJOR DOE INSTALLATION FOR THE PRODUCTION OF NUCLEAR MATERIALS FOR NATIONAL DEFENSE. APPROX. 22 MILLION GAL OF HLW ARE CURRENTLY STORED IN TANKS AT THE SRP SITE. THE PROPOSED DWPF WOULD PROCESS THE LIQUID HLW GENERATED BY SRP OPERATIONS INTO A STABLE FORM FOR ULTIMATE DISPOSAL. THIS EIS ASSESSES THE EFFECTS OF THE PROPOSED IMMOBILIZATION PROJECT ON LAND USE, AIR QUALITY, WATER QUALITY, ECOLOGICAL SYSTEMS, HEALTH RISK, CULTURAL RESOURCES, ENDANGERED SPECIES, WETLAND PROTECTION, RESOURCE DEPLETION, AND REGIONAL SOCIAL AND ECONOMIC SYSTEMS. THE RADIOLOGICAL AND NONRADIOLOGICAL RISKS OF TRANSPORTING THE IMMOBILIZED WASTES ARE ASSESSED. THE ENVIRONMENTAL IMPACTS OF DISPOSAL ALTERNATIVES HAVE RECENTLY BEEN EVALUATED IN A PREVIOUS EIS AND ARE THEREFORE ONLY SUMMARIZED IN THIS EIS.

278

WASTE ISOLATION PILOT PLANT. FINAL ENVIRONMENTAL IMPACT
STATEMENT. VOL. 1

DOE/EIS-0026, VOL. 1

U.S. DOE, ASSISTANT SECRETARY FOR DEFENSE PROGRAMS

800101

NTIS. 500 P.

U.S. DOE

L,1;L,2;L,5,B;L,5,D;L,5,F;L,5,H;L,9;N,1;N,2;N,5,B;N,5,D;N,5,F;N,

5,H;N,9;O,1;O,2;O,5,B0;5,D;O,5,F;O,5,H;C,9;P,1;P,2;P,5,B;P,5,D;P,5,F;P,5,H;P,9

IN ACCORDANCE WITH NEPA, DOE HAS PREPARED THIS DOCUMENT AS ENVIRONMENTAL INPUT TO FUTURE DECISIONS REGARDING WIPP, WHICH WOULD INCLUDE THE DISPOSAL OF TRU WASTE, AS CURRENTLY AUTHORIZED. THE ALTERNATIVES COVERED IN THIS REPORT ARE: (1) CONTINUE STORING TRU WASTE AT INEL AS IT IS NOW OR WITH IMPROVED CONFINEMENT. (2) PROCEED WITH WIPP AT THE LOS MEDANOS SITE IN SE NM, AS CURRENTLY AUTHORIZED. (3) DISPOSE OF TRU WASTE IN THE FIRST AVAILABLE REPOSITORY FOR H-L WASTE, THE LOS MEDANOS SITE WOULD BE INVESTIGATED FOR ITS POTENTIAL SUITABILITY AS A CANDIDATE SITE. THIS IS ADMINISTRATION POLICY AND IS THE ALTERNATIVE PREFERRED BY THE DOE. (4) DELAY THE WIPP TO ALLOW OTHER CANDIDATE SITES TO BE EVALUATED FOR TRU-WASTE DISPOSAL.

279

WASTE ISOLATION PILOT PLANT. FINAL ENVIRONMENTAL IMPACT STATEMENT, VOL. 2

DOE/EIS-0026, VOL. 2

U.S. DOE, ASSISTANT SECRETARY OF DEFENCE PROGRAMS

800101

NTIS. 550 P.

U.S. DOE

C,5;L,1;L,2;L,5;L,7;L,8;L,9;N,1;N,2;N,5;N,7;N,8;N,9;P,1;P,2;P,5;P,7;P,9

VOL. 2 CONTAINS THE APPENDICES. ALTERNATIVE GEOLOGIC ENVIRONS ARE CONSIDERED. SALT, CRYSTALLINE ROCK, ARGILLACEOUS ROCK, AND TUFF ARE DISCUSSED. STUDIES ON ALTERNATIVE GEOLOGIC REGIONS FOR THE SITING OF WIPP ARE REVIEWED. PRESIDENT CARTER'S MESSAGE TO CONGRESS ON THE MANAGEMENT OF RADWASTES AND THE FINDINGS AND RECOMMENDATIONS OF THE INTERAGENCY REVIEW GROUP ON NUCLEAR WASTE MANAGEMENT ARE INCLUDED. SELECTION CRITERIA FOR THE WIPP SITE INCLUDE GEOLOGIC, HYDROLOGIC, TECTONIC, PHYSIOCHEMICAL COMPATIBILITY, AND SOCIO-ECONOMIC FACTORS. A DESCRIPTION OF THE WASTE TYPES AND THE WASTE PROCESSING PROCEDURES ARE GIVEN. METHODS USED TO CALCULATE RADIATION DOSES FROM RADIONUCLIDE RELEASES DURING OPERATION ARE PRESENTED. A COMPLETE DESCRIPTION OF THE LOS MEDANOS SITE, INCLUDING ARCHAEOLOGICAL AND HISTORIC ASPECTS IS INCLUDED. ENVIRONMENTAL MONITORING PROGRAMS AND LONG-TERM SAFETY ANALYSIS PROGRAM ARE DESCRIBED.

280

U.S. DOMESTIC HIGH LEVEL WASTE MANAGEMENT SYSTEM

BNWL-SA-5725

FINNIGAN, J.W.

760101

BATTELLE, PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 21 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

L,1;O,1

THE FOLLOWING ASPECTS OF RADWASTE MANAGEMENT ARE DISCUSSED: TECHNIQUES FOR SOLIDIFYING OR FIXING THE H-L WASTE; TRANSPORT OF THE FIXED WASTE TO A FEDERAL REPOSITORY; THE CHARACTERISTICS OF THE SOLIDIFIED WASTE; AN INTERIM STORAGE TECHNIQUE FOR THESE WASTES AT THE FEDERAL REPOSITORY; AND A ROUGH ESTIMATE OF COSTS.

281

HIGH-LEVEL WASTE CONCENTRATION AND STORAGE: AN OVERVIEW

BNWL-SA-5477

BURNS, R.E.

750101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 23 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

J,1;J,9;J,0;K,1;K,9;K,0

THIS PAPER WAS REVISED FOR PUBLICATION; SEE ACN=455. RECOGNIZED PROBLEMS IN CONCENTRATION AND STORAGE OPERATIONS OF HIGH LEVEL WASTE PRODUCED IN THE REPROCESSING OF COMMERCIAL POWER REACTOR FUEL ARE CITED AND DISCUSSED.

282

MONITORING AND CHARACTERIZATION OF RADIONUCLIDE TRANSPORT
IN THE HYDROGEOLOGICAL SYSTEM .

BNWL-SA-5495, PT. 2; CONF-750967

PHILLIPS, S.J.; RAYMOND, J.R.

750901

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 84 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

K,1;K,5;L,1;L,5;N,1;N,5

THESE PAPERS WERE PREPARED FOR THE PROC. 3RD ERDA CONF. SEE ACN=230 FOR PT. 1. SITE DETERMINATION AND DECOMMISSIONING PLANS ARE NEEDED ON THE HANFORD RESERVATION SINCE PU PRODUCTION THERE HAS BEEN CURTAILED. EACH CONTAMINATED SITE WILL BE RELOCATED OR PLACED IN A STABLE CONDITION WITH THE MINIMUM POSSIBILITY OF AFFECTING THE LOCAL ENVIRONMENT. DURING OPERATIONS AT HANFORD RADIOACTIVE OR CONTAMINATED MATERIALS WERE PLACED IN LOCATIONS WHICH WOULD MINIMIZE EXPOSURE TO PERSONNEL. SPECIFIC CONDITIONS FOR DISPOSAL OF THESE RADIOACTIVE WASTES WERE: (1) THAT THE WASTE WOULD NOT MIGRATE IN QUANTITIES SUFFICIENT ENOUGH TO THREATEN PERSONNEL AND (2) THE LOCATIONS OF THE RADIOACTIVE MATERIAL WOULD BE POSITIVELY IDENTIFIED AND RECORDS WOULD BE KEPT AS LONG AS SIGNIFICANT QUANTITIES OF CONTAMINATED MATERIALS REMAINED. THE 300 NORTH AND WYE BURIAL GROUNDS CONTAIN VOLUMES OF APPROX. 5600 M3 AND 340 M3, RESPECTIVELY, OF BURIED WASTE. LOW-LEVEL WASTES WERE COLLECTED IN SQUARE CARDBOARD CARTONS WHICH WERE PLACED IN OPEN TRENCHES IN A CONTROLLED BURIAL GROUND. INTERMEDIATE LEVEL WASTES WERE PLACED IN SPUN ALUMINUM CYLINDERS WHICH WERE SEALED, THEN TRANSPORTED IN LEAD CASKS TO A BURIAL GROUND INTO WHICH THEY WERE LOADED, THROUGH A CHUTE, INTO A BURIED VERTICAL CAISSON. IN MANY INSTANCES THE CAISSONS WERE SEALED WITH CONCRETE. HIGH-LEVEL WASTES WERE SEALED IN 1 LITER

COMMERCIAL CANS AND DISPOSED OF IN SPECIAL REVOLVING PB CASKS. THEY WERE BURIED IN THE SAME MANNER AS INTERMEDIATE-LEVEL WASTES. FIVE TECHNIQUES HAVE BEEN EMPLOYED TO DETECT BURIED WASTE. THESE INCLUDE: (1) A METAL DETECTOR, (2) A MAGNETOMETER, (3) ACOUSTICS, (4) GROUND PENETRATING RADAR, AND (5) INFRARED IMAGING STUDIES. SEDIMENT-FLUID INTERACTION AND FLUID MIGRATION WERE CHARACTERIZED. A STUDY TO DETERMINE BIOLOGICAL TRANSPORT OF RADIONUCLIDES WAS INITIATED. IN FUTURE WORK DRILLING TECHNIQUES WILL BE DEVELOPED AND UTILIZED IN ORDER TO DETERMINE AMOUNT OF WASTE MIGRATION AS WELL AS FOR RECOVERING AND CHARACTERIZING SEDIMENTS AND CONTAMINATED MATERIAL. DEALS WITH MONITORING AND CHARACTERIZING DISPOSED HIGH-, INTERMEDIATE- AND LOW-LEVEL WASTE. TABLES 1 AND 22 PROVIDE DATA ON BULK DENSITY, SATURATED WATER CONTENT, AND HYDRAULIC CONDUCTIVITY.

283

A DECISION MODEL INCORPORATING UTILITY THEORY AND MEASURES OF SOCIAL VALUES APPLIED TO NUCLEAR WASTE MANAGEMENT

BNWL-B-424

LIICFIELD, J.W.; HANSEN, M.V.; BECK, L.C.

750101

BATTIELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 58 P.

BATTIELLE, PACIFIC NORTHWEST LABORATORIES

C,1;C,3;C,4;C,5;C,6;C,8;K,1;K,3;K,4;K,5;K,6;K,8;M,1;M,3;M,4;M,5;M,6;M,8;N,1;N,3;N,4;N,5;N,6;N,8

THE GOAL OF THIS RESEARCH WAS TO PROVIDE A DECISION ANALYSIS TOOL THAT COULD SUPPLY INFORMATION USEFUL IN INDICATING FUTURE RESEARCH NEEDS FOR THE LONG-TERM STORAGE OF NUCLEAR WASTES. TO MAKE A CHOICE BASED ON TECHNICAL ESTIMATES OF THE COSTS, SHORT-TERM SAFETY, LONG-TERM SAFETY, AND ACCIDENT DETECTION AND RECOVERY REQUIRES ESTIMATING THE RELATIVE IMPORTANCE OF EACH OF THESE FACTORS FOR ATTRIBUTES.

284

CONCEPTUAL DESIGN CONSIDERATIONS FOR THE STORAGE OF SOLIDIFIED HIGH-LEVEL WASTE IN CANISTERS AT A COMMERCIAL FUEL REPROCESSING PLANT

ARH-SA-221

LARIVIERE, J.R.; MOORE, E.L.

751101

ATLANTIC RICHLAND HANFORD CO., RICHLAND, WA. 19 P.

ATLANTIC RICHLAND HANFORD CO.

K,1

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE AIChE 1975 ANNUAL MEETING. ONSITE STORAGE OF CANISTERS OF SOLIDIFIED HL WASTE GENERATED BY THE COMMERCIAL FUEL REPROCESSING PLANTS (FPR) MAY BE REQUIRED PRIOR TO SHIPPING THESE CANISTERS TO A FEDERAL REPOSITORY. THE MOST LIKELY STORAGE CONCEPT IS TO HOLD THE WASTE-FILLED CANISTERS IN WATER STORAGE BASINS. IN THE RETRIEVABLE SURFACE STORAGE FACILITY CONCEPTUAL DESIGN STUDIES,

AIR-COOLED AND WATER-COOLED STORAGE OF SOLIDIFIED HLW HAS BEEN CONSIDERED. THE STUDIES OF WATER-COOLED STORAGE INCLUDED DESIGN CONSIDERATIONS, AS PART OF THE CONCEPTUAL DESIGN OF CANISTERS AND WATER STORAGE BASINS, THAT WOULD APPLY ALSO TO THE CONCEPTUAL DESIGN OF SIMILAR FACILITIES AT AN FRP. THESE SIMILAR CONSIDERATIONS INCLUDE: TYPES OF CORROSION LIKELY TO DEVELOP ON CANISTERS STORED IN WATER, CONDITIONS THAT PROMOTE STRESS CORROSION CRACKING (SCC), PREVENTION OF SCC, ROUTINE BASIN WATER CLEANUP, CLEANUP OF A GROSSLY CONTAMINATED WATER BASIN, EFFLUENT DISCHARGE DISCUSSIONS, STORAGE BASIN INTEGRITY, AND DESIGNING FOR DECOMMISSIONING.

285

THE MIGRATION OF LONG-LIVED RADIOACTIVE PROCESSING WASTES IN SELECTED ROCKS. ANNUAL REPORT TO THE OFFICE OF WASTE HANDLING, PROJECT AN011A, FY 1977

ANL-78-46

FRIED, S.; FRIEDMAN, A.M.; COHEN, D.; HINES, J.J.; STRICKERT, R.G.

780101

ARGONNE NATIONAL LABORATORY, ARGONNE, IL. 43 P.

ARGONNE NATIONAL LABORATORY

L,1;L,5,B;L,9;L,0

LABORATORY SCALE MODELS HAVE BEEN CONSTRUCTED OF THE PU-AM DISPOSAL AREAS AT LASL AND THE MIGRATION OF RADIONUCLIDES DETERMINED. THESE RESULTS WERE COMPARED TO THE MIGRATION AT THE ACTUAL DISPOSAL AREA AS MEASURED BY ANALYZING CORE SAMPLES. OTHER STUDIES ARE DESCRIBED THAT INCLUDE I-129, TE-99, AND NP CHEMISTRY AND MODELING.

287

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE - CONVERSION OF RECYCLE URANIUM TO UF-6

ORNL/NUREG/TM-37

RODDY, J.W.; BLANCO, R.E.; FINNEY, B.C.; HILL, G.S.; MOORE, R.E.; WITHERSPOON, J.P.

770101

NTIS. 126 P.

OAK RIDGE NATIONAL LABORATORY

F,1;F,2;F,5,D;F,9

A COST BENEFIT STUDY WAS MADE TO DETERMINE THE COST AND EFFECTIVENESS OF VARIOUS RADWASTE TREATMENT SYSTEMS FOR DECREASING THE AMOUNT OF RADIOACTIVE MATERIALS RELEASED FROM A MODEL RECYCLE U CONVERSION AND UF-6 PRODUCTION PLANT AND TO DETERMINE THE RADIOLOGICAL IMPACT OF THE RELEASED RADIOACTIVE MATERIALS ON THE ENVIRONMENT. THE BASE CASE MODEL PLANT IS REPRESENTATIVE OF A LICENSABLE UF-6 PRODUCTION PLANT AND HAS AN ANNUAL CAPACITY OF 1500 METRIC TONS OF U.

288

ASSESSMENT OF MATERIALS FOR NUCLEAR FUEL IMMOBILIZATION
CONTAINERS

AECL-6440

AECL, WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT

810101

AECL, WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT, PINAWA,
MANITOBA. 213 P.

AECL, WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT

L,1

A WIDE RANGE OF ENGINEERING METALS AND ALLOYS HAVE BEEN ASSESSED FOR THEIR SUITABILITY AS CONTAINER MATERIALS FOR IRRADIATED NUCLEAR FUEL INTENDED FOR PERMANENT DISPOSAL IN A DEEP, UNDERGROUND HARD-ROCK VAULT. THE EXPECTED RANGE OF SERVICE CONDITIONS IN THE DISPOSAL VAULT ARE DISCUSSED, AS WELL AS THE MATERIAL PROPERTIES REQUIRED FOR THIS APPLICATION. AN IMPORTANT REQUIREMENT IS THAT THE CONTAINER LAST AT LEAST 500 YEARS WITHOUT BEING BREACHED. THE ASSESSMENT IS TREATED IN TWO PARTS. PART I CONCENTRATES IN THE PHYSICAL AND MECHANICAL METALLURGY, WITH SPECIAL REFERENCE TO STRENGTH, WELDABILITY, POTENTIAL EMBRITTLEMENT MECHANISMS AND SOME ECONOMIC ASPECTS. PART II DISCUSSES POSSIBLE MECHANISMS OF METALLIC CORROSION FOR THE VARIOUS ENGINEERING ALLOYS AND THE EXPECTED RANGE OF ENVIRONMENTAL CONDITIONS IN THE VAULT. LOCALIZED CORROSION AND DELAYED FRACTURE PROCESSES ARE IDENTIFIED AS BEING MOST LIKELY TO LIMIT CONTAINER LIFETIME. HENCE AN ESSENTIAL REQUIREMENT IS THAT SUCH PROCESSES EITHER BE ABSENT OR PROCEED AT AN INSIGNIFICANT RATE. THREE GROUPS OF ALLOYS ARE RECOMMENDED FOR FURTHER CONSIDERATION AS POSSIBLE CONTAINER MATERIALS: AISI 300 SERIES AUSTENITIC STAINLESS STEELS, HIGH NICKEL-BASE ALLOYS AND VERY DILUTE TITANIUM-BASE ALLOYS. SPECIFIC ALLOYS FROM EACH GROUP ARE INDICATED AS HAVING THE OPTIMUM COMBINATION OF REQUIRED PROPERTIES, INCLUDING COST. FOR CONTAINER DESIGNS WHERE THE OUTER CONTAINER SHELL DOES NOT INDEPENDENTLY SUPPORT THE SERVICE LOADS, COPPER SHOULD ALSO BE CONSIDERED. THE FINAL MATERIAL SELECTION WILL DEPEND PRIMARILY ON THE ENVIRONMENTAL CONDITIONS IN THE VAULT. SOME RECOMMENDATIONS ARE GIVEN FOR FUTURE RESEARCH ON THE CANDIDATE MATERIALS.

289

CHARACTERIZATION OF PARTICULATE PLUTONIUM RELEASED IN FUEL
CYCLE OPERATIONS

ANL-75-78

SEEFELDT, W.B.; MECHAN, W.J.; STEINDLER, M.J.

760101

ARGONNE NATIONAL LABORATORY, ARGONNE, IL. 79 P.

ARGONNE NATIONAL LABORATORY

C,5;C,9;P,5;P,9

AN ESTIMATE OF THE PU SOURCE TERMS IS MADE FOR THE FUEL CYCLES OF THREE REACTOR TYPES ON THE BASIS OF CURRENTLY APPLIED

TECHNOLOGY. THE THREE REACTORS ARE LWR-U, LWR-PU, AND LMFBR. THE SOURCE TERMS ARE CHARACTERIZED AS TO QUANTITY, FORM, AND PARTICLE SIZE DISTRIBUTION. HISTORICAL OPERATING DATA FOR EXISTING PLANTS AND THE STATE OF THE ART OF THE TECHNOLOGY OF AIR CLEANING ARE REVIEWED.

290

RISK-ASSESSMENT METHODOLOGY FOR FAST BREEDER REACTORS

ANL-76-39

OTI, K.O.

760101

ARGONNE NATIONAL LABORATORY, ARGONNE, IL. 58 P.

ARGONNE NATIONAL LABORATORY

C,2;C,3;C,4;C,5;C,8

THE METHODS APPLIED OR PROPOSED FOR RA OF NUCLEAR REACTORS ARE REVIEWED, PARTICULARLY WITH RESPECT TO THEIR APPLICABILITY FOR RA OF FUTURE COMMERCIAL FAST BREEDER REACTORS. AMONG THE CONCEPTS REVIEWED ARE THE MAXIMUM CREDIBLE ACCIDENT APPROACH, DESIGN BASED ACCIDENT APPROACH, FARMER'S LIMIT-LINE APPROACH, ACCIDENT-RISK ENVELOPE, PROBABILITY DISTRIBUTION CONSEQUENCES, THE KASHUSSEN APPROACH, LINE-LIMIT AND ENVELOPE INTEGRATIONS, EVENT TREES, FAULT TREES, ACCIDENT-PROGRESSION DIAGRAMS, AND SIMULATION. A GENERALIZED AND IMPROVED RA METHODOLOGY IS OUTLINED AND PROPOSED. THE GENERALIZATION CONSISTS PRIMARILY OF AN EXPLICIT TREATMENT OF UNCERTAINTIES THROUGHOUT THE ACCIDENT PROGRESSION.

291

RADIATION PROTECTION STANDARD

ARH-220

ATLANTIC RICHFIELD HANFORD CO.

700101

ATLANTIC RICHFIELD HANFORD CO., RICHLAND, WA. 48 P.

ATLANTIC RICHFIELD HANFORD CO.

C,1;C,4;C,5;C,9;C,0 ;J,1;J,4,A;J,4,C;J,5,B;J,5,D;J,9;K,1;K,4,A;K,4,C;K,5,B;K,5,D;K,9;M,1;M,4,A;M,4,C;M,5,B;M,5,D;M,9;N,1;N,4,A;N,4,C;N,5,B;N,5,D;N,9

THE RADIATION PROTECTION STANDARDS TO BE FOLLOWED AT THE HANFORD RESERVATION ARE OUTLINED. DEFINITIONS OF RADIATION ZONES, BARRIERS, MARKING OF RADIATION ZONES, RADIATION WORK PRACTICES, NON-OCCUPATIONAL EXPOSURE STANDARDS, OCCUPATIONAL EXPOSURE STANDARDS, OCCUPATIONAL EXPOSURE CONTROLS, EMERGENCY EXPOSURE CONTROLS, RADIATION EXPOSURE MEASUREMENT, VISITOR EXPOSURE CONTROL, AIRBORNE CONTAMINATION, HIGHLY TOXIC MATERIALS, SURFACE CONTAMINATION, AND INTERNAL DEPOSITION MEASUREMENTS ARE DISCUSSED IN DETAIL.

292

HANFORD GROUNDWATER SCENARIO STUDIES

ARH-SA-292

ARNETT, R.C.; GEPHART, R.E.; DEJU, R.A.; COLE, C.H.; AHLSTROM, S.K.

770101

ATLANTIC RICHLAND HANFORD CO., RICHLAND, WA. 43 P.

ATLANTIC RICHLAND HANFORD CO.

K,1;K,2;K,5,B;K,5,D;K,5,J;K,5,L;K,7

TWO SCENARIOS WERE CREATED TO AID IN ACHIEVING THE FOLLOWING MANAGEMENT GOALS: IDENTIFY POTENTIAL WAYS GROUNDWATER AND HLW COME IN CONTACT; ASSESS DATA GATHERING AND COMPUTER MODELING REQUIREMENTS FOR LONG-TERM PREDICTION OF SURFACE MIGRATION OF HLW TO GROUNDWATER SYSTEMS; EXAMINE THE IMPACT TO THE HLW AREAS FROM OTHER HANFORD ACTIVITIES; AND IMPROVE THE MANAGEMENT OF THE HANFORD FLOW REGIME AND IDENTIFY METHOD OF CONTROLLING ACCIDENTAL RELEASES AND PREVENTING THESE RELEASES FROM INTERACTING WITH THE BIOSPHERE.

293

CONCEPTUAL AND MATHEMATICAL MODELING OF THE HANFORD GROUNDWATER FLOW REGIME

ARH-SI-140

ARNETT, R.C.; DEJU, R.A.; NELSON, R.W.; COLE, C.R.; GEPHART, R.E.

760202

ATLANTIC RICHLAND HANFORD CO., RICHLAND, WA. 103 P.

ATLANTIC RICHLAND HANFORD CO.

C,5;C,7;C,9

DERIVATION OF A MATHEMATICAL MODEL IS DISCUSSED, ALTHOUGH LITTLE SPECIFIC DATA IS PRESENTED, SOME GENERAL GEOLOGIC AND HYDROLOGIC INFORMATION IS GIVEN.

294

PLUTONIUM RELEASE STUDIES. IV. FRACTIONAL RELEASE FROM HEATING PLUTONIUM NITRATE SOLUTION IN A FLOWING AIR STREAM

BNWL-931

MISHIMA, J.; SCHWENDEMAN, L.C.; RADASH, C.A.

680101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 43 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

J,5;J,9

THE FRACTION OF PU RELEASED AS AN AEROSOL UPON HEATING SOLUTIONS OF PU NITRATE OR PU NITRATE RESIDUES WAS DETERMINED. ARRANGEMENTS AND HEATING REGIMES INVESTIGATED INCLUDE LOW TEMPERATURE AIR DRYING OF SHALLOW POOLS OF CONCENTRATED PU NITRATE SOLUTIONS, EVAPORATION OF WATER FROM A SMALL VESSEL CONTAINING PU NITRATE AT DIFFERENT VAPOR RATES, AND HEATING SOLIDS REMAINING AFTER EVAPORATION OF SHALLOW POOLS OF PU NITRATE TO NEAR DRYNESS.

296

RADIOLOGICAL EVALUATIONS FOR ADVANCED WASTE MANAGEMENT STUDIES

BNWL-1764

DENHAM, D.H.; BAKER, D.A.; SOLDAT, J.K.; CORLEY, J.P.
730101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 79 P.
BATTELLE, PACIFIC NORTHWEST LABORATORIES
C,5;C,9;K,5;K,9;L,5;L,9

THIS REPORT DESCRIBES THE METHODS, ASSUMPTIONS, AND PARAMETERS THAT APPLY TO EVALUATION RADIATION DOSES FOR WASTE MANAGEMENT STUDIES. A COMPREHENSIVE DOSE COMPUTATIONAL MODEL, DEVELOPED AND USED FOR OTHER AEC STUDIES, HAS BEEN ADOPTED TO IMPROVE FLEXIBILITY AND TO ASSIST IN EVALUATING ALTERNATIVE MEANS FOR DISPOSAL OF HLW. TYPICAL INPUT TERMS FOR NORMAL USE INCLUDE SOURCE TERMS AND DILUTION FACTORS.

297

PROBABILISTIC RISK ANALYSIS OF NUCLEAR SYSTEMS

BNWL-1846

SMITH, T.H.

740101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 43 P.
BATTELLE, PACIFIC NORTHWEST LABORATORIES

C,1;C,2;C,3;C,5;C,9;L,1;L,2;L,3;L,5;N,1;N,2;N,3;N,5;O,1;O,2;O,3;
L,5

EVALUATION OF EVENT FREQUENCY AND SEVERITY, AND OF DISPERSED RADIONUCLIDES REQUIRES TREATMENT OF SEVERAL PROBABILITY SPECTRA BECAUSE INITIATING EVENTS VARY IN SEVERITY AND RELEASES VARY IN QUANTITY AND RATE. THE REPORT STRESSES THE NEED FOR INCLUDING PROBABILISTIC CONSIDERATIONS IN NUCLEAR RA. ALTHOUGH REPORT FINDINGS' POTENTIAL APPLICATION IS GENERAL, CERTAIN ASPECTS OF THE TREATMENT ARE OF SPECIAL INTEREST FOR STUDIES OF TRANSPORTATION AND WASTE MANAGEMENT. SPECIAL EFFORT IS DIRECTED TOWARD AN APPROACH COMPATIBLE WITH EXISTING FAULT TREE AND RADIONUCLIDE TRANSPORT METHODOLOGY. CALCULATED ACCIDENT FREQUENCIES AND RELEASE QUANTITIES, INCLUDING FREQUENCY DISTRIBUTIONS OF THE MOST IMPORTANT PARAMETERS, ARE WEIGHTED TO GIVE A MEASURE OF RISK. WAYS ARE DISCUSSED OF SIMPLIFYING THE COMPLETE EQUATIONS INTO MORE READILY USABLE FORMS FOR PRELIMINARY STUDIES.

298

METHODOLOGY FOR CALCULATION OF RADIATION DOSES IN THE ENVIRONS FROM NUCLEAR FUEL CYCLE FACILITIES

BNWL-2075

SOLDAT, J.K.

760101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA.
BATTELLE, PACIFIC NORTHWEST LABORATORIES

C,4;C,5,B;C,5,D;C,5,J;C,5,L

COMPARISON OF THE IMPACTS OF VARIOUS NUCLEAR FUEL CYCLE ALTERNATIVES INCLUDES THE EVALUATION OF THE RADIOLOGICAL IMPACTS, TO EVALUATE THE RADIOLOGICAL IMPACTS OF THE FUEL CYCLE ALTERNATIVES, EXPOSURE TO MAN MUST FIRST BE IDENTIFIED. THE PATHWAYS OF CONSEQUENCE BY WHICH MAN CAN BE EXPOSED TO RADIATION FROM A NUCLEAR FACILITY ARE LISTED AND ARE GROUPED INTO THOSE ASSOCIATED WITH GASEOUS EFFLUENTS, LIQUID EFFLUENTS, DIRECT EXPOSURE FROM FACILITY, OR FROM TRANSPORTATION OF RADIOACTIVE MATERIALS TO OR FROM THE FACILITY. CALCULATIONS FOR EACH PATHWAY WERE MADE FOR THOSE SELECTED ORGANS WHICH COULD POTENTIALLY RECEIVE THE HIGHEST RADIATION DOSE. SOME OF THE PROGRAMS DEVELOPED FOR CALCULATING RADIATION DOSES FROM RADIONUCLIDES IN THE ENVIRONMENT ARE DESCRIBED.

299

ACORN: A COMPUTER PROGRAM FOR PLOTTING FAULT TREES

BNWL-2144

CARTER, J.L.

770101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 48 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

C,1;C,3

A DESCRIPTION AND USER'S INSTRUCTIONS ARE PRESENTED FOR ACORN, A FORTRAN COMPUTER PROGRAM FOR DRAWING FAULT TREES. ACORN PROVIDES INPUT DATA CHECKING, A PRINTER PLOT OF THE FAULT TREE, AND PLOTTING DATA FOR A CALCOMP MODEL 763 PLOTTER. THE PROGRAM IS OPERATIONAL ON A CONTROL DATA CYBER 74.

300

MFAULT: A COMPUTER PROGRAM FOR ANALYZING FAULT TREES

BNWL-2145

PELTO, P.J.; PURCELL, W.L.

770101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 58 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

C,1;C,3;C,9

A DESCRIPTION AND USER INSTRUCTIONS ARE PRESENTED FOR MFAULT, A FORTRAN COMPUTER PROGRAM FOR FAULT TREE ANALYSIS. MFAULT IDENTIFIES THE CUT SETS OF A FAULT TREE, CALCULATES THEIR PROBABILITIES, AND SCREENS THE CUT SETS ON THE BASIS OF SPECIFIED CUT-OFFS ON THE PROBABILITY AND/OR CUT SET LENGTH. THE CODE IS PRESENTLY CAPABLE OF FINDING UP TO 10 EVENT CUT SETS FROM A FAULT TREE WITH UP TO 512 BASIC EVENTS AND 400 GATES. IT IS OPERATIONAL ON THE CONTROL DATA CYBER 74 COMPUTER.

301

RAFT: A COMPUTER PROGRAM FOR FAULT TREE RISK CALCULATIONS

BNWL-2146

SEYBOLD, G.D.

770101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 67 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

C,1;C,3;C,4;C,5

A DESCRIPTION AND USER INSTRUCTIONS ARE PRESENTED FOR RAFT, A FORTRAN COMPUTER CODE FOR CALCULATION OF A RISK MEASURE FOR FAULT TREE CUT SETS. RAFT CALCULATES RELEASE QUANTITIES AND A RISK MEASURE BASED ON THE PRODUCT OF PROBABILITY AND RELEASE QUANTITY FOR CUT SETS OF FAULT TREES MODELING THE ACCIDENTAL RELEASE OF RADIOACTIVE MATERIAL FROM A NUCLEAR FUEL CYCLE FACILITY.

302

REVIEW OF CALCULATIONAL MODELS AND COMPUTER CODES FOR

ENVIRONMENTAL DOSE ASSESSMENT OF RADIOACTIVE RELEASES

BNWL-B-454

STRENGE, D.L.; WATSON, E.C.; DROPPU, J.G.

760101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 65 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

C,1;C,2;C,4;C,5

THE DEVELOPMENT OF TECHNOLOGICAL BASIS FOR SITING NUCLEAR FUEL CYCLE FACILITIES REQUIRES CALCULATIONAL MODELS AND COMPUTER CODES FOR THE EVALUATION OF RISKS AND THE ASSESSMENT OF ENVIRONMENTAL IMPACT OF RADIOACTIVE EFFLUENTS. A LITERATURE SEARCH AND REVIEW OF AVAILABLE COMPUTER PROGRAMS REVEALED THAT NO ONE PROGRAM WAS CAPABLE OF PERFORMING ALL OF THE GREAT VARIETY OF CALCULATIONS (I.E. EXTERNAL DOSE, INTERNAL DOSE, POPULATION DOSE, CHRONIC RELEASE, ACCIDENTAL RELEASE, ETC.). AVAILABLE LITERATURE ON EXISTING COMPUTER PROGRAMS HAS BEEN REVIEWED AND A DESCRIPTION OF EACH PROGRAM REVIEWED IS GIVEN.

304

ABOVE-GROUND STORAGE FACILITIES FOR VITRIFIED HIGHLY ACTIVE WASTES

BNWL-TR-189

AZAMAEVA, L.G.; KONDRAT'AV, A.N.; KRYUKOV, I.I.; KULICHENKO, V.V.; MARTYNOV, Y.P.

760101

ADDIS TRANSLATION INTERNATIONAL, FOR BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 22 P.

V.G. KHLUPIN RADIUM INSTITUTE, LENINGRAD

K,1;N,1

TWO TYPES OF STORAGE FACILITIES FOR HIGHLY ACTIVE VITRIFIED WASTES ARE EXAMINED: THOSE WITH AIR COOLING AND THOSE WITH WATER COOLING OF THE SOLIDIFIED WASTES. THERMOPHYSICAL CALCULATIONS ARE PRESENTED. THE DESIGNS OF STORAGE FACILITIES FOR VITRIFIED WASTES FROM A REPROCESSING PLANT AND AN ECONOMIC COMPARISON OF THE ALTERNATIVES CONSIDERED ARE PRESENTED.

305

A MULTI-ATTRIBUTE ANALYSIS OF RADIATION PROTECTION CHOICES.
A METHODOLOGICAL APPROACH IN THE CASE OF RADIOACTIVE
RELEASES FROM U.S. NUCLEAR PLANTS.

CEA-R-5086

LOMBARD, J.; OUDIZ, A.

610101

ASSOCIATION EURATOM-CEA, FONTENAY-AUX-ROSES. 117 P.

C,1;C,3;C,4;C,5;C,8

IN THE FIELD OF PWR FUEL CYCLE THE AUTHORS USE OF
MULTI-ATTRIBUTE ANALYSIS TO OPTIMIZE RADIATION PROTECTION. THIS
STUDY PROCEEDS FROM A METHODOLOGICAL POINT OF VIEW AND DATA HAVE
BEEN TAKEN FROM A U.S. EPA STUDY. THE MULTI-ATTRIBUTE ANALYSIS,
CALLED ELECTRE 1, INCLUDES TWO DISTINCT PHASES. THE FIRST ONE
GIVES A SEGMENTATION OF THE 39 EFFLUENT CONTROL OPTIONS, WHICH
MAY BE APPLIED IN THE FUEL CYCLE PLANTS, IN SIX SUB-GROUPS OR
KERNELS. SUCH A CLASSIFICATION ALLOWS FOR A FIRST REDUCTION OF
THE DECISION PROBLEM AND GIVES A RANKING OF THE SUB-GROUPS. IN
ORDER TO SEPARATE BETWEEN THE OPTIONS OF A SUB-GROUP ANOTHER
PROCEDURE IS USED. THIS SECOND PHASE INTRODUCES WEIGHT OF THE
CRITERIA. THE ADOPTED CRITERIA ARE: OPTION'S COST, AVOIDED
COLLECTIVE RISK, AVOIDED INDIVIDUAL RISK, AND A DATA RELATIVE
UNCERTAINTY INDICATOR. FOLLOWING THIS SECOND STEP WE ARE ABLE TO
SELECT FROM THE 39 OPTIONS 19 LEADING TO ALARA LEVELS. THE FINAL
RANKING SUGGESTS THE SYNTHETIC CHARACTER OF THE METHOD USED
WHICH PERMITS TO REFER SIMULTANEOUSLY TO THE INDIVIDUAL APPROACH
AND THE COLLECTIVE ONE.

306

FROM ACCEPTABLE RISK TO REGULATIONS

CUED-F-CAMS-TR-191

WATSON, S.R.

790101

NTIS. 16 P.

CAMBRIDGE UNIV.

C,3;C,4;C,5;P,3;P,4;P,5

THIS PAPER IS CONCERNED WITH SOME OF THE PROBLEMS THAT
ARISE IN REGULATING RISKY ACTIVITIES SUCH AS NUCLEAR WASTE
MANAGEMENT. AFTER A DISCUSSION OF THE MEASUREMENT AND EVALUATION
OF RISK, THE DIFFERENCE BETWEEN PERFORMANCE-BASED REGULATIONS IS
DISCUSSED, AND HOW THIS DISTINCTION AFFECTS THE MANAGEMENT OF
RISK. IT IS DEMONSTRATED THAT REQUIREMENTS-BASED REGULATIONS
WHILE BEING EASIER TO IMPLEMENT, ARE INEFFICIENT.

307

CALCULATED RADIATION DOSES FROM DEPOSITION OF MATERIAL
RELEASED IN HYPOTHETICAL TRANSPORTATION ACCIDENTS
INVOLVING WIPP-RELATED RADIOACTIVE WASTES

DOE/AL/10752-2

CHANNELL, J.K.

801001

U.S.DOE, WASHINGTON, DC, 70 P.

NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT

C,1;C,5;O,2;O,3;O,5,B;O,8;O,9;O,0,B

A SEVERE TRANSPORTATION ACCIDENT RESULTING IN THE RELEASE OF RADIOACTIVE MATERIAL DURING WIPP SITE OPERATION IS UNLIKELY, BUT POSSIBLE. RADIOACTIVE MATERIAL DEPOSITED ON THE GROUND FOLLOWING AN ACCIDENT COULD DELIVER A RADIATION DOSE TO PEOPLE FROM THE FOLLOWING PATHWAYS: (1) INGESTION OF CONTAMINATED FOOD, MILK OR WATER; (2) INHALATION OF DEPOSITED MATERIAL THAT IS RESUSPENDED; (3) EXTERNAL RADIATION FROM MATERIAL REMAINING NEAR THE SURFACE. THE TOTAL DOSE FROM THESE PATHWAYS MAY OCCUR OVER A PERIOD OF MANY YRS. THIS REPORT PRESENTS THE RESULTS OF AN ANALYSIS THAT ESTIMATES THE MAXIMUM SHORT-TERM (FIRST YR) AND LIFETIME (70 YRS) DOSES THAT EXPOSED INDIVIDUALS MIGHT RECEIVE. ALSO, THE EXPECTED REDUCTION OF THESE DOSES BY PROTECTIVE ACTIONS WAS ALSO CONSIDERED.

308

GEOTECHNICAL CONSIDERATIONS FOR RADIOLOGICAL HAZARD

ASSESSMENT OF WIPP: A REPORT OF A MEETING HELD ON

JANUARY 17-18, 1980

DOE/AL/10752-6

NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT

800101

NTIS. 76 P.

L,1;L,2;L,5;L,7

SUMMARY REPORTS FROM A MEETING OF THE ENVIRONMENTAL EVALUATION GROUP ON GEOLOGIC AND HYDROLOGIC MECHANISMS WHICH MIGHT LEAD TO THE RELEASE OF RADIONUCLIDES FROM THE WIPP REPOSITORY ARE PRESENTED. THE FOLLOWING TOPICS ARE DISCUSSED: GROUNDWATER HYDROLOGY, DEEP DISSOLUTION AND BRECCIA PIPES; BRINE RESERVOIRS; FAULTS, DIKES, FOLDS, AND DIAPYCNIC STRUCTURES; AND HUMAN INTRUSION.

309

WIPP SITE AND VICINITY GEOLOGICAL FIELD TRIP

DOE/AL/10752-7

CHATURVEDI, L.

800101

NTIS. 162 P.

NEW MEXICO ENVIRONMENTAL IMPROVEMENT AGENCY

L,1;L,2;L,7

THE ENVIRONMENTAL EVALUATION GROUP IS CONDUCTING AN ASSESSMENT OF THE RADIOLOGICAL HEALTH RISKS TO PEOPLE FROM WIPP. AS A PART OF THIS WORK, EEG IS MAKING AN EFFORT TO IMPROVE THE UNDERSTANDING OF THOSE GEOLOGICAL ISSUES CONCERNING THE WIPP SITE WHICH MAY AFFECT THE RADIOLOGICAL CONSEQUENCES OF THE

PROPOSED REPOSITORY, FROM THIS FIELD TRIP, EEC FORMULATED THE FOLLOWING CONCLUSIONS: IT HAS NOT BEEN CLEARLY ESTABLISHED THAT THE SITE OR THE SURROUNDING AREA HAS BEEN ATTACKED BY DEEP DISSOLUTION TO RENDER IT UNSUITABLE FOR THE NUCLEAR WASTE PILOT REPOSITORY; THE EXISTENCE OF AN ISOLATED BRECCIA PIPE AT THE SITE UNACCOMPANIED BY A DEEP DISSOLUTION WEDGE, IS A VERY REMOTE POSSIBILITY; MORE SPECIFIC INFO ABOUT THE ORIGIN AND THE NATURE OF THE BRINE RESERVOIRS IS NEEDED. OTHER IMPORTANT GEOLOGIC ISSUES WERE ALSO CONSIDERED.

310

ENVIRONMENTAL DEVELOPMENT PLAN: DEFENSE WASTE MANAGEMENT

DOE/EDP-0064

U.S. DOE

800101

NTIS. 147 P.

K,1;K,5,C;K,5,D;L,1;L,5,C;L,5,D

THIS EDP ENCOMPASSES THE PROGRAMMATIC AND ENVIRONMENTAL, HEALTH AND SAFETY CONSIDERATIONS ASSOCIATED WITH THE HANDLING OF DOE WASTES GENERATED PRIMARILY AS A BYPRODUCT OF THE DOE NATIONAL DEFENSE PROGRAMS. THE DEFENSE WASTE MANAGEMENT PROGRAM AND THE COMMERCIAL WASTE MANAGEMENT (CWM) PROGRAM DEAL WITH SIMILAR TECHNOLOGIES PERTAINING TO WASTE PROCESSING, IMMOBILIZATION, PACKAGING, BURIAL, AND DISPOSAL. HOWEVER, COMMERCIAL WASTE ACTIVITIES ARE ADDRESSED IN A SEPARATE EDP AND ARE CONSIDERED IN THIS EDP TO THE EXTENT THAT SUCH ACTIVITIES ARE COMMON TO THE DWM PROGRAM. THIS PLAN DOES NOT ADDRESS MINING AND MILLING TAILS, TRANSPORTATION OF WASTES, D & D PROGRAMS OR SAFEGUARDS, SECURITY, AND PROLIFERATION ASPECTS.

311

ENVIRONMENT, SAFETY, HEALTH AT DOE FACILITIES. ANNUAL

REPORT, FISCAL YEAR 1980

DOE/ER-0024

U.S. DOE, ASSISTANT SECRETARY FOR ENVIRONMENTAL PROTECTION,
SAFETY AND EMERGENCY PREPAREDNESS

810101

NTIS. 98 P.

P,4;P,5;P,6;P,9

DOE'S OCCUPATIONAL SAFETY AND PROPERTY PROTECTION PERFORMANCE IN FY '80 WAS EXCELLENT IN ALL REPORTED CATEGORIES WITH LOSS RATES GENERALLY LESS THAN 1/3 OF COMPARABLE INDUSTRY FIGURES. DOE'S FISCAL YR '80 INCIDENCE RATE PER 200,000 WORK HRS WAS 1.1 LOST WORKDAY CASES AND 18.2 LOST WORKDAYS COMPARED TO 1.1 LOST WORKDAY CASES AND 17.2 LOST WORKDAYS DURING FY '79. THE RECORDED OCCUPATIONAL ILLNESS RATE, BASED ON ONLY 70 CASES, WAS 0.05 CASES PER 200,000 WORK HRS COMPARED TO 0.06 CASES PER 200,000 WORK HRS FOR FY '79. TEN FATALITIES INVOLVING FEDERAL OR CONTRACTOR EMPLOYEES OCCURRED IN FY '80 COMPARED TO 9 FOR FY '79. OTHER COMPARABLE STATISTICS ARE GIVEN.

312

TECHNOLOGY FOR COMMERCIAL RADIOACTIVE WASTE MANAGEMENT
DOE/ET-0028, VOL. 1

BATTELLE, PACIFIC NORTHWEST LABORATORIES
790101

NTIS. 250 P.

K,1;K,2;K,3;K,4,A;K,4,C;K,4,I;K,4,K;K,5,B;K,5,D;K,5,J;K,5,L;K,7;
K,9;L,1;L,2;L,3;L,4,A;L,4,C;L,4,I;L,4,K;L,5,B;L,5,D;L,5,J;L,
5,L;L,7;L,9;M,1;M,2;M,3;M,4,A;M,4,C;M,4,I;M,4,K;M,5,B;M,5,D;
M,5,J;M,5,L;M,7;M,9;N,1;N,2;N,3;N,4,A;N,4,C;N,4,I;N,4,K;N,5,
B;N,5,D;N,5,J;N,5,L;N,7;N,9; O,1;O,2;O,3;O,4,A;O,4,C;O,4,I;
O,4,K;O,5,B;O,5,D;O,5,J;O,5,L;O,7;O,0

THE SCOPE OF THIS REPORT IS LIMITED TO TECHNOLOGY FOR
MANAGEMENT OF FAST-FISSION WASTES PRODUCED IN THE COMMERCIAL
NUCLEAR POWER LWR FUEL CYCLE. MANAGEMENT OF SPENT FUEL (AS A
WASTE), HIGH-LEVEL AND OTHER TRANSURANIC WASTES, AND GASEOUS
WASTES ARE CHARACTERIZED. NON-TRANSURANIC WASTES ARE DESCRIBED,
BUT MANAGEMENT OF THESE WASTES, EXCEPT FOR GASEOUS WASTES, IS
EXCLUDED FROM THE SCOPE OF THIS REPORT. VOL. 1 CONTAINS THE
SUMMARY AND THE BASES AND BACKGROUND INFORMATION.

313

TECHNOLOGY FOR COMMERCIAL RADIOACTIVE WASTE MANAGEMENT
DOE/ET-0028, VOL. 2

BATTELLE, PACIFIC NORTHWEST LABORATORIES
790101

NTIS. 550 P.

J,1;K,1;L,1;M,1;N,1;O,1

CONCEPTUAL PROCESSES AND FACILITIES FOR TREATING GASEOUS
AND VARIOUS TRU WASTES PRODUCED DURING THE FAST FISSION PORTION
OF THE LWR FUEL CYCLE ARE DESCRIBED IN VOL. 2. THE GOAL OF THE
TREATMENT PROCESS FOR TRU WASTES AND FOR LONG-LIVED
RADIONUCLIDES REMOVED FROM THE GASEOUS WASTE STREAMS IS TO
CONVERT THESE WASTES TO STABLE PRODUCTS SUITABLE FOR PLACEMENT
IN GEOLOGIC ISOLATION REPOSITORIES. THE TREATMENT CONCEPTS ARE
BASED ON AVAILABLE TECHNOLOGY. IN ACTUAL APPLICATIONS IT IS
REASONABLE TO EXPECT THAT THERE COULD BE SOME IMPROVEMENT OVER
THESE CONCEPTS THAT MIGHT BE REFLECTED IN EITHER LOWER COSTS OR
LOWER ENVIRONMENTAL IMPACTS OR BOTH. THE WASTE TREATMENT
TECHNOLOGIES CONSIDERED INCLUDE: HLW SOLIDIFICATION, PACKAGING
OF FUEL RESIDUE, FAILED EQUIPMENT AND NONCOMBUSTIBLE WASTE
TREATMENT, GENERAL TRASH AND COMBUSTIBLE WASTE TREATMENT,
DEGRADED SOLVENT TREATMENT, DILUTE AQUEOUS WASTE PRETREATMENT,
IMMOBILIZATION OF WET AND SOLID WASTES, OFF-GAS PARTICLE REMOVAL
SYSTEMS, FUEL REPROCESSING PLANT DISSOLVER OFF-GAS TREATMENT,
PROCESS OFF-GAS TREATMENT, AND FUEL REPROCESSING PLANT
ATMOSPHERIC PROTECTION SYSTEM.

314

TECHNOLOGY FOR COMMERCIAL RADIOACTIVE WASTE MANAGEMENT

DOE/ET-0028, VOL. 3

BATTELLE, PACIFIC NORTHWEST LABORATORIES

790101

NTIS. 400 P.

K,1;M,1;N,1

CONCEPTUAL FACILITIES FOR INTERIM STORAGE OF VARIOUS TREATED TRU AND GASEOUS WASTES PRODUCED DURING FUEL REPROCESSING AND MIXED OXIDE FUEL FABRICATION ARE DESCRIBED IN VOL. 3. ALTERNATIVES FOR INTERIM STORAGE OF SPENT FUEL PRIOR TO REPROCESSING OR GEOLOGIC ISOLATION ARE ALSO DESCRIBED. SECTIONS ARE DEVOTED TO: STORAGE OF HIGH-LEVEL LIQUID WASTE IN LARGE STAINLESS STEEL TANKS; TWO INTERIM STORAGE CONCEPTS FOR FUEL RESIDUE WASTE STORAGE; STORAGE CONCEPTS FOR OTHER NON-HIGH-LEVEL TRU WASTE; TWO ALTERNATIVES FOR STORAGE OF SOLIDIFIED HIGH-LEVEL WASTE; CONCEPTUAL STORAGE FOR LARGE QUANTITIES OF PLUTONIUM OXIDE; A CONCEPT FOR STORING KRYPTON GAS CYLINDERS; AND ALTERNATIVES FOR BOTH SHORT-TERM AND EXTENDED STORAGE OF SPENT FUEL.

315

TECHNOLOGY FOR COMMERCIAL RADIOACTIVE WASTE MANAGEMENT

DOE/ET-0028, VOL. 4

BATTELLE, PACIFIC NORTHWEST LABORATORIES

790101

NTIS. 550 P.

O,1;O,2;L,1;L,5;L,7;P,9

TRANSPORTATION IS DESCRIBED IN VOL. 4 FOR WASTES GENERATED IN THREE FUEL CYCLE OPTIONS: ONCE-THROUGH FUEL CYCLE, URANIUM RECYCLE ONLY, AND RECYCLE OF U AND PU. THE GEOLOGIC CONSIDERATIONS ESSENTIAL FOR REPOSITORY SELECTION, THE NATURE OF GEOLOGIC FORMATIONS THAT ARE POTENTIAL REPOSITORY MEDIA, THE THERMAL CRITERIA FOR WASTE PLACEMENT IN GEOLOGIC REPOSITORIES, AND CONCEPTUAL REPOSITORIES IN FOUR DIFFERENT GEOLOGIC MEDIA ARE DESCRIBED. THIS STUDY PRESENTS DATA CHARACTERIZING WASTES FROM PREBREEDER LIGHT WATER BREEDER REACTORS USING THORIUM AND SLIGHTLY ENRICHED U-235. THE PREBREEDER LWBRs ARE ESSENTIALLY LWRS USING THORIUM. THE OPERATION OF HTGR AND LWBR CYCLES ARE CONCEPTUALLY DESIGNED, AND WASTES PRODUCED IN THESE CYCLES ARE COMPARED FOR POTENTIAL DIFFERENCES.

316

TECHNOLOGY FOR COMMERCIAL RADIOACTIVE WASTE MANAGEMENT

DOE/ET-0028, VOL. 5

BATTELLE, PACIFIC NORTHWEST LABORATORIES

790101

NTIS. 575 P.

K,1;K,2;K,3;K,4,A;K,4,C;K,4,I;K,4,K;K,5,B;K,5,D;K,5,J;K,5,L; K,7;
K,9;L,1;L,2;L,3;L,4,A;L,4,C;L,4,I;L,4,K;L,5,B;L,5,D;L,5,J;L,

5,L;L,7;L,9;M,1;M,2;M,3;M,4,A;M,4,C;M,4,I;M,4,K;M,5,B;M,5,D;
M,5,J;M,5,L;M,7;M,9;N,1;N,2;N,3;N,4,A;N,4,C;N,4,I;N,4,K;N,5,
B;N,5,D;N,5,J;N,5,L;N,7;N,9; O,1;O,2;O,3;O,4,A;O,4,C;O,4,I;
O,4,K;O,5,B;O,5,D;O,5,J;O,5,L;O,7;O,9

IN VOL. 5 AN ANALYSIS OF THE COMPLETE WASTE MANAGEMENT SYSTEM WAS DEVELOPED TO ASSESS THE TOTAL IMPACT OF MANAGING RADWASTE GENERATED OVER THE ENTIRE LIFETIME OF A NUCLEAR POWER SYSTEM. THE ANALYSIS CONSIDERES TREATMENT AND DISPOSAL OF ALL POST-FISSION TRU, GASEOUS AND AIRBORNE AND DECOMMISSIONING WASTES. EACH RADIOACTIVE WASTE STREAM IS TRACKED EACH YEAR FROM ITS ORIGIN THROUGH TREATMENT, STORAGE, TRANSPORT, AND ACCUMULATION IN A GEOLOGIC REPOSITORY. THE SYSTEM OPERATION DESCRIBED ENCOMPASSES A 101-YR PERIOD FROM 1975 THROUGH 2075. IN ADDITION, THE DECAY OF RADIOACTIVITY IN THE FINAL REPOSITORIES IS FOLLOWED OVER A MILLION YR PERIOD.

317

ENVIRONMENTAL ASPECTS OF COMMERCIAL RADIOACTIVE WASTE
MANAGEMENT

DOE/ET-0029, VOL. 1

BATTELLE, PACIFIC NORTHWEST LABORATORIES

790101

NTIS. 587 P.

C,2;C,5;C,7;C,8;C,9;I,2;I,5;I,7;I,8;I,9;J,2;J,5;J,7;J,8;J,9;M,2;
M,5;M,7;M,8;M,9;N,2;N,5;N,7;N,8;N,9;O,2;O,5;O,7;O,8;O,9;K,2;
K,5;K,7;K,8;K,9;L,2;L,5;L,7;L,8;L,9

ENVIRONMENTAL EFFECTS (INCLUDING ACCIDENTS) ASSOCIATED WITH FACILITY CONSTRUCTION, OPERATION, DECOMMISSIONING, AND TRANSPORTATION IN THE MANAGEMENT OF COMMERCIALLY GENERATED RADWASTE WERE ANALYZED FOR PLANTS AND SYSTEMS ASSUMING LWPR SCENARIO THAT PRODUCES ABOUT 10,000 GEW-YR THROUGH THE YR 2050. THE FOLLOWING ALTERNATIVE FUEL CYCLE MODES OR CASES THAT GENERATE POST-FISSION WASTES REQUIRING MANAGEMENT WERE ANALYZED: A ONCE-THROUGH OPTION, A FUEL REPROCESSING OPTION FOR URANIUM-ONLY RECYCLE. VOL. 1 COMPRISES OF 5 CHAPTERS: INTRO; SUMMARY OF FINDINGS; APPROACH TO ASSESSMENT OF ENVIRONMENTAL EFFECTS RELATED TO RADIOACTIVE MANAGEMENT IN A ONCE-THROUGH FUEL CYCLE; AND ENVIRONMENTAL EFFECTS OF RADIOACTIVE WASTE MANAGEMENT ASSOCIATED WITH LWR FUEL REPROCESSING PLANT.

318

ENVIRONMENTAL ASPECTS OF COMMERCIAL RADIOACTIVE WASTE
MANAGEMENT

DOE/ET-0029, VOL. 2

BATTELLE, PACIFIC NORTHWEST LABORATORIES

790101

NTIS. 492 P.

C,2;C,5;C,7;C,8;C,9;I,2;I,5;I,7;I,8;I,9; J,2;J,5;J,7;J,8;J,9;M,2;
M,5;M,7;M,8;M,9;N,2;N,5;N,7;N,8;N,9;O,2;O,5;O,7;O,8;O,9;K,2;
K,5;K,7;K,8;K,9;L,2;L,5;L,7;L,8;L,9

VOL. 2 CONTAINS CHAPTERS 6-10: ENVIRONMENTAL EFFECTS RELATED TO RADWASTE MANAGEMENT ASSOCIATED WITH LWR FUEL REPROCESSING - MIXED-OXIDE FUEL FABRICATION PLANT; ENVIRONMENTAL EFFECTS RELATED TO TRANSPORTING RADIOACTIVE WASTES ASSOCIATED WITH LWR FUEL REPROCESSING AND FABRICATION; ENVIRONMENTAL EFFECTS RELATED TO RADWASTE MANAGEMENT ASSOCIATED WITH LWR FUEL REPROCESSING - RELIEVABLE WASTE STORAGE FACILITY; ENVIRONMENTAL EFFECTS RELATED TO GEOLOGIC ISOLATION OF LWR FUEL REPROCESSING WASTES; AND INTEGRATED SYSTEMS FOR COMMERCIAL RADIOACTIVE WASTE MANAGEMENT.

319

ENVIRONMENTAL ASPECTS OF COMMERCIAL RADIOACTIVE WASTE MANAGEMENT

DOE/ET/0029, VOL. 3

BATTTELLE, PACIFIC NORTHWEST LABORATORIES

790101

NTIS. 330 P.

C,2;C,5;C,7;C,8;C,9;I,2;I,5;I,7;I,8;I,9;J,2;J,5;J,7;J,8;J,9;M,2;M,5;M,7;M,8;M,9;N,2;N,5;N,7;N,8;N,9;O,2;O,5;O,7;O,8;O,9;K,2;K,5;K,7;K,8;K,9;L,2;L,5;L,7;L,8;L,9

VOL. 3 CONTAINS 8 APPENDICES: A REFERENCE ENVIRONMENT FOR ASSESSING IMPACTS ASSOCIATED WITH CONSTRUCTION AND OPERATION OF WASTE TREATMENT, INTERIM STORAGE AND/OR FINAL DEPOSITION FACILITIES; DOSE CALCULATIONS AND SOCIOECONOMIC IA; RELEASE/DOSE FACTORS AND DOSE IN 5-YR INTERVALS TO REGIONAL AND WORLD WIDE POPULATIONS FROM REFERENCE INTEGRATED SYSTEMS; RESOURCE AVAILABILITY; ENVIRONMENTAL MONITORING; DETAILED DOSE RESULTS FOR RADIONUCLIDE MIGRATION GROUNDWATER FROM A WASTE REPOSITORY; AND ANNUAL AVERAGE DISPERSION FACTORS FOR SELECTED RELEASE POINTS.

320

ENVIRONMENTAL AND OTHER EVALUATIONS OF ALTERNATIVES FOR LONG-TERM MANAGEMENT OF STORED INEL TRANSURANIC WASTE

DOE/ET-0081 (REV.)

U.S. DOE, OFFICE OF NUCLEAR WASTE MANAGEMENT

791201

U.S. DOE, WASHINGTON, DC. 700 P.

U.S. DOE

K,1;K,2;K,4,A;K,4,C;K,4,G;K,5,D;K,7;K,9;K,0,A;K,0,C;K,0,D;K,0,G

THIS STUDY IDENTIFIES, DEVELOPS, AND EVALUATES, IN A PRELIMINARY MANNER, ALTERNATIVES FOR LONG-TERM MANAGEMENT OF TRU WASTE STORED AT THE RADIOACTIVE WASTE MANAGEMENT COMPLEX (RWMC) AT INEL. THE EVALUATIONS CONCERN WASTE CURRENTLY AT THE RWMC AND WASTE EXPECTED TO BE RECEIVED BY THE BEGINNING OF THE YR 1985. THE EFFECTS OF WASTE THAT MIGHT BE RECEIVED AFTER THAT DATE ARE ADDRESSED IN AN APPENDIX. THE TECHNOLOGY REQUIRED FOR MANAGING THE WASTE, THE ENVIRONMENTAL EFFECTS, THE RISKS TO THE PUBLIC, THE RADIOLOGICAL AND NONRADIOLOGICAL HAZARDS TO WORKERS, AND THE

ESTIMATED COSTS ARE DISCUSSED.

321

EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT SHIPPING
HIGH-LEVEL NUCLEAR WASTES

DOE/EV-0003

U.S. DOE, DIVISION OF ENVIRONMENTAL CONTROL TECHNOLOGY

780101

NTIS, 58 P.

U,110,2

DOE HAS GATHERED TOGETHER IN THIS DOCUMENT THE "MOST OFTEN ASKED" QUESTIONS, AND HAS FURNISHED DETAILED ANSWERS TO THEM. INDIVIDUAL ANSWERS ARE NOT NECESSARILY TOTALLY SELF-CONTAINED, AND IT MAY BE NECESSARY TO PUT SEVERAL OF THE ANSWERS TOGETHER IN ORDER TO OBTAIN A FULL PICTURE OF THE VARIOUS ASPECTS OF A PARTICULAR QUESTION. THE ANSWERS TO THE QUESTIONS THEN SERVE A DUAL PURPOSE - TO PROVIDE SPECIFIC INFO ON COMMONLY ASKED QUESTIONS, IN UNDERSTANDABLE TERMS, AND TO PRESENT THE COMPOSITE PARTS OF AN OVERALL PROGRAM ON JUST HOW THE WASTE WILL BE TRANSPORTED AND THE MANY RELATED FACTORS, ACCIDENT SITUATIONS ARE COVERED.

322

SHIPMENTS OF NUCLEAR FUEL AND WASTE: ARE THEY REALLY SAFE?

DOE/EV-0004

U.S. DOE

770101

U.S. DOE, WASHINGTON, DC. 13 P.

U.S. DOE

O,110,4,A;O,4,C;U,4,E;O,5,D;O,5,F;O,9;O,0,A;O,0,C;O,0,D;O,0,E;O,0,F

THE SAFETY ASPECTS OF SHIPPING NUCLEAR FUELS AND RADWASTE ARE DISCUSSED CONSIDERING: U.S. REGULATIONS ON THE SHIPMENT OF HAZARDOUS AND RADIOACTIVE MATERIALS, TYPES OF RADIOACTIVE WASTES; PACKAGING METHODS, MATERIALS, AND SPECIFICATIONS; DESIGN OF SHIPPING CONTAINERS; EVALUATION OF THE RISK POTENTIAL UNDER NORMAL SHIPPING CONDITIONS AND IN ACCIDENT SITUATIONS. IT IS CONCLUDED THAT: THE RISK OF PUBLIC CATASTROPHE HAS BEEN ELIMINATED BY STRICT STANDARDS, ENGINEERING DESIGN SAFETY, AND OPERATIONAL CARE; THE LONG-TERM PUBLIC BURDEN OF NOT TRANSPORTING NUCLEAR MATERIALS IS LIKELY TO BE HIGHER THAN THE RISKS OF CAREFULLY CONTROLLED TRANSPORTATION, CONSIDERING THE VARIOUS OPTIONS AVAILABLE; AND THE LIKELIHOOD OF DEATH, INJURY, OR SERIOUS PROPERTY DAMAGE FROM THE NUCLEAR ASPECTS OF NUCLEAR TRANSPORTATION IS THOUSANDS OF TIMES LESS THAN THE LIKELIHOOD OF DEATH, INJURY, OR SERIOUS PROPERTY DAMAGE FROM MORE COMMON HAZARDS, SUCH AS AUTOMOBILE AND BOATING ACCIDENTS, ACCIDENTAL POISONING, GUNSHOT WOUNDS, FIRES, OR EVEN FALLS.

323

ICPP INJECTION WELL ALTERNATIVE PROJECT, IDAHO NATIONAL
ENGINEERING LABORATORY, FINAL REPORT

DOE/ID/12115-T1

FLUOR ENGINEERS AND CONSTRUCTORS, INC.

800101

FLUOR ENGINEERS AND CONSTRUCTORS, INC., IRVINE, CA. 607 P.

FLUOR ENGINEERS AND CONSTRUCTORS, INC.

N,1;N,9;P,1;P,2;P,9

THE IDAHO CHEMICAL PROCESSING PLANT (ICPP) PORTION OF INEL HAS BEEN OBTAINING WATER NEEDED FOR ITS OPERATIONS FROM THE SNAKE RIVER AQUIFER, WHICH OCCUPIES THE ENTIRE REGION UNDERLYING THE SITE. MOST OF THIS WATER HAS BEEN USED FOR COOLING OPERATING EQUIPMENT, WHILE A SMALL PORTION HAS FOUND VARIOUS PROCESS USES. AFTER PASSING THROUGH THE ICPP PROCESS AREA, THESE WATERS ARE THEN RETURNED TO THE AQUIFER. A SMALL PORTION (ABOUT 1%) OF THE RETURNED STREAM CONTAINS MEASURABLE AMOUNTS OF RADIOACTIVITY DERIVED FROM THE MISCELLANEOUS PROCESS USERS. THIS REPORT AND THE RECOMMENDATIONS CONTAINED HEREIN ARE BASED UPON STREAM FLOWS PROJECTED FOR 1985 AS SUPPLIED BY DOE FOR THE ICPP. 26 DIFFERENT ALTERNATIVES FOR HANDLING COOLING WATER, CHEMICAL, AND LOW LEVEL RADIOACTIVE WATER DISPOSAL ARE EXAMINED. THESE CASES ARE CONSIDERED FROM TECHNICAL, ENVIRONMENTAL, SAFETY, AND ECONOMIC POINTS OF VIEW. THE LEVEL OF DETAIL IS SUFFICIENT TO ELIMINATE NON-VIABLE CASES, AND TO IDENTIFY THOSE WHICH OFFER IMPROVEMENTS OVER PRESENT PRACTICE. THE ENVIRONMENTAL/SAFETY RISK FACTORS WERE EVALUATED ON A QUALITATIVE COMPARISON BASIS ONLY. BEFORE A RECOMMENDED IMPROVEMENT IS INCORPORATED INTO THE WASTE DISPOSAL SYSTEM, A CONCEPTUAL DESIGN STUDY SHOULD BE MADE WHICH WOULD EVALUATE ALL THOSE SECONDARY EFFECTS AND ENVIRONMENTAL FACTORS THAT, BY THE VERY NATURE OF THE SCREENING PROCESS, THIS STUDY HAS NOT PROVIDED. CERTAIN SYNERGISTIC COMBINATIONS HAVE BEEN NOTED AND ARE DISCUSSED. THIS REPORT DOES NOTE WHETHER THE OPERATIONS CONSIDERED ARE IN REGULATORY COMPLIANCE, OR ARE LIKELY TO BE CAPABLE OF PROVIDING LASTING IMPROVEMENT TO THE WASTE WATER SYSTEM. QUALITATIVE COMPARISONS WERE MADE BETWEEN THE VARIOUS ALTERNATIVES TO CONFIRM THEIR RELATIONSHIP WITH APPLICABLE STANDARDS.

324

AREA 5 RADIOACTIVE WASTE MANAGEMENT SITE SAFETY ASSESSMENT
DOCUMENT

DOE/NV/00410-54

HORTON, K.K.; KENDALL, E.W.; BROWN, J.J.

800101

U.S. DOE, WASHINGTON, DC. 75 P.

REYNOLDS ELECTRICAL AND ENGINEERING CO., INC.

N,1;N,5;N,7;N,9

THE AREA 5 RADWASTE MANAGEMENT SAFETY ASSESSMENT DOCUMENT EVALUATES SITE CHARACTERISTICS, FACILITIES AND OPERATING PRACTICES WHICH CONTRIBUTE TO THE SAFE HANDLING AND

STORAGE/DISPOSAL OF RADWASTE AT THE NEVADA TEST SITE. PHYSICAL GEOGRAPHY, CULTURAL FACTORS, CLIMATE AND METEOROLOGY, GEOLOGY, HYDROLOGY (WITH EMPHASIS ON RADIONUCLIDE MIGRATION), ECOLOGY, NATURAL PHENOMENA, AND NATURAL RESOURCES ARE DISCUSSED AND DETERMINED TO BE SUITABLE FOR EFFECTIVE CONTAINMENT OF RADIONUCLIDES. ALSO CONSIDERED, AS A SEPARATE SECTION, ARE FACILITIES AND OPERATING PRACTICES SUCH AS MONITORING; STORAGE/DISPOSAL CRITERIA; SITE MAINTENANCE, EQUIPMENT, AND SUPPORT; TRANSPORTATION AND WASTE HANDLING; AND OTHERS WHICH ARE ADEQUATE FOR THE SAFE HANDLING AND STORAGE/DISPOSAL OF RADIOACTIVE WASTES. IN CONCLUSION, THE AREA 5 RADWASTE MANAGEMENT SITE IS SUITABLE FOR RADWASTE HANDLING AND STORAGE/DISPOSAL FOR A MAXIMUM OF 20 MORE YRS AT THE PRESENT RATE OF UTILIZATION.

325

PROPOSED WASTE ISOLATION PILOT PROJECT (WIPP) AND IMPACTS
IN THE STATE OF NEW MEXICO: A SOCIO-ECONOMIC ANALYSIS
DOE/TIC-1021731

CUMKINGS, R.D.; BURNES, H.S.; NORTON, R.D.

810101

NTIS. 371 P.

UNIV. OF NEW MEXICO

L,1;L,2;L,3;L,5;L,7;L,9

THIS IS THE FINAL REPORT FOR RESEARCH CONDUCTED CONCERNING THE SOCIO-ECONOMIC IMPACTS IN THE STATE OF NEW MEXICO THAT MIGHT ATTEND THE CONSTRUCTION AND OPERATION OF THE PROPOSED WIPP LOS MEDANOS SITE IN SE NM'S EDDY COUNTY, SOME 25 MI E OF CARLSBAD, NM. THE PURPOSE AS SET OUT IN THE DOE'S EIS IS FOR STORAGE OF TRU WASTE FROM THE U.S. DEFENSE PROGRAM AND THE CONSTRUCTION OF AN R & D AREA FOR EXPERIMENTS CONCERNING THE ISOLATION OF ALL TYPES OF NUCLEAR WASTE IN SALT. TO HELP ENSURE OBJECTIVITY, TWO ADVISORY BOARDS, TECHNICAL ADVISORY BOARD AND PUBLIC ADVISORY BOARD, WERE FORMED AT THE OUTSET OF THE PROJECT FOR THE PURPOSE OF PROVIDING PERIODIC REVIEWS OF RESEARCH EFFORTS.

326

ENGINEERING ASSESSMENT OF INACTIVE URANIUM MILL TAILINGS

DOE/UMT-0105

FORD, BACON AND DAVIS UTAH, INC.

810101

NTIS. 201 P.

E,1;E,2;E,5,B;E,5,D;E,5,J;E,5,L;E,7

THE GRAND JUNCTION SITE HAS BEEN REEVALUATED IN ORDER TO REVISE THE OCT. 1977 EA OF THE PROBLEMS RESULTING FROM THE EXISTENCE OF RADIOACTIVE U MILL TAILINGS THERE. THIS EA HAS INCLUDED THE PREPARATION OF TOPO MAPS, THE PERFORMANCE OF CORE DRILLINGS AND RADIOMETRIC MEASUREMENTS SUFFICIENT TO DETERMINE AREAS AND VOLUMES OF TAILINGS AND RADIATION EXPOSURES OF INDIVIDUALS AND NEARBY POPULATIONS. THE INVESTIGATIONS OF SITE

HYDROLOGY AND METEOROLOGY, AND THE EVALUATION AND COSTING OF ALTERNATIVE CORRECTIVE ACTIONS. RADON GAS RELEASED FROM THE 1.9 MILLION TONS OF TAILINGS AT THE GRAND JUNCTION SITE CONSTITUTES THE MOST SIGNIFICANT ENVIRONMENTAL IMPACT, ALTHOUGH WINDBLOWN TAILINGS AND EXTERNAL GAMMA RADIATION ARE ALSO FACTORS. EIGHT ALTERNATIVE ACTIONS ARE PRESENTED. REPROCESSING DOES NOT SEEM TO BE ECONOMICALLY FEASIBLE.

327

SUMMARY OF THE ENGINEERING ASSESSMENT OF INACTIVE URANIUM MILL TAILINGS, RIVERTON SITE, RIVERTON, WYOMING
DOE/UMT-0106S; FBDU-360-19S
FORD, BACON AND DAVIS UTAH, INC.
810101

NTIS. 57 P.

E,1;E,2;E,5,B;E,5,D;E,5,J;E,5,L;E,7

THE SITE HAS BEEN REEVALUATED IN ORDER TO REVISE THE DEC. 1977 EA OF THE PROBLEMS RESULTING FROM THE EXISTENCE OF RADIOACTIVE U MILL TAILINGS. RADON GAS RELEASED FROM THE 900,000 TONS OF TAILINGS MATERIALS AT THE RIVERTON SITE CONSTITUTES THE MOST SIGNIFICANT ENVIRONMENTAL IMPACT. REPROCESSING THE TAILINGS FOR U RECOVERY DOES NOT APPEAR TO BE ECONOMICALLY ATTRACTIVE. SEE ACN=326.

328

ENGINEERING ASSESSMENT OF INACTIVE URANIUM MILL TAILINGS:
MONUMENT VALLEY SITE, MONUMENT VALLEY, ARIZONA
DOE/UMT-0117
FORD, BACON AND DAVIS UTAH, INC.
810101

NTIS. 214 P.

E,1;E,2;E,5,B;E,5,D;E,5,J;E,5,L;E,7

THE MONUMENT VALLEY SITE HAS BEEN REEVALUATED IN ORDER TO REVISE THE MARCH 1977 ENGINEERING ASSESSMENT OF THE PROBLEMS RESULTING FROM THE EXISTENCE OF RADIOACTIVE U MILL TAILINGS. THIS ENGINEERING ASSESSMENT HAS INCLUDED THE PREPARATION OF TOPOGRAPHIC MAPS, THE PERFORMANCE OF CORE DRILLINGS AND RADIOMETRIC MEASUREMENTS SUFFICIENT TO DETERMINE AREAS AND VOLUMES OF TAILINGS AND RADIATION EXPOSURES OF INDIVIDUALS AND NEARBY POPULATIONS, THE INVESTIGATIONS OF SITE HYDROLOGY AND METEOROLOGY, AND THE EVALUATION AND COSTING OF ALTERNATIVE CORRECTIVE ACTIONS. RADON GAS RELEASED FROM THE 1.1 MILLION TONS OF TAILINGS AT THE MONUMENT VALLEY SITE CONSTITUTES THE MOST SIGNIFICANT ENVIRONMENTAL IMPACT, ALTHOUGH WINDBLOWN TAILINGS AND EXTERNAL GAMMA RADIATION ALSO ARE FACTORS. THE FOUR ALTERNATIVE ACTIONS PRESENTED IN THIS ENGINEERING ASSESSMENT RANGE FROM MILLSITE DECONTAMINATION WITH THE ADDITION OF 3 M OF STABILIZATION COVER MATERIAL (OPTION I), TO REMOVAL OF THE TAILINGS TO REMOTE DISPOSAL SITES AND DECONTAMINATION OF THE TAILINGS SITE (OPTIONS II THROUGH IV). COST ESTIMATES FOR THE

FOUR OPTIONS RANGE FROM ABOUT \$6,600,000 FOR STABILIZATION IN-PLACE, TO ABOUT \$15,900,000 FOR DISPOSAL AT A DISTANCE OF ABOUT 15 MI. THREE PRINCIPAL ALTERNATIVES FOR REPROCESSING THE MONUMENT VALLEY TAILINGS WERE EXAMINED: (1) HEAP LEACHING (2) TREATMENT AT AN EXISTING MILL (3) REPROCESSING AT A NEW CONVENTIONAL MILL CONSTRUCTED FOR TAILINGS REPROCESSING. THE COST OF THE URANIUM RECOVERED WOULD BE MORE THAN \$500/LB OF U₃O₈ BY HEAP LEACH OR CONVENTIONAL PLANT PROCESSES. THE SPOT MARKET PRICE FOR U WAS \$25/LB EARLY IN 1961, THEREFORE, REPROCESSING THE TAILINGS FOR U RECOVERY IS ECONOMICALLY UNATTRACTIVE.

329

QUALITATIVE SAFETY ANALYSIS - II

DP-1420

ARNETT, L.M.

760101

NTIS. 34 P.

SAVANNAH RIVER LABORATORY

C,1;C,3

SEVERAL EXAMPLES OF PROBABILISTIC MODELS OFTEN USED TO ANALYZE FAULT TREES, COMMON MODE FAILURES, AND DECISION TREES ARE DISCUSSED TO SHOW THAT EACH IS A SPECIAL CASE OF A GENERAL MODEL. THE GENERAL MODEL IS TERMED PRA, AND IS USED TO ENHANCE THE UNDERSTANDING AND INTERPRETATION OF THIS TYPE OF ANALYSIS. THE PRA METHOD WAS FLEXIBLY DESIGNED TO EASE DATA ASSEMBLY AND REVIEW. THE MODEL'S GENERALITY IS INTENDED TO PREVENT A FALSE SENSE OF SECURITY THAT A SINGLE NUMERICAL ANSWER OR RESTRICTED VIEW OF THE PROBLEM MIGHT GIVE.

330

POTENTIAL SAFETY-RELATED INCIDENTS WITH POSSIBLE

APPLICABILITY TO A NUCLEAR FUEL REPROCESSING PLANT

DP-1558

PERKINS, W.C.; DURANT, W.S.; DEXTER, A.H.

800101

SAVANNAH RIVER LABORATORY, AIKEN, SC. 300 P.

SAVANNAH RIVER LABORATORY

J,1;J,2;J,4,A;J,4,B;J,4,E;J,4,F;J,5,B;J,5,F;J,6;J,7;J,0,A;J,0,B;J,0,E;J,0,F

IN THE ABSENCE OF APPROPRIATE SAFETY FEATURES, THE OCCURRENCE OF CERTAIN POTENTIAL EVENTS IN THE NUCLEAR FUEL REPROCESSING PLANTS COULD LEAD TO SIGNIFICANT CONSEQUENCES INVOLVING RISK TO OPERATING PERSONNEL OR TO THE GENERAL PUBLIC. THIS DOCUMENT IS A COMPILATION OF SUCH POTENTIAL INITIATING EVENTS IN NUCLEAR FUEL REPROCESSING PLANTS. POSSIBLE GENERAL INCIDENTS AND INCIDENTS SPECIFIC TO KEY OPERATIONS IN FUEL REPROCESSING ARE CONSIDERED, INCLUDING POSSIBLE CAUSES, CONSEQUENCES, AND SAFETY FEATURES DESIGNED TO PREVENT, DETECT, OR MITIGATE SUCH INCIDENTS.

331

DURABILITY OF CONTAINERS FOR STORING SOLIDIFIED RADIOACTIVE WASTES

DP-MS-76-66

ANGERMAN, C.L.; RANKIN, W.N.

760101

NTIS. 30 P.

SAVANNAH RIVER LABORATORY

K,1

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE CORROSION/77 MEETING. MOST CONCEPTS FOR THE DISPOSAL OF HIGHLY RADIOACTIVE WASTE INVOLVE CONVERTING THE WASTE TO A SOLID FORM LIKE CONCRETE OR GLASS AND STORING THIS SOLID FORM IN METAL CONTAINERS. TWO MAJOR FACTORS IN THE FINAL SELECTION OF MATERIALS FOR THESE CONTAINERS ARE THE COMPATIBILITY BETWEEN WASTE FORM AND CONTAINER MATERIAL AND THE DURABILITY OF THE MATERIAL AT TEMPERATURES AND STRESSES EXPECTED DURING SERVICE AND POSSIBLE ACCIDENTS. CURRENTLY, AISI 1020 CARBON STAINLESS STEEL APPEARS TO BE A BETTER MATERIAL THAN OTHER ALLOYS. THIS CHOICE IS BASED ON THERMAL TESTING.

332

ALTERNATIVES FOR LONG-TERM MANAGEMENT OF DEFENSE

RADIOACTIVE HIGH-LEVEL WASTE AT THE SAVANNAH RIVER

PLANT

DP-MS-77-22; CONF-77045-1

TOPP, S.V.

770101

NTIS. 21 P.

SAVANNAH RIVER LABORATORY

K,1;K,5,D

THE PURPOSE OF THIS SITE-SPECIFIC PAPER IS TO DESCRIBE THE DIFFERENT ALTERNATIVES AND THEIR PROBABLE RELATIVE COSTS, RISKS, AND UNCERTAINTIES. A SECONDARY PURPOSE IS TO RAISE THE ISSUE OF METHODOLOGY FOR DECISION MAKING IN NUCLEAR WASTE MANAGEMENT. THIS PAPER DOES NOT ATTEMPT TO ARRIVE AT ANY RECOMMENDATIONS.

333

SAFETY EVALUATION OF A CONCEPTUAL FUEL RECYCLE COMPLEX

DP-MS-80-6; CONF-800943

HODGES, M.E.

800101

SAVANNAH RIVER LABORATORY, AIKEN, SC. 20 P.

SAVANNAH RIVER LABORATORY

I,1;J,1

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE NATIONAL MEETING ON FUEL CYCLES FOR THE 80'S. A CONCEPTUAL DESIGN INTEGRATION STUDY FOR AN INTEGRATED FUEL RECYCLE COMPLEX (FRC) HAS BEEN COMPLETED. A SAFETY EVALUATION OF THE RADIATION

SHIELDING, FIRE PRECAUTIONS, HANDLING OF NONRADIOACTIVE HAZARDOUS MATERIALS, CRITICALITY HAZARDS, OPERATING ERRORS, AND THE INFLUENCE OF NATURAL PHENOMENA ON THE FRC SHOWS THAT ALL FEDERAL REGULATIONS ARE MET OR EXCEEDED.

334

SAFETY ASSESSMENT FOR DRAGON FUEL ELEMENT PRODUCTION. PT. 2. HAZARDS ANALYSIS, OPERATING LIMITATIONS, STANDING ORDERS AND EMERGENCY DRILL

DP-R-242, PT. 2
PRICE, M.S.T., ED.

630101

UKAEA, WINFRITH, DORCHESTER, DORSET, ENGLAND. 157 P.
OECD

H,1;H,2;H,4;H,6;P,1

THIS REPORT IS THE THE SA COVERING THE MANUFACTURE OF THE FIRST CHARGE OF FUEL AND FUEL ELEMENTS FOR THE DRAGON REACTOR EXPERIMENT. IT IS ISSUED IN TWO PARTS, OF WHICH PT. 1 IS DESCRIPTIVE AND PT. 2 GIVES THE HAZARDS ANALYSIS, THE OPERATING LIMITATIONS, THE STANDING ORDERS AND THE EMERGENCY DRILL.

335

RISK OF EARTHQUAKE DAMAGE TO WASTE MANAGEMENT FACILITIES

DPST-76-303

PCE, N.L.

760101

NTIS. 53 P.

SAVANNAH RIVER LABORATORY

J,1;J,2;J,3;J,4,A;J,5,B;J,7;K,1;K,2;K,3;K,4,A;K,5,B;K,7;M,1;M,2;M,3;M,4,A;M,5,B;M,7

THE CALCULATED RESULTS OF THE RISK OF EARTHQUAKE DAMAGE TO THE SOLIDIFICATION AND RSSF STEPS OF THE LONG-TERM WASTE MANAGEMENT ARE PRESENTED. THE CONSEQUENCES AND RISKS PRESENTED ARE PROBABLY OVERESTIMATED BECAUSE OF THE ASSUMPTIONS MADE. VARIOUS STATISTICS ARE CALCULATED INCLUDING OFF-PLANT RISK.

336

ENVIRONMENTAL INFORMATION DOCUMENT DEFENSE WASTE PROCESSING FACILITY. SUPPLEMENT. DEFENSE WASTE PROCESSING FACILITY ENVIRONMENTAL DOCUMENTATION: BRIEFING

DPST-80-249; DPST-80-249 SUPPL.; DPST-80-249 SUPPL. A

SAVANNAH RIVER LABORATORY

800701

NTIS. 1073, 305, 17 P.

SAVANNAH RIVER LABORATORY

J,1;P,1;P,9

THESE REPORTS DOCUMENT THE IMPACT ANALYSIS OF A PROPOSED DEFENSE WASTE PROCESSING FACILITY (DWPF) FOR IMMOBILIZING HIGH-LEVEL WASTE CURRENTLY BEING STORED ON AN INTERIM BASIS AT

SRP, THE DWPF WILL PROCESS THE WASTE INTO A FORM SUITABLE FOR SHIPMENT TO AND DISPOSAL IN A FEDERAL REPOSITORY. THE DWPF WILL CONVERT THE HIGH-LEVEL WASTE INTO: A LEACH-RESISTANT FORM CONTAINING ABOVE 99.9% OF ALL THE RADIOACTIVITY, AND A RESIDUE OF SLIGHTLY CONTAMINATED SALT. THE DOCUMENT DESCRIBES THE SRP SITE AND ENVIRONS, INCLUDING POPULATION, LAND AND WATER USES; SURFACE AND SUBSURFACE SOILS AND WATERS; METEOROLOGY; AND ECOLOGY. A CONCEPTUAL INTEGRATED FACILITY FOR CONCURRENTLY PRODUCING GLASS WASTE AND SALTCAKE IS DESCRIBED, AND THE ENVIRONMENTAL EFFECTS OF CONSTRUCTING AND OPERATING THE FACILITY ARE PRESENTED. ALTERNATIVE SITES AND WASTE DISPOSAL OPTIONS ARE ADDRESSED. ALSO ENVIRONMENTAL CONSULTATIONS AND PERMITS ARE DISCUSSED. THE SUPPLEMENT ADDRESSES THE CONSTRUCTION OF THE DWPF IN TWO STAGES, WHEREAS THE EIS ADDRESSES THE CONSTRUCTION OF A SINGLE FACILITY. THE DOCUMENTS PROVIDE INFORMATION THAT WAS USED IN THE PREPARATION OF THE EIS ON THE DWPF (SEE ACN=277). SUPPLEMENT A IS AN OUTLINE OF A BRIEFING ON THE PROGRAM'S DOCUMENTATION PRESENTED BY J. L. CRANDALL.

337

ENVIRONMENTAL ANALYSIS BURIAL OF OFFSITE LOW-LEVEL WASTE AT
SRP. I. UNCLASSIFIED NAVAL WASTE

DPST-80-466

POE, W.L.; MOYER, R.A.

800101

SAVANNAH RIVER LABORATORY, Aiken, S.C. 86 P.

SAVANNAH RIVER LABORATORY

K,1;K,2;K,5;K,7;K,9;K,0,C;K,0,B;L,1;L,2;L,5;L,7;L,9;L,0,C;L,0,B;
N,1;N,2;N,5;N,7;N,9;N,0,C;N,0,B;O,1;O,2;O,0,C;O,0,B;P,1;P,4,
C;P,5,D;P,9

THE ENVIRONMENTAL EFFECTS OF RECEIPT AND BURIAL OF LOW-LEVEL NAVAL WASTE GENERATED AT DOE LABS ARE ASSESSED IN THIS ENVIRONMENTAL ANALYSIS (EA). THROUGH 1979, THIS LOW-LEVEL DOE WASTE WAS SENT TO THE NRC-LICENSED BURIAL GROUND OPERATED BY CHEM-NUCLEAR SYSTEMS, INC., AT BARNWELL, SC. DOE ANNOUNCED ON OCT. 26, 1979, THAT DOE-GENERATED LOW-LEVEL WASTE WOULD NO LONGER BE BURIED AT COMMERCIAL WASTE BURIAL SITES. THE SAVANNAH RIVER PLANT (SRP) WAS SELECTED TO RECEIVE THE NAVAL WASTE DESCRIBED IN THIS ANALYSIS. RECEIPT AND BURIAL OF THESE WASTES WILL HAVE A NEGLIGIBLE EFFECT ON SRP'S ENVIRONMENT AND INCREASE ONLY SLIGHTLY THE ENVIRONMENTAL EFFECTS ON THE SRP OPERATIONS DISCUSSED IN THE EIS ON SRP WASTE MANAGEMENT OPERATIONS. THE ENVIRONMENTAL EFFECTS OF BURIAL OF THIS WASTE AT CHEM-NUCLEAR BURIAL GROUND OR AT THE SRP BURIAL GROUND ARE DESCRIBED IN THIS EA TO PERMIT ASSESSMENT OF INCREMENTAL EFFECTS CAUSED BY THE DECISION TO BURY THIS NAVAL WASTE IN THE SRP BURIAL GROUND RATHER THAN IN THE BARNWELL BURIAL GROUND. THE RADIOLOGICAL EFFECTS FROM BURIAL OF THIS WASTE IN EITHER THE SRP OR CHEM-NUCLEAR BURIAL GROUND ARE VERY SMALL WHEN COMPARED TO THOSE FROM NATURAL BACKGROUND RADIATION OR TO THE ANNUAL POPULATION DOSE COMMITMENT FROM OPERATION OF SRP. THE ENVIRONMENTAL EFFECTS

OF BURIAL AT SRP TO DOSE COMMITMENTS NORMALLY RECEIVED BY THE POPULATION SURROUNDING SRP ARE COMPARED.

338

SAFETY ANALYSIS REPORT FOR THE PU02-238 FUEL FORM FACILITY
DPSTA-200-5
ANGERMAN, C.L.; BICKFORD, D.F.; GOULD, T.H., JR.; SMITH, P.A.
770101

SAVANNAH RIVER LABORATORY, AIKEN, SC. 200 P.
SAVANNAH RIVER LABORATORY

I,1;I,2;I,3;I,4,A;I,4,B;I,5,A;I,5,B;I,7;I,9;I,0,A;I,0,B

THE PLUTONIUM FUEL FORM (PUFF) FACILITY HAS BEEN CONSTRUCTED AT THE SAVANNAH RIVER PLANT TO MANUFACTURE 30 TO 60 KG/YR OF PU-238 FUEL FORMS FOR SPACE POWER APPLICATIONS. PILOT PRODUCTION IS SCHEDULED TO BEGIN IN JULY 1977, WITH FULL-SCALE PRODUCTION IN APRIL 1978. THIS REPORT DESCRIBES DESIGN OBJECTIVES, NATURE OF OPERATIONS, POTENTIAL HAZARDS AND LIMITING FACTORS, FACILITY RESPONSE TO POSTULATED ACCIDENTS AND FAILURES, AND ENVIRONMENTAL EFFECTS. THE RESULTS OF THE ANALYSES DESCRIBED IN THIS REPORT INDICATE THAT THE FACILITY HAS THE CAPACITY TO PREVENT OR SUFFICIENTLY REDUCE ACCIDENTS THAT REPRESENT POTENTIAL RISKS TO HEALTH AND SAFETY. THE SA IN CONJUNCTION WITH PROCESS REQUIREMENTS PROVIDES THE BASIS FOR TECHNICAL STANDARDS FOR OPERATION. THE ANALYSIS ALSO DOCUMENTS THE DEGREE OF CONFORMANCE OF THE FACILITY DESIGN WITH THE GENERAL DESIGN CRITERIA - PU FACILITIES AND THE ENVIRONMENTAL STATEMENT.

339

ALTERNATIVES FOR LONG-TERM MANAGEMENT OF DEFENSE
TRANSURANIC WASTE AT THE SAVANNAH RIVER PLANT, AIKEN,
SOUTH CAROLINA

DOE/SR-WM-79-1

U.S. DOE

790101

U.S. DOE, WASHINGTON, DC. 307 P.

U.S. DOE

K,1;K,2;K,4,A;K,4,C;K,4,E;K,4,G;K,5,B;K,5,D;K,7;K,0

COSTS AND RISKS ARE ESTIMATED FOR 12 ALTERNATIVES FOR THE LONG-TERM MANAGEMENT OF DEFENSE TRANSURANIC WASTE NOW STORED IN TRENCHES AND ON PADS AT SRP. THE ALTERNATIVES RANGE FROM THE NO-ACTION ALTERNATIVE TO THE ALTERNATIVE WHERE ALL WASTE IS RETRIEVED, FIXED IN CONCRETE OR GLASS, AND DISPOSED OF IN DEEP GEOLOGIC FACILITIES. FOR A 10-YR PROCESSING AND A 100-YR SURVEILLANCE PERIOD, ESTIMATED COSTS RANGE FROM UNDER 25 MILLION (1979) DOLLARS FOR FIXATION OF ALL TRANSURANIC WASTE AND DISPOSAL IN BEDROCK. TIME-INTEGRATED RISKS RANGE FROM 13,000 MAN-REM FOR THE NO ACTION ALTERNATIVE TO 50 MAN-REM FOR ALTERNATIVES IN WHICH ALL WASTE IS PLACED EITHER IN ONSITE TRENCHES OR OVERPACKED AND PLACED IN GEOLOGIC DISPOSAL FACILITIES. IF INSTITUTIONAL CONTROL OF THE ONSITE TRENCH AREA

CEASES AFTER 100 YRS, RADIATION DOSES TO THE PUBLIC OVER THE NEXT 1000-YR PERIOD WOULD RANGE FROM ABOUT 20,000 MAN-REM FOR THE NO-ACTION ALTERNATIVE DOWN TO 100 TO 300 MAN REM FOR THE ACTION ALTERNATIVES. SEE ALSO DOE/SR-88-79-1 SUPPL., ACN=278.

340

PERFORMANCE OF SAND FILTERS FOR THE SEPARATIONS AREAS AT
THE SAVANNAH RIVER LABORATORY

CONF-801038, VOL. 1

ORTH, D.A.; SYKES, G.H.; MCKIBBEN, J.M.

810101

NTIS

SAVANNAH RIVER LABORATORY

OGE NUCLEAR AIR CLEANING CONFERENCE. PROC. 161H. PP. 745-762.

J,5,8;J,5,D

TWO NEW LARGE SAND FILTERS, 30.5 BY 100 M, WERE CONSTRUCTED AND PUT INTO SERVICE AT SRP IN 1975 AND 1976. THESE UNITS WERE DESIGNED TO PROVIDE FINAL FILTRATION OF PROCESS AIR - ONE FOR EACH OF THE TWO SEPARATIONS AREAS. THEY WERE BUILT AS REPLACEMENTS FOR THE ORIGINAL SAND FILTERS THAT BEGAN OPERATION IN 1954-55. AN ANALYSIS OF EFFICIENCIES A FUNCTION OF INPUT ACTIVITY PROJECTS EFFICIENCIES GREATER THAN 99.9% FOR LARGE INPUTS THAT MIGHT BE CHARACTERISTIC OF LARGE INTERNAL ACCIDENTS. THE DATA INDICATE THAT DOP EFFICIENCIES CAN BE USED IN HAZARDS ANALYSES TO DETERMINE ACCIDENT CONSEQUENCES. ROUTINE EVALUATION OF FILTER RELEASES CAN BE USED FOR SURVEILLANCE TO ESTABLISH THAT PERFORMANCE IS NORMAL AT OTHER TIMES.

341

TEMPERATURE CALCULATIONS ON DIFFERENT CONFIGURATIONS FOR
DISPOSAL OF HIGH-LEVEL REPROCESSING WASTE IN A SALT
DOME MODEL

ECN-42

HAMSTRA, J.; KEVENAAR, J.W.A.M.

780101

NTIS. 57 P.

STICHTING ENERGIEONDERZOEK CENTRUM NEDERLAND, PETTEN

L,1

A MEDIUM SIZE SALT DOME IS CONSIDERED AS A STRUCTURE IN WHICH A REPOSITORY CAN BE LOCATED FOR ALL RADWASTES TO BE PRODUCED WITHIN THE SCOPE OF A POSTULATED NUCLEAR POWER PROGRAM. A DOMINATING DESIGN FACTOR FOR THE LAY-OUT OF SUCH A WASTE REPOSITORY IS THE TEMPERATURE DISTRIBUTION IN THE SALT DOME RESULTING FROM DECAY HEAT RELEASED FROM THE BURIED SOLIDIFIED HIGH-LEVEL REPROCESSING WASTE. TWO NUMERICAL MODELS ARE PRESENTED FOR THE CALCULATION OF BOTH GLOBAL AND LOCAL ROCK SALT TEMPERATURES. CALCULATED RESULTS INDICATE THAT ROCK SALT TEMPERATURES CAN BE KEPT WITHIN ACCEPTABLE LIMITS TO REALIZE A REPOSITORY USING STANDARD MINING TECHNIQUES. THE APPARENT ADVANTAGES OF A DEEP BORE HOLE CONCEPT EMPHASIZE THE NEED FOR R

& D WORK WITH RESPECT TO ADVANCED DRILLING TECHNIQUES IN ORDER TO ACHIEVE DEEP DRY DISPOSAL BORE HOLES THAT CAN BE REALIZED FROM A BURIAL MINE IN THE SALT DOME.

342

TASK FORCE EVALUATION OF TRU WASTE RETRIEVAL METHODS, FINAL REPORT

EGG/PR/W-78-016

BURTON, H.M.; BILLS, C.W.; FIELDING, J.R.; SCHOFIELD, J.S.;
WARREN, J.L.; WICKLAND, C.E.; WHITTY, W.J.

780101

E.G.&G. IDAHO, INC., IDAHO FALLS, ID. 96 P.

E.G.&G. IDAHO, INC.

C,1;K,1;K,2

A TASK FORCE REVIEW OF THE CONCEPTS FOR REMOVAL OF BURIED TRU WASTE AT INEL WAS PERFORMED AT THE REQUEST OF DOE. THIS TASK FORCE, COMPOSED OF MEMBERS FROM OUTSIDE THE EG&G WASTE MANAGEMENT DIV., WAS SELECTED FOR THEIR PARTICULAR EXPERTISE APPLICABLE TO RETRIEVAL OF BURIED TRU WASTE. THE APPLICATION OF A FIGURE-OF-MERIT PROCEDURE TO PROVIDE AN ORDERLY EVALUATION WAS SELECTED. THE CONCLUSION OF THE TASK FORCE WAS THAT THE DESIGN CONCEPT SUBMITTED BY FMC CORP. FOR A MECHANIZED RETRIEVAL SYSTEM HAS THE HIGHEST POTENTIAL OF SATISFYING THE REQUIREMENTS FOR SAFE REMOVAL OF THE 2.5 MILLION CUBIC FT OF BURIED WASTE BEFORE THE YR 2000 AT A REASONABLE COST. RECOMMENDATIONS FOR FURTHER DESIGN IMPROVEMENTS, INVESTIGATIVE WORK, AND STUDIES ARE PROVIDED.

343

TRANSURANIC WASTE PROGRAM AT EG&G IDAHO, INC. ANNUAL TECHNICAL REPORT

EGG-WM-5295

SMITH, T.H.; TOLMAN, C.R.

800101

E.G.&G. IDAHO, INC., IDAHO FALLS, ID. 22 P.

E.G.&G. IDAHO, INC.

K,1;L,1;P,0

THE 1980 OBJECTIVES AND TECHNICAL ACHIEVEMENTS ARE SUMMARIZED. THE TRU WASTE ACTIVITIES COVERED INCLUDE: INEL TRU WASTE EIS, INCLUDING PREPARATION OF THE EIS, SUPPORT STUDIES, AND THE PUBLIC PARTICIPATION PROGRAM; INEL TRU WASTE PROJECTS, INCLUDING SYSTEM ANALYSIS, STORED WASTE PROJECTS, AND BURIED WASTE PROJECTS; AND WASTE MANAGEMENT MATERIALS STUDIES, INCLUDING PROCESS CONTROL AND DURABILITY STUDIES.

344

PRELIMINARY ENVIRONMENTAL ANALYSIS OF A GENERIC FUEL REPROCESSING PLANT

EPA-520/3-75-003; PB-263 323

COOPERSTEIN, R.; ERDMANN, R.C.; FULLWOOD, R.R.
740101

NTIS. 323 P.
SCIENCE APPLICATIONS, LA JOLLA
J,1;J,2;J,3;J,5,B;J,7;J,9

A GENERIC REPROCESSING PLANT FOR LWR SPENT FUEL UTILIZING THE PUREX PROCESS HAS BEEN SYNTHESIZED FROM A REVIEW OF EXISTING PLANTS AND THOSE UNDER CONSTRUCTION. THIS MODEL IS USED TO DEVELOP A QUANTITATIVE DESCRIPTION OF THE PROBABILITY OF OCCURRENCE OF A SPECTRUM OF POTENTIALLY CREDIBLE ACCIDENTS AND RESULTANT RADIOACTIVE RELEASES DURING ITS OPERATION. THE RESULTS CAN BE USED TO DETERMINE THE POTENTIAL IMPACT ON THE ENVIRONMENT. IT IS RECOGNIZED BY EPA THAT THIS REPORT PRESENTS ONLY AN INITIAL ANALYSIS OF THE POTENTIAL ENVIRONMENTAL IMPACT OF ACCIDENTS AT A GENERIC LWR FUEL REPROCESSING FACILITY. THERE REMAIN FURTHER ANALYSES WHICH COULD BE COMPLETED, USING THIS TECHNIQUE, FOR BOTH A GENERIC FACILITY AND FOR ANY SPECIFIC FACILITY DESIGN SITED AT A PARTICULAR LOCATION. EXTENSIONS OF THE CURRENT STUDY TO DERIVE POPULATION DOSE ESTIMATES AND PREDICTIONS OF THE HEALTH EFFECTS WHICH COULD RESULT FROM THESE EXPOSURES ARE EXAMPLES OF TWO SUCH POSSIBLE ADDITIONAL STUDIES. SEPARATE CHAPTERS DESCRIBE FAULT TREE CONSTRUCTION OF ACCIDENT SEQUENCES, ACCIDENT ANALYSIS, CONSEQUENCES OF ACCIDENTS, AND RA.

345
METHODOLOGY DEVELOPMENT FOR STATISTICAL EVALUATION OF
REACTOR SAFETY ANALYSIS

EPRI NP-194
MAZUMDAR, M.; MARSHALL, J.A.; CHAY, S.C.
760101

NTIS. 139 P.
WESTINGHOUSE ELECTRIC CORP.
C,1;C,3;C,8

THIS REPORT DOCUMENTS THE RESULTS OF TWO TASKS AIMED AT THE DEVELOPMENT OF A METHODOLOGY FOR STATISTICAL EVALUATION OF NUCLEAR- SAFETY-RELATED ENGINEERING ANALYSIS. THE TASKS ARE: (1) AN INVESTIGATION OF THE RELATIVE EFFICIENCIES AND ACCURACIES OF VARIOUS MONTE CARLO AND ANALYTICAL TECHNIQUES FOR ESTIMATING PROBABILITY DISTRIBUTIONS OF OUTPUT VARIABLES FOR A SIMPLE THERMAL HYDRAULIC PROBLEM, WHOSE OUTPUT VARIABLE OF INTEREST IS GIVEN IN A CLOSED-FORM RELATIONSHIP OF THE INPUT VARIABLES; AND (2) A REPETITION OF THE ABOVE STUDY ON A THERMAL HYDRAULIC PROBLEM IN WHICH THE RELATIONSHIPS BETWEEN THE PREDICTED VARIABLE AND THE INPUTS ARE DESCRIBED BY A SHORT-RUNNING COMPUTER PROGRAM. THE METHODS USED IN THIS STUDY MAY BE USEFUL IN ASSESSING THE PROBABILITIES OF RISKS ASSOCIATED WITH THE UNDERGROUND STORAGE OF RADIOACTIVE WASTES.

346
A COMPUTER-ORIENTED APPROACH TO FAULT-TREE CONSTRUCTION

EPRI NP-228
SALEM, S.L.; APOSTOLAKIS, G.E.; OKRENT, D.
760101
NTIS. 56 P.
UNIV. OF CALIFORNIA, LOS ANGELES
C,3

A METHODOLOGY FOR SYSTEMATICALLY CONSTRUCTING FAULT TREES FOR GENERAL COMPLEX SYSTEMS IS DEVELOPED, AND VIA THE COMPUTER PROGRAM CAT IT IS APPLIED TO SEVERAL SYSTEMS. FIRST, A MEANS OF REPRESENTING COMPONENT BEHAVIOR BY DECISION TABLES IS PRESENTED. TO USE THE TABLES DESCRIBED, A PROCEDURE FOR CONSTRUCTING AND EDITING FAULT TREES, EITHER MANUALLY OR BY COMPUTER, IS DESCRIBED. CAT WAS DEVELOPED TO VERIFY THE METHODOLOGY AND HAS BEEN USED TO CONSTRUCT FAULT TREES FOR TWO SYSTEMS. BY ANALYZING AND COMPARING THESE TREES, SEVERAL CONCLUSIONS ARE REACHED. THIS APPROACH IS SHOWN TO BE A USEFUL TOOL FOR THE ANALYST, ESPECIALLY WHEN EMPLOYED THOUGHTFULLY AND CAREFULLY.

347
PROBABILISTIC SAFETY ANALYSIS V. INTERIM REPORT
EPRI NP-1275
ERDMANN, R.C.; KELLY, J.E.
790101

NTIS. 156 P.
SCIENCE APPLICATIONS, INC., PALO ALTO
C,1;C,2;C,3;C,4;C,5;C,6;C,7;C,8;P,3;P,4,A;P,5,B;P,6;P,7;P,8
THE DEVELOPMENT OF PRA METHODS AND THEIR APPLICATION WITHIN INDUSTRY IS DESCRIBED TWO RA WORKSHOPS ARE DESCRIBED. A SUMMARY OF A RECENT EPRI REPORT COMPARING THE LEWIS COMMITTEE REVIEW OF THE REACTOR SAFETY STUDY WITH EARLIER EPRI REVIEWS REVEALS GENERAL AGREEMENT. PROGRESS IN FAULT TREE METHODOLOGY AND CODE DEVELOPMENT IS SUMMARIZED. TWO ANALYSES RELATED TO ANTICIPATED TRANSIENTS WITHOUT SCRAM ARE REPORTED. SENSITIVITY STUDIES TO DETERMINE THE ECONOMIC AND RISK REDUCTION VALUE OF LWR SAFETY FEATURES ARE DOCUMENTED. TWO NEW CONSEQUENCE CODES, ONE TO PREDICT TIME-DEPENDENT POST-LOCA CONTAINMENT CONDITIONS AND ONE TO CALCULATE RADIATION DOSES TO INTERNAL ORGANS, ARE DESCRIBED. THE STATUS REPORT OF THE EPRI FUEL CYCLE RA IS SUMMARIZED. PROGRESS IN ESTABLISHING EARTHQUAKE STRONG MOTION IS DESCRIBED. RAPID RESPONSE EFFORTS FOLLOWING THE ACCIDENT AT TMI ARE REPORTED.

348
GERMAN RISK STUDY - MAIN REPORT: A STUDY OF THE RISK DUE TO ACCIDENTS IN NUCLEAR POWER PLANTS
EPRI NP-1804-SR
BARSELL, A.W.; WALL, I.B.
810101
NTIS. 364 P.
TORREY PINES TECHNOLOGY

P,1;P,2;P,3;P,4,A;P,5,B;P,7;P,8;P,9

A TRANSL. OF PHASE A OF THE DEUTSCHE RISIKOSTUDIE KERNKRAFTWERKE, THIS REPORT ASSESSES THE RISKS DUE TO ACCIDENTS CAUSED BY THE OPERATION OF NUCLEAR POWER PLANTS IN THE FEDERAL REPUBLIC OF GERMANY. THE PRA METHODOLOGY USED IN WASH-1400 IS APPLIED TO THE SYSTEM TECHNOLOGY AND SITING CONDITIONS PARTICULAR TO THE GERMAN SITUATION.

349

PROBABILISTIC SAFETY ANALYSIS. INTERIM REPORT 1

EPRI-217-2-4

ERDMANN, R.C.

750101

NTIS. 138 P.

SCIENCE APPLICATIONS, INC.

P,3;P,4;P,5;P,8;P,9

THIS REPORT SUMMARIZES WORK ON LWR PSA. A LARGE AMOUNT OF USEFUL SOURCE MATERIAL WAS PROVIDED FROM WASH-1400D, AND MUCH OF THE SAI ACTIVITY DURING THE PAST YR WAS BASED UPON THE METHODS, DATA, AND RESULTS CONTAINED IN IT. THE PERFORMANCE OF A SENSITIVITY ANALYSIS TO DETERMINE WHICH SYSTEMS CONTRIBUTE SIGNIFICANTLY TO OVERALL RISK IN A BWR IS ANALYZED. CONSEQUENCE ANALYSES ARE PRESENTED FOR A PWR AND A BWR FOR EACH OF THE ACCIDENT CATEGORIES GIVEN IN WASH-1400, FOLLOWED BY THE SAI ACCIDENT SEQUENCE CALCULATIONS. THE DEVELOPMENT OF THE BAM CODE FOR ANALYZING LOGIC DIAGRAMS AND ITS COMPARISON WITH EXISTING CODES IS THEN PRESENTED. THE FINAL CHAPTER DESCRIBES A FAILURE DATA GATHERING ACTIVITY NECESSARY TO THE RELIABILITY ANALYSES CONDUCTED.

350

ALTERNATIVES FOR LONG-TERM MANAGEMENT OF DEFENSE HIGH-LEVEL RADIOACTIVE WASTE

ERDA-77-42/1

SAVANNAH RIVER PLANT

770101

NTIS. 200 P.

SAVANNAH RIVER PLANT

C,2;C,3;L,1;L,2;L,3;L,7;L,9;N,1;N,2;N,3;N,7;N,9;O,2;O,3;O,9

IMPLEMENTATION COSTS AND RISK COSTS ARE CALCULATED IN THE TEXT FOR 23 ALTERNATIVE PLANS FOR LONG-RANGE MANAGEMENT AND ISOLATION OF THE SRP HLW. THESE 23 PLANS CAN BE GROUPED INTO 4 MAIN CLASSES: (1) CONVERT THE WASTE TO A HIGHLY LEACH-RESISTANT FORM, SUCH AS CANNED GLASS CYLINDERS, AND SHIP TO A FEDERAL REPOSITORY, (2) CONVERT AND STORE THE WASTE IN AN ENGINEERED SURFACE FACILITY AT SRP, (3) RECONSTITUTE THE WASTE TO A SLURRY, AND DISPOSE OF IT IN A BEDROCK CAVERN UNDER THE SRP SITE, AND (4) CONTINUE STORAGE IN TANKS WITH THE WASTE AS SALT CAKE AND SLUDGE.

351

LIGHT WATER REACTOR FUEL REPROCESSING AND RECYCLING

ERDA-77-75

U.S. ERDA

770101

NTIS. 300 P.

I,111,5;J,1;J,5

THIS DOCUMENT WAS ORIGINALLY INTENDED TO PROVIDE THE BASIS FOR AN EIS TO ASSIST ERDA IN MAKING DECISIONS WITH RESPECT TO POSSIBLE LWR FUEL REPROCESSING AND RECYCLING PROGRAMS. SINCE THE ADMINISTRATION HAS RECENTLY MADE A DECISION TO INDEFINITELY DEFER REPROCESSING, THIS EIS IS NO LONGER NEEDED. NEVERTHELESS, THIS DOCUMENT IS ISSUED AS A REPORT TO ASSIST THE PUBLIC IN ITS CONSIDERATION OF NUCLEAR POWER ISSUES. THE STATEMENT COMPARES THE VARIOUS ALTERNATIVES FOR THE LWR FUEL CYCLE. COSTS AND ENVIRONMENTAL EFFECTS ARE COMPARED. SAFEGUARDS FOR PU FROM SABOTAGE AND THEFT ARE ANALYZED.

352

SYSTEM STUDY. RADIOACTIVE WASTES IN THE FEDERAL REPUBLIC OF

GERMANY. SRA 5: METHODOLOGY AND APPLICATION OF

PROBABILISTIC RISK ANALYSIS

ERDA-TR-308

WINGENDR, H.J.

760101

U.S. ERDA, WASHINGTON, DC. 125 P.

NUKEM, HANAU

C,1;C,2;C,3,A;C,3,B;C,4,A;C,4,B;C,5,B;J,1;J,2;J,3,A;J,3,B;J,4,A;J,4,B;J,5,B;J,0,A;J,0,H;K,1;K,2;K,3,A;K,3,B;K,4,A;K,4,B;K,5,B;K,0,A;K,0,B

THIS TRANSL. OF A GERMAN REPORT DEALS ON A BROAD BASIS, WITH THE PROBLEMS CONNECTED WITH THE ACCUMULATION OF RAD-WASTE IN ORDER TO PREPARE A WASTE REMOVAL SYSTEM IN THE FRG ADJUSTED TO FUTURE WASTE VOLUME. IT COVERS THE YRS UP UNTIL 1990 AND SUPPLIES TREND DATA TO THE YR 2000. A METHODOLOGY WAS DEVELOPED FOR PERFORMING PRA AND TESTED ON HYPOTHETICAL REFERENCE PLANTS (TANK FARM, VITRIFICATION SYSTEM). RESULTS OF THE ANALYSES ARE PRESENTED.

353

LONG-TERM RISK ASSESSMENT OF RADIOACTIVE WASTE DISPOSAL IN

GEOLOGICAL FORMATIONS

EUR-5902

GIRARDI, F.; BERTOZZI, G.; D'ALESSANDRO, M.

780101

NTIS. 42 P.

COMMISSION OF THE EUROPEAN COMMUNITIES, ISPRA

C,1;C,2;C,3;C,5;L,1;L,2;L,3;L,5,B;L,5,D

METHODS FOR LONG-TERM SA OF WASTE FROM NUCLEAR POWER

PRODUCTION IN THE EUROPEAN COMMUNITY ARE UNDER STUDY. THE AIM OF THE WORK IS TO DEVELOP A SUITABLE METHODOLOGY FOR LONG-TERM RA. THE METHODOLOGY UNDER STUDY IS BASED ON THE ASSESSMENT OF THE QUANTITATIVE VALUE OF A SYSTEM OF BARRIERS WHICH MAY BE INTERPOSED BETWEEN WASTE AND MAN.

354

HIGR ACCIDENT INITIATION AND PROGRESSION ANALYSIS STATUS REPORT. VOL. 2. AIPA RISK ASSESSMENT METHODOLOGY

GA-A-13617, VOL. 2

FLEMING, K.N.; RAABE, P.H.; HANNAMAN, G.W.; HOUGHTON, W.J.; PFRENNER, R.D.; DOMBEK, F.S.

750101

NTIS. 185 P.

GENERAL ATOMIC CO.

C,1;C,2;C,3;C,4;C,5;P,1

VOL. 2 COMPREHENSIVELY SUMMARIZES THE METHODS AND TECHNIQUES USED IN ACCIDENT INITIATION AND PROGRESSION ANALYSIS. BECAUSE PROBABILITIES AND CONSEQUENCES MUST BE AS REALISTIC AS POSSIBLE, IT WAS NECESSARY TO EXPAND AND IMPROVE EXISTING METHODS IN SEVERAL AREAS. FOR EXAMPLE, SYSTEM RELIABILITY MODELING HAD TO BE IMPROVED TO ACCOUNT FOR COMMON MODE FAILURES AND SYSTEM-ORIENTED INTERACTIONS. IN THE BIOLOGICAL CONSEQUENCE EVALUATION AREA, EXISTING METHODS AND ASSUMPTIONS HAD TO BE MODIFIED SO THAT REALISTIC ASSESSMENTS COULD BE MADE IN CONTRAST TO OTHER METHODS THAT USUALLY YIELD ULTRA CONSERVATIVE RESULTS.

355

FINAL SAFETY ANALYSIS REPORT FOR THE IRRADIATED FUELS STORAGE FACILITY

ICP-1052

BINGHAM, G.E.; EVANS, T.K.

760101

ALLIED CHEMICAL CORP., IDAHO FALLS, ID. 180 P.

ALLIED CHEMICAL CORP., IDAHO FALLS

M,1;M,2;M,4;C,5;D,7;M,0

A FUEL STORAGE FACILITY HAS BEEN CONSTRUCTED AT IDAHO CHEMICAL PROCESSING PLANT (ICPP) TO PROVIDE SAFE STORAGE FOR SPENT FUEL FROM TWO COMMERCIAL HIGH-TEMPERATURE GAS-COOLED REACTORS - FORT ST. VRAIN AND PEACH BOTTOM - AND FROM THE ROVER NUCLEAR ROCKET PROGRAM. IN THIS REPORT THE POTENTIAL HAZARDS ASSOCIATED WITH THE STORAGE AT THE FACILITY ARE STUDIED. THE STUDY INDICATES THAT THE FACILITY CAN WITHSTAND ALL CREDIBLE COMBINATIONS OF INTERNAL ACCIDENTS AND PERTINENT NATURAL FORCES - INCLUDING DESIGN BASIS NATURAL PHENOMENA OF A 10,000 YR FLOOD, A 175-MPH TORNADO, OR AN EARTHQUAKE HAVING A BEDROCK ACCELERATION OF 0.33 G AND AN AMPLIFICATION FACTOR OF 1.3 - WITHOUT A LOSS OF INTEGRITY OR A SIGNIFICANT RELEASE OF RADIOACTIVE MATERIALS. THE RESULTS AND METHODOLOGY OF THIS STUDY PERTAIN SPECIFICALLY TO THE ICPP FACILITY AND, FOR THE MOST PART,

CANNOT BE TRANSFERRED TO A RISK ANALYSIS FOR THE UNDERGROUND STORAGE OF NUCLEAR WASTE.

356

STATUS OF TECHNOLOGIES RELATED TO RADIOACTIVE WASTE
MANAGEMENT AND DISPOSAL

INFCE/DEP./WG-7/9

INTERNATIONAL NUCLEAR FUEL CYCLE EVALUATION

790101

NTIS. 38 P.

INTERNATIONAL NUCLEAR FUEL CYCLE EVALUATION

L,1;L,2;L,6;L,9

THE STATUS OF TECHNOLOGIES RELEVANT TO RADWASTE MANAGEMENT AND DISPOSAL, AS DEFINED BY THE INFCE WORKING GROUP 7 STUDY ARE DISCUSSED. ALL FUEL CYCLE WASTES, WITH THE EXCEPTION OF MILL TAILINGS, ARE PLACED IN MINED GEOLOGIC REPOSITORIES. IN ADDITION TO THE AVAILABILITY OF TECHNOLOGIES, THE IMPORTANCE OF THE SYSTEMS VIEWPOINT, IMPORTANCE OF MODELING, NEED FOR SITE-SPECIFIC INVESTIGATIONS, CONSIDERATION OF FUTURE SUB-SURFACE HUMAN ACTIVITIES, AND PROSPECTS FOR SUCCESSFUL ISOLATION ARE ALSO DISCUSSED. IN THE SECTIONS ON WASTE ISOLATION AND REPOSITORY SA, PRINCIPAL CONSIDERATIONS ARE DISCUSSED. IT IS CONCLUDED THAT SUCCESSFUL ISOLATION OF RADWASTES FROM THE BIOSPHERE APPEARS TECHNICALLY FEASIBLE FOR PERIODS OF THOUSANDS OF YRS PROVIDED THAT THE SYSTEMS VIEW IS USED IN REPOSITORY SITING AND DESIGN.

357

RELEASE CONSEQUENCE ANALYSIS FOR A HYPOTHETICAL GEOLOGIC
RADIOACTIVE WASTE REPOSITORY IN SALT

INFCE/DEP./WG-7-16

INTERNATIONAL NUCLEAR FUEL CYCLE EVALUATION

790101

NTIS. 180 P.

INTERNATIONAL NUCLEAR FUEL CYCLE EVALUATION

L,2;L,5,B;L,5,D;L,7;L,0

ONE SUBTASK CONDUCTED UNDER THE INFCE PROGRAM IS TO EVALUATE AND COMPARE THE HEALTH AND SAFETY IMPACTS OF DIFFERENT FUEL CYCLES IN WHICH ALL RADWASTE (EXCEPT FROM MINING AND MILLING) ARE PLACED IN A SALT REPOSITORY. TO ACHIEVE THIS, INFCE WORKING GROUP 7 EXAMINED THE RADIOLOGIC DOSE TO HUMANS FROM GEOLOGIC REPOSITORIES CONTAINING WASTE ARISING AS DEFINED FOR 7 REFERENCE FUEL CYCLES. RELEASE SCENARIOS MODELING ARE GIVEN.

358

AN ASSESSMENT OF THE LONG TERM SUITABILITY OF PRESENT AND
PROPOSED METHODS FOR THE MANAGEMENT OF URANILM MILL
TAILINGS

INFO-0024

KILBORN LTD.

790101

NTIS. 392 P.

KILBORN LTD., TORONTO

D,1;D,2;E,1;E,2;H,1;H,2;N,5;N,7;N,9

THE URANIUM MINE/MILLING INDUSTRY IN CANADA IS UNDERGOING A MAJOR EXPANSION. THIS INDUSTRY IS A LARGE PRODUCER OF TAILINGS, AND THE SAFE CONTAINMENT OF THESE TAILINGS IN THE LONG TERM IS AN ISSUE OF SOME CONCERN. THE PRESENT URANIUM MINE/MILL OPERATIONS OR DEVELOPMENTS IN CANADA ARE IN ONTARIO, AND IN NORTHERN SASKATCHEWAN. THE DEPOSITS VARY SIGNIFICANTLY IN MINEROLOGY AND THEREFORE THE TAILINGS ALSO VARY. PROPOSALS FOR SAFE LONG TERM CONTAINMENT OF CONVENTIONAL TAILINGS INCLUDE (1) STORAGE UNDER WATER, (2) STORAGE IN ACTIVE, ABANDONED OR SPECIALLY CREATED UNDERGROUND MINES, AND (3) STORAGE IN OPEN PITS, WITH SUBSEQUENT FLOODING OR COVERING WITH OVERBURDEN. IT IS ALSO POSSIBLE TO REDUCE THE HAZARD BY REDUCING THE RADIUM AND THORIUM CONTENT OF THE TAILINGS. PROPOSALS FOR SUCH AN UNDERTAKING INCLUDE ORE BENEFICIATION WITH REJECTION OF THE RELATIVELY INNOCUOUS FRACTION, RADIUM-THORIUM REMOVAL IN THE MILL, AND SIGNIFICANT CHANGES IN BOTH ORE PROCESSING AND TREATMENT OF TAILINGS. IT IS CONCLUDED THAT SURFACE STORED TAILINGS ARE VULNERABLE OVER THE LONG TERM TO DISPERSION BY LEACHING AND WATER EROSION, AND THAT ACCESS TO A TAILINGS SITE CANNOT BE PREVENTED. IN CONTRAST, ONLY A MAJOR CLIMATIC OR SEISMIC EVENT COULD DISTURB TAILINGS STORED IN SUITABLE UNDERWATER OR UNDERGROUND MINE SITES. THE CRITERIA FOR DETERMINING SUITABILITY OF EACH METHOD, HOWEVER, WILL NEED TO BE IDENTIFIED, TESTED, AND ACCEPTED THROUGH THE NORMAL PROCESS OF MODELING, PILOT PLANT EVALUATION, MONITORING AND EVALUATION.

360

HANDLING OF SPENT NUCLEAR FUEL AND FINAL STORAGE OF
VITRIFIED HIGH LEVEL REPROCESSING WASTE

INIS-MF-4390

KAERNBRAENSLESAEKERHET

780101

NTIS. 153 P.

KAERNBRAENSLESAEKERHET

M,1;K,1;L,1;O,1

THE REPORT GIVES A GENERAL SUMMARY OF THE SWEDISH KBS-PROJECT ON MANAGEMENT AND DISPOSAL OF VITRIFIED REPROCESSED WASTE. ITS FINAL AIM IS TO DEMONSTRATE THAT THE MEANS OF PROCESSING AND MANAGING POWER REACTOR WASTE IN AN ABSOLUTELY SAFE WAY, AS STIPULATED IN THE SWEDISH SO CALLED CONDITIONS ACT, ALREADY EXIST. CHAPTERS ON STORAGE FACILITY FOR SPENT FUEL, INTERMEDIATE STORAGE OF REPROCESSED WASTE, GEOLOGY, FINAL REPOSITORY, TRANSPORTATION, PROTECTION AND SITING.

361

HANDLING OF SPENT NUCLEAR FUEL AND FINAL STORAGE OF
VITRIFIED HIGH-LEVEL REPROCESSING WASTE

INIS-MF-4460

KAERNBRAENSLESÆKERHET

780101

NTIS. 115 P.

KAERNBRAENSLESÆKERHET

L,1;L,2;L,3;L,4;L,5;L,7;L,9;L,0;0,1;0,2;0,3;0,4;0,5; 0,9;0,0

THE REPORT IS A SA ON THE MANAGEMENT OF HIGH-LEVEL
RADIOACTIVE WASTE FROM REPROCESSING OF SPENT FUEL. THE WORK IS
PART OF THE SWEDISH KBS-PROJECT. HANDLING, STORAGE AND TRANSPORT
WILL BE DONE IN ACCORDANCE WITH INTERNATIONAL AND NATIONAL
RULES. MANAGEMENT AND STORING OF VITRIFIED HIGH-LEVEL WASTE WILL
BE DONE ACCORDING TO THE PRINCIPLES TESTED IN THE MARCONLE PLANT
IN FRANCE. PROBABILITY CALCULATIONS SHOW THAT RELEASES WOULD BE
LESS THAN THE VARIATIONS OF NATURAL RADIATION.

362

CONSIDERATIONS FOR DEVELOPING SEISMIC DESIGN CRITERIA FOR
NUCLEAR WASTE STORAGE REPOSITORIES

JAB-00099-128

OWEN, G.N.; YANEV, P.I.; SCHOLL, R.E.

800101

NTIS. 73 P.

URS/JOHN A. BLUME & ASSOCIATES, ENGINEERS

L,1;L,2;L,7,B;L,7,D;L,7,J;L,7,L

THE FUNCTION OF SEISMIC DESIGN CRITERIA IS TO REDUCE THE
POTENTIAL FOR HAZARDS THAT MAY ARISE DURING VARIOUS STAGES OF
THE REPOSITORY LIFE. DURING THE OPERATIONAL PHASE, THE MAJOR
CONCERN IS WITH THE POSSIBLE EFFECTS OF EARTHQUAKES ON SURFACE
FACILITIES, UNDERGROUND FACILITIES, AND EQUIPMENT. DURING THE
DECOMMISSIONED PHASE, THE MAJOR CONCERN IS WITH THE POTENTIAL
EFFECTS OF EARTHQUAKES ON THE GEOLOGIC FORMATION, WHICH MAY
RESULT IN A REDUCTION IN ISOLATION CAPACITY. EXISTING STANDARDS
AND GUIDES OR CRITERIA USED FOR THE STATIC AND SEISMIC DESIGN OF
LICENSED NUCLEAR FACILITIES WERE REVIEWED AND EVALUATED FOR
THEIR APPLICABILITY TO REPOSITORY DESIGN. THIS REPORT IS
DIRECTED MAINLY TOWARD THE DEVELOPMENT OF SEISMIC DESIGN
CRITERIA FOR THE UNDERGROUND STRUCTURES OF REPOSITORIES.

363

PRELIMINARY RISK ANALYSIS OF A SPENT FUEL RECEIVING AND
STORAGE FACILITY USING THE GO METHODOLOGY

K-77-91U(R)

WOOD, D.E.

780101

NTIS. 119 P.

KAMAN SCIENCES CORP.

C,3;C,5;C,7;K,3;K,5,B;M,5,D;M,7

THE GO METHODOLOGY HAS BEEN USED TO PROVIDE PRELIMINARY RA

OF A SPENT FUEL RECEIVING AND STORAGE BASIN. THE FACILITY WAS STILL IN THE CONCEPTUAL DESIGN PHASE, SO THE MODEL WAS DEVELOPED TO EMPHASIZE MATERIAL FLOWS AND FUNCTIONS RATHER THAN HARDWARE. THE EXPECTED RELEASES (INSTEAD OF JUST SINGLE POINT VALUES). MATERIAL FLOW THROUGH LOCATIONS IN THE FACILITY WAS MODELED WITH RELEASE DISTRIBUTIONS DETERMINED FOR EACH SECTION OF THE FACILITY. THE EXPECTED VALUES OF THE AVERAGE ANNUAL RELEASES FROM THE FACILITY ARE FIVE ORDERS OF MAGNITUDE BELOW THE EPA PROPOSED LIMITS FOR THE TOTAL FUEL CYCLE OF THE 100GW OF NUCLEAR POWER THAT COULD BE SERVED BY THIS FACILITY.

364

TORNADO RISKS AND DESIGN WINDSPEEDS FOR THE OAK RIDGE PLANT
SITE

K-BD-1059-PT.2

OAK RIDGE GASEOUS DIFFUSION PLANT; TEXAS TECH UNIV.
750101

NTIS. 43 P.

C,1;C,3;C,5;C,7;C,0;G,7

THE EFFECTS OF TORNADOS AND OTHER EXTREME WINDS SHOULD BE CONSIDERED IN ESTABLISHING DESIGN CRITERIA FOR STRUCTURES TO RESIST WIND LOADS. DESIGN STANDARDS THAT ARE INCORPORATED IN BUILDING CODES DO NOT NORMALLY INCLUDE THE EFFECTS OF TORNADOS IN THEIR WIND LOAD CRITERIA. SOME TORNADO RISK MODELS IGNORE THE PRESENCE OF NONTORNADIC EXTREME WINDS. THE PURPOSE OF THIS STUDY IS TO DETERMINE THE PROBABILITY OF TORNADIC AND STRAIGHT WINDS EXCEEDING A THRESHOLD VALUE IN THE GEOGRAPHICAL REGION SURROUNDING THE OAK RIDGE SITE.

365

TORNADO RISK AND DESIGN WINDSPEEDS FOR THE PADUCAH PLANT
SITE

K-BD-1059-PT.4

TEXAS TECH. UNIV.
750101

NTIS. 44 P.

TEXAS TECH. UNIV.

C,1;C,3;C,5;C,7;C,0;G,7

THIS STUDY DETERMINES THE PROBABILITY OF TORNADIC AND STRAIGHT WINDS EXCEEDING A THRESHOLD VALUE IN THE REGION SURROUNDING THE PADUCAH, KY PLANT SITE. THE DESIGN CRITERIA PRESENTED ARE BASED ON A LEVEL OF RISK REPRESENTED BY A 16% PROBABILITY THAT THE DESIGN WINDSPEED WILL BE EXCEEDED WITHIN A 50 YR LIFETIME OF THE STRUCTURE.

367

RISK ANALYSIS OF A SPENT FUEL RECEIVING AND STORAGE
FACILITY USING THE GO METHODOLOGY

KSC-1006-1

WOOD, D.E.; BECAR, N.J.

790101

KAMAN SCIENCES CORP., COLORADO SPRINGS, CO. 145 P.

KAMAN SCIENCES CORP.

C,2;C,3,A;C,3,B;C,4,A;C,4,B;C,5,B;C,6;C,7;C,6;M,1;M,2;M,3,A;M,3,
B;M,4,A;M,4,B;M,5,B;M,6;M,7;M,8;M,9,A;M,9,B;M,0,A;M,0,B

THE GO METHODOLOGY HAS BEEN SUCCESSFULLY USED TO PROVIDE A COMPREHENSIVE RISK ANALYSIS OF A SPENT FUEL RECEIVING AND STORAGE BASIN. AS THE FACILITY WAS STILL IN THE CONCEPTUAL DESIGN PHASE, THE MODEL WAS DEVELOPED TO EMPHASIZE MATERIAL FLOWS AND FUNCTIONS RATHER THAN HARDWARE. THE MULTISTATE AND INTERACTIVE CAPABILITY OF GO WAS USED TO PROVIDE DISTRIBUTIONS OF EXPECTED RELEASES. MATERIAL FLOW THROUGH LOCATIONS IN THE FACILITY WAS MODELED WITH RELEASE DISTRIBUTIONS DETERMINED FOR EACH SECTION OF THE FACILITY. DETAILED RISK PLOTS ARE PROVIDED FOR SOME OF THE MORE SIGNIFICANT POTENTIAL RELEASES. THE EXPECTED VALUES OF THE AVERAGE ANNUAL POTENTIAL RELEASES FROM THE FACILITY ARE FIVE ORDERS OF MAGNITUDE BELOW THE EPA PROPOSED LIMITS FOR THE TOTAL FUEL CYCLE OF THE 100 GWE OF NUCLEAR POWER THAT COULD BE SERVED BY THIS FACILITY.

368

GEOLOGY AND PETROLOGY OF THE BASALTS OF CRATER FLAT:

APPLICATIONS TO VOLCANIC RISK ASSESSMENT FOR THE
NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS

LA-8845-MS

VANIMAN, D.; CROWE, B.

810101

LOS ALAMOS SCIENTIFIC LABORATORY, LOS ALAMOS, NM. 67 P.

LOS ALAMOS LABORATORY

L,7;L,9;N,1;N,9

VOLCANIC HAZARD STUDIES OF THE SOUTH-CENTRAL GREAT BASIN, NEVADA, ARE BEING CONDUCTED FOR THE NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS. THIS REPORT PRESENTS THE RESULTS OF FIELD AND PETROLOGIC STUDIES OF THE BASALTS OF CRATER FLAT, A SEQUENCE OF PLIOCENE TO QUATERNARY-AGE VOLCANIC CENTERS LOCATED NEAR THE SOUTHWESTERN PART OF THE NEVADA TEST SITE (NTS). CRATER FLAT IS ONE OF SEVERAL BASALTIC FIELDS CONSTITUTING A NORTH-NORTHEAST-TRENDING VOLCANIC BELT OF THE LATE CENOZOIC AGE EXTENDING FROM SOUTHERN DEATH VALLEY, CA, THROUGH THE NTS REGION TO CENTRAL NV. THE RECURRENCE OF SMALL VOLUMES OF HAWAIIITE MAGMA AT CRATER FLAT SUPPORTS ASSUMPTIONS REQUIRED FOR PROBABILITY MODELING OF FUTURE VOLCANIC ACTIVITY AND PROVIDES A BASIS FOR ESTIMATING THE EFFECTS OF VOLCANIC DISRUPTION OF A REPOSITORY SITE IN THE SOUTHWESTERN NTS REGION. PRELIMINARY DATA SUGGEST THAT SUCCESSIVE BASALT CYCLES AT CRATER FLAT MAY BE OF DECREASING VOLUME BUT RECURRING MORE FREQUENTLY.

369

ACCEPTABLE TRU PACKAGING FOR INTERIM STORAGE AND/OR

TERMINAL ISOLATION: FY-1977 FINAL REPORT

MLM-2489

DOTY, J.W.; PETERSON, J.B.

780101

NTIS. 34 P.

MOUND FACILITY, MIAMISBURG, OH

K,1;L,1

A PROGRAM WAS CONDUCTED FOR THE DEFINITION AND DEMONSTRATION OF ACCEPTABLE WASTE PACKAGES FOR DEFENSE TRANSURANIC WASTE FOR INTERIM STORAGE AND TERMINAL ISOLATION. DURING FY-77, A CONTRACTOR QUESTIONNAIRE WAS USED TO GATHER PERTINENT DATA AND TO ASSESS CONTRACTOR CONCERNS. THIS INFO WAS INTEGRATED INTO BASIC APPLICATIONS DATA IN THE FORM OF A CHECKLIST. CONCEPTUAL DESIGN SPECIFICATIONS WERE DEVELOPED BY ANALYZING AND EVALUATING THE APPLICATION DATA AGAINST FEDERAL REGULATIONS AND INTERIM/TERMINAL STORAGE CONSTRAINTS.

372

AN ANALYSIS OF THE BACK END OF THE NUCLEAR FUEL CYCLE WITH

EMPHASIS ON HIGH-LEVEL WASTE MANAGEMENT. VOL. 1

NASA-CR-155319; N-78-12823

JET PROPULSION LABORATORY

770101

NTIS. 55 P.

JET PROPULSION LABORATORY

L,1

THE PROGRAMS AND PLANS OF THE U.S. GOVERNMENT FOR THE BACK END OF THE NFC WERE EXAMINED TO DETERMINE IF THERE WERE ANY SIGNIFICANT TECHNOLOGICAL OR REGULATORY GAPS AND INCONSISTENCIES. PARTICULAR EMPHASIS WAS PLACED ON ANALYSIS OF HIGH-LEVEL NUCLEAR WASTE MANAGEMENT PLANS, SINCE THE PERMANENT DISPOSAL OF RADIOACTIVE WASTE HAS EMERGED AS A MAJOR FACTOR IN THE PUBLIC ACCEPTANCE OF NUCLEAR POWER. THE IMPLICATIONS OF VARIOUS LIGHT WATER REACTOR FUEL CYCLE OPTIONS WERE EXAMINED INCLUDING THROWAWAY, STOWAWAY, U RECYCLE, AND FU PLUS U RECYCLE. THE RESULTS OF THIS STUDY INDICATE THAT THE U.S. PROGRAM FOR HIGH-LEVEL WASTE MANAGEMENT HAS SIGNIFICANT GAPS AND INCONSISTENCIES. AREAS OF GREATEST CONCERN INCLUDE: THE ADEQUACY OF THE SCIENTIFIC DATA BASE FOR GEOLOGICAL DISPOSAL; PROGRAMS FOR THE DISPOSAL OF SPENT FUEL RODS; INTERAGENCY COORDINATION; AND UNCERTAINTIES IN NRC REGULATORY REQUIREMENTS FOR DISPOSAL OF BOTH COMMERCIAL AND MILITARY HLW.

373

DOW SYSTEM FOR SOLIDIFICATION OF LOW LEVEL RADIOACTIVE

WASTES FROM NUCLEAR POWER PLANTS

NP-21742

FILIER, H.E.

760101

DOW CHEMICAL CO., MIDLAND, MI. 22 P.

DOW CHEMICAL CO.

J,1;J,9;M,1;M,9;N,1;N,9

TECHNOLOGY WAS DEVELOPED TO IMBED WASTE SLURRIES AND SOLUTIONS IN A POLYMERIC MATRIX TO FORM A STABLE, SOLID MATERIAL. THE WATER LEACHING RATE OF TEST SPECIMENS OF THE MATERIAL PRODUCED BY THE DOW SYSTEM IS WELL WITHIN ACCEPTABLE LIMITS. LABORATORY TEST SPECIMENS WERE MADE USING THE DOW SYSTEM,

CEMENT AND UREA FORMALDEHYDE WITH SIMULATED BOILING WATER AND PRESSURIZED WATER REACTOR EVAPORATOR BOTTOMS, MIXED BED ION EXCHANGE RESINS, FILTER AIR MATERIALS AND DECONTAMINATION SOLVENT WASTES. THE SIMULATED WASTES WERE SOLIDIFIED WITH THE DOW SYSTEM WITH NO ADJUSTMENT IN PH INTO A LIQUID-FREE HOMOGENEOUS MASS. THE SOLIDS PRODUCED BY THE DOW SYSTEM HAVE HIGH STRENGTH AND COMPRESSIBILITY AND MEET OR EXCEED IAEA AND DOT STANDARDS FOR THE TRANSPORT OF RADIOACTIVE MATERIALS. WASTES SOLIDIFIED BY THE DOW SYSTEM ARE LESS SUSCEPTIBLE TO WATER LEACHING THAN THE OTHER SYSTEMS STUDIED. RADIATION EXPOSURE OF 110 MEGARADS OR 75 TEMPERATURE CYCLES BETWEEN -20 TO +140 DEGREES F ON THESE SOLIDS HAD NO MEASURED EFFECT. THE LABORATORY DATA FOR THE DOW SYSTEM WERE EXTRAPOLATED TO PREPARE 55-GAL SOLIDIFICATIONS OF THE FIVE TYPES OF SIMULATED WASTES THESE SOLIDS WERE STABLE, HOMOGENEOUS AND LIQUID-FREE. EXAMINATION AND TESTING OF THE SCALE-UP SOLIDS VERIFIED LABORATORY DATA. AFTER A SMALL-SCALE VERIFICATION TRIAL, 900 GALLONS OF A RADIOACTIVE DECONTAMINATION SOLVENT WASTE FROM A NUCLEAR POWER PLANT WERE SUCCESSFULLY SOLIDIFIED IN 55-GAL DRUMS INTO A LIQUID-FREE, STABLE, HOMOGENEOUS PRODUCT. THIS FIELD TRIAL DEMONSTRATED THE CAPABILITIES AND PREDICTABILITY OF THE DOW SYSTEM IN A PRACTICAL APPLICATION.

374

NUCLEAR FUEL REPROCESSING AND HIGH LEVEL WASTE DISPOSAL:
INFORMATION HEARINGS. VOL. 12. PUBLIC AND PRIVATE
ROLES. PT. 2

NP-22631/12/2

CALIFORNIA ENERGY RESOURCE CONSERVATION AND DEVELOPMENT
COMMISSION

770101

NTIS. 375 P.

CALIFORNIA ENERGY RESOURCE CONSERVATION AND DEVELOPMENT
COMMISSION

I,1;N,1;P,1

PRESENTATIONS WERE MADE ON INSTITUTIONAL EXPERIENCES AT NUCLEAR FUEL SERVICES, THE FRAMEWORK FOR AN ACCEPTABLE NUCLEAR FUTURE, THE PRICE-ANDERSON INDEMNITY ACT, CONGRESS AND NUCLEAR ENERGY POLICY, HUMAN DIMENSION, AND RISK PERCEPTION. THE SUPPLEMENTAL TESTIMONY AND MATERIALS SUBMITTED FOR THE RECORD INCLUDED INFORMATION OF THE NUCLEAR WASTE AT WEST VALLEY, NY, THE PERCEPTION/ACCEPTABILITY OF RISK FROM NUCLEAR AND ALTERNATIVE ENERGY SOURCES, AND PSYCHOLOGICAL DETERMINANTS OF PERCEIVED AND ACCEPTABLE RISK.

375

IMPACTS ON HUMAN HEALTH FROM COAL AND NUCLEAR FUEL CYCLES
AND OTHER TECHNOLOGIES ASSOCIATED WITH ELECTRIC POWER
GENERATION AND TRANSMISSION

NP-25188

RADFORD, E.P.

800101

U.S. EPA, WASHINGTON, DC. 54 P.

UNIV. OF PITTSBURGH

P,1;P,3;P,4;P,5;P,9;P,0

MAJOR PUBLIC HEALTH IMPACTS OF ELECTRIC POWER GENERATION
AND TRANSMISSION ASSOCIATED WITH THE NFC AND WITH COAL USE ARE
EVALUATED. COMPARISON OF THE TOTAL HEALTH EFFECTS TO THE GENERAL
PUBLIC GIVES: NUCLEAR, 0.03 TO 0.05 MAJOR HEALTH EFFECTS PER
1000 MWE/YR; COAL, 0.7 TO 3.7 PER 1000 MWE/YR. THUS FOR THE
GENERAL PUBLIC THE HEALTH RISKS FROM THE COAL CYCLE ARE ABOUT 50
TIMES GREATER THAN FOR THE NUCLEAR FUEL CYCLE.

376

SEISMOTECTONIC RISK MODELLING FOR NUCLEAR WASTE DISPOSAL IN
SWEDISH BEDROCK

KBS-TR-51

RINGDAL, F.; GJOEYSTAD, H.; HUSEBYE, E.S.

770101

NTIS. 46 P.

KAERNBRAENSLESAEKKERHET

C,3;L,1;L,3;L,7

THE PROBLEM STUDIES IN THIS REPORT CONCERNS GEOTECTONIC
RISK FACTORS FOR NUCLEAR WASTE CANISTERS SITED UNDERGROUND IN
THE SWEDISH BEDROCK, AND EMBEDDED IN TUNNELS FILLED WITH A
CLAY-LIKE MATERIAL. THE TECTONIC EVENTS CAUSING POTENTIAL DAMAGE
CAN BE CLASSED AS EARTHQUAKES AND CREEP MOTION. A MODEL HAS BEEN
DEVELOPED TO COMPUTE THE PROBABILITY OF A STORAGE AREA BEING
INTERSECTED BY A KNOWN OR UNKNOWN FAULT.

377

RISK OF ENERGY PRODUCTION. 3RD ED

AECB-1119 (REV. 2)

INHABER, H.

780101

ATOMIC ENERGY CONTROL BOARD, OTTAWA. 166 P.

ATOMIC ENERGY CONTROL BOARD

P,1 ;P,3;P,4;P,5

THIS REPORT PRESENTS AN EVALUATION OF THE RISK, BOTH
OCCUPATIONAL AND TO THE PUBLIC, OF THESE NON-CONVENTIONAL SYSTEMS
(SOLAR, WIND, OCEAN THERMAL AND METHANOL) IS GIVEN. THE
METHODOLOGY OF "RISK ACCOUNT" WILL NOT TELL WHICH ENERGY
TECHNOLOGY TO USE. HOWEVER, IT CAN BE EMPLOYED TO INFORM SOCIETY

OF THE RISK INHERENT IN COMPETING ENERGY SYSTEMS.

378

CONCEPTUAL TRU WASTE CONTAINER DESIGN SPECIFICATIONS

CONF-780506

DOTY, J.W.; PETERSON, J.B.

780501

SANDIA LABORATORIES, ALBUQUERQUE, NM

MOUND FACILITY

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROCC. 5TH

INT. SYMP. PP. 324-330.

K,1;L,1;O,1

THE REPORT FORM OF THIS PAPER IS ML-2521(CF). A CONTRACTOR QUESTIONNAIRE WAS USED TO GATHER PERTINENT DATA. SITE VISITS WERE MADE TO FORMULATE AN INTEGRATED CONTRACTOR CONSENSUS; A PACKAGING MEETING WAS HELD TO EXAMINE, DISCUSS, AND INTEGRATE PACKAGING PHILOSOPHIES; AND DATA COLLECTED FROM THESE ACTIVITIES AND FROM THE TASK FORCE MEETINGS WERE CONSOLIDATED TO PROVIDE INPUT TO THE BASIC APPLICATION CHECKLIST AND CRITERIA CHECKLISTS. CONCEPTUAL DESIGN CRITERIA WERE DEVELOPED FROM AN ANALYSIS AND EVALUATION OF THE APPLICATION DATA AGAINST FEDERAL REGULATIONS AND INTERIM/TERMINAL STORAGE CONSTRAINTS.

380

ENGINEERED INTERMEDIATE STORAGE OF SOLIDIFIED HIGH LEVEL

WASTES/A COMPARISON OF AN AIR COOLED AND A WATER

COOLED CONCEPT

CONF-8005143

AHNER, S.; DEKALS, J.J.

800101

HARWOOD ACADEMIC PUBL., NEW YORK

NUKEM GMBH, HANAU

RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL. PP. 160-180.

K,1;K,2;K,3,A;K,3,B;K,4,A;K,4,B;K,9;K,0,A;K,0,B

IN THE COURSE OF THE CEC-PROGRAM SHEET NO. 6, NUKEM JOINTLY WITH BELGONUCLEAIRE PERFORMED A COMPARATIVE STUDY ON AN AIR COOLED AND A WATER COOLED INTERMEDIATE STORAGE OF VITRIFIED, HIGHLY RADIOACTIVE WASTE (HLW) IN OVERGROUND INSTALLATIONS. FOR THIS PURPOSE, COMMON DESIGN BASIS WERE DETERMINED. IN THE CONCEPT OF THE AIR COOLED STORAGE FACILITY (NUKEM DESIGN) THE DECAY HEAT FROM THE STORAGE CANISTERS WILL BE REMOVED, USING NATURAL CONVECTION. IN THE WATER COOLED CONCEPT (BELGONUCLEAIRE CONCEPT) THE DECAY HEAT IS CARRIED OFF BY A PRIMARY AND SECONDARY FORCED COOLING SYSTEM WITH REDUNDANT AND DIVERSE DEVICES. THE SAFETY ANALYSIS CARRIED OUT BY NUKEM USED A FAULT TREE METHOD. IT SHOWS THAT THE RELIABILITY OF THE DESIGNED WATER COOLING SYSTEM IS VERY HIGH AND COMPARABLE TO THE INHERENT SAFE AIR COOLED SYSTEM. THE IMPACT FOR BOTH CONCEPTS ON THE ENVIRONMENT, IS DETERMINED BY THE RELEASE ROUTE, BUT EVEN DURING ACCIDENT CONDITIONS THE RELEASE IS FAR BELOW PERMISSIBLE LIMITS.

THE ECONOMIC ANALYSIS CARRIED OUT BY BELGONUCLEAIRE SHOWS THAT THE CONSTRUCTION COSTS FOR BOTH SYSTEMS DO NOT DIFFER VERY MUCH, BUT THE OPERATION AND MAINTENANCE COSTS FOR THE WATER COOLED FACILITY ARE 4-8 HIGHER THAN FOR THE AIR COOLED FACILITY.

381

THE HIGH-LEVEL RADIOACTIVE WASTE MANAGEMENT PROGRAM AT
NUCLEAR FUEL SERVICES

CONF-740346

DUCKWORTH, J.P.

760101

AMERICAN CHEMICAL SOCIETY, WASHINGTON, DC

NUCLEAR FUEL SERVICES

ADV. CHEM. SER. 153:72-83.

L,1;L,9

THE NFS PLANT AT WEST VALLEY, NY, WAS DESIGNED TO USE THE STANDARD PUREX AND THOREX PROCESSES WITH TWO LIQUID WASTE STREAMS: (1) LOW-LEVEL LIQUID WASTE SUCH AS PROCESS CONDENSATES AND COOLING WATER CONTAINING ONLY TRACE QUANTITIES OF RADIOACTIVITY WHICH COULD BE DISCHARGED DIRECTLY INTO THE SURROUNDING WATERWAYS, AND (2) HIGH-LEVEL LIQUIDS. SKETCHES IN THE PAPER ILLUSTRATE THE STORAGE SYSTEMS AND TABLES OF WASTE COMPOSITIONS ARE INCLUDED.

382

VOLUME REDUCTION SYSTEM FOR SOLID AND LIQUID TRU WASTE FROM

THE NUCLEAR FUEL CYCLE: JANUARY-MARCH 1978

MLM-2517

ALEXANDER, B.M.; BATCHELDER, D.A.; DOTY, J.W.; LEWIS, E.L.

780501

MOUND FACILITY, MIAMISBURG, OH. 15 P.

MOUND FACILITY

K,1;L,1

THE LABORATORY CYCLONE INCINERATOR, WHICH STARTED OPERATION IN JANUARY 1978, HAS BEEN DEVELOPED TO STUDY THE EFFECTS OF BURNING FEED CONTAINING RADIONUCLIDES OTHER THAN PU-238. THESE ISOTOPES, WHICH WILL BE PRIMARILY PRODUCTS OF FISSION, MUST BE EFFICIENTLY REMOVED FROM THE OFF-GAS, IF COMBUSTIBLE WASTE CONTAINING SUCH SPECIES IS TO BE INCINERATED. IN THE FIRST TWO MONTHS OF OPERATION, A NUMBER OF BURNS WERE MADE AND EFFORTS WERE MADE TO IDENTIFY AND REMEDY PROBLEM AREAS. PRELIMINARY DATA FROM EARLY RUNS SHOW THAT THE COMBUSTION EFFICIENCY OF THE INCINERATOR CAN STILL BE IMPROVED UPON AND INDICATE THE CHANGES NECESSARY TO IMPROVE COMBUSTION PERFORMANCE. CONTROLLED EXPERIMENTS WERE CONDUCTED ON THE PRESSED ASH-CEMENT PELLET MATRIX TO DEFINE COMPRESSIVE STRENGTH, MECHANICAL STABILITY, DENSITY, AND EFFECT OF CURING ENVIRONMENT (WET CURE AND DRY CURE). LEACHABILITY STUDIES WERE INITIATED ON PRESSED SLUDGE/CEMENT MATRIX IN DISTILLED WATER AT AMBIENT TEMPERATURE. COMPRESSIVE STRENGTHS OF SLUDGE/CEMENT PRESSED MATRIX SAMPLES

WERE INVESTIGATED. PHYSICAL AND CHEMICAL ATTRIBUTES OF INCINERATED ASH WERE EVALUATED IN RELATIONSHIP TO THE ASH/CEMENT MATRIX.

384

VOLUME REDUCTION SYSTEM FOR SOLID AND LIQUID TRU WASTE FROM THE NUCLEAR FUEL CYCLE; JULY-SEPTEMBER 1978

MLM-2569

ALEXANDER, B.M.; LEWIS, E.L.; DOTY, J.W.; BATCHELDER, D.H.
781101

MOUND FACILITY, MIAMISBURG, OH. 16 P.

MOUND FACILITY

K,1;L,1

THE LABORATORY CYCLONE INCINERATOR HAS BEEN DEVELOPED TO STUDY THE EFFECTS OF BURNING WASTES CONTAINING RADIONUCLIDES OTHER THAN PU-238. THESE ISOTOPES MUST BE EFFICIENTLY REMOVED FROM THE OFF-GAS IF COMBUSTIBLE WASTE CONTAINING FISSION PRODUCTS IS TO BE INCINERATED. MODIFICATIONS TO THE ORIGINAL INCINERATOR DESIGN WERE MADE TO INCREASE COMBUSTION EFFICIENCY, TO IMPROVE PARTICULATE AND GASEOUS POLLUTANT REMOVAL IN THE OFF-GAS SYSTEM, TO REDUCE ENERGY CONSUMPTION, AND TO DECREASE RETENTION OF MATERIAL IN THE PROCESS SYSTEM. FURTHER CHANGES CONTEMPLATED WILL PERMIT THE SAFE BURNING OF FEED MATERIAL SPIKED WITH RADIOISOTOPES. DURING THIS QUARTER THE MATRIX FOR BONE CHAR AND CEMENT MIXTURES WAS INVESTIGATED. LIMITED WORK WAS ALSO DONE ON DETERMINING THE BEST MATRIX FOR SLUDGE-CEMENT PELLETS. THE NEW GLOVEBOX LINE FOR IMMOBILIZING ASH PRODUCED FROM INCINERATION OF <10 NCI PU-238/G WASTE WAS COMPLETED. EXTENSIVE WORK WAS DONE TO DEVELOP AN ACCEPTABLE SINTERING PROCEDURE. ALMOST 200 PELLETS WERE MANUFACTURED, AND SAMPLE PELLETS WERE TESTED FOR CRUSH STRENGTH AND THERMAL STABILITY.

385

PAT-2 (PLUTONIUM AIR-TRANSPORTABLE MODEL 2) SAFETY ANALYSIS REPORT

SAND81-0001

ANDERSEN, J.A.; DAVIS, E.J.; DUFFEY, T.A.; DUPREE, S.A.; GEORGE, O.L., JR.; ORTIZ, Z.

810701

SANDIA NATIONAL LABORATORY, ALBUQUERQUE, NM. 450 P.

SANDIA NATIONAL LABORATORY

O,5;O,7;O,8;O,0,A;O,0,B

THE SAR PRESENTS DESIGN AND OPERATIONAL INFORMATION INCLUDING EVALUATIONS AND ANALYSES, TEST RESULTS, OPERATING PROCEDURES, MAINTENANCE, AND QUALITY ASSURANCE INFORMATION. BOTH TESTS AND ANALYSES WERE APPLIED TO CONFIRM THAT THE PAT-2 PACKAGE MEETS THE VARIOUS STATUTORY AND REGULATORY REQUIREMENTS. STRUCTURAL ANALYSES ADDRESS ALL OF THE STATED REQUIREMENTS AND, ADDITIONALLY, TREAT THE CONTAINMENT VESSEL BY FINITE ELEMENT ANALYSIS AND THE OVERPACK BY AN ENERGY BALANCE ANALYSIS. THERMAL

ANALYSES DEFINE MAXIMUM NORMAL OPERATING TEMPERATURE WITH THERMALLY ACTIVE RADIOISOTOPIC CONTENTS; THERMAL TESTS DEFINE MAXIMUM CREDIBLE ACCIDENT TEMPERATURES OF THE CONTAINMENT. LEAK-RATE TESTING AND PU CONTAINMENT ANALYSES TREAT THE PROBLEM OF PU TRANSPORT THROUGH VERY SMALL APERTURES OR CRACKS, FOR VARIOUS EXTREME POST- ACCIDENT CONDITIONS IMPOSED ON THE CONTAINMENT VESSEL AND ITS INTERNAL CAPSULE. PU CONTAINMENT IS CONFIRMED TO BE ORDERS OF MAGNITUDE IN EXCESS OF IAEA REQUIREMENTS (ESSENTIALLY, THERE WOULD BE NO PU RELEASE). NUCLEAR CRITICALITY ANALYSIS CONFIRMS, THROUGH THE USE OF BENCHMARKED (PROVEN) CODES, THAT THE PAT-2 PACKAGE QUALIFIES AS A FISSIONABLE CLASS 1 PACKAGE, MEANING THAT INFINITE ARRAYS OF DAMAGED PACKAGES WITH THE MOST FISSIONABLE CONTENTS PERMITTED AND WITH WATER SHIELDING REMAIN HIGHLY SUBCRITICAL. HOWEVER, SINCE THE PAT-2 IS ONLY INTENDED FOR 15 GRAMS MAXIMUM OF FISSIONABLE CONTENTS, IT IS FISSIONABLE CLASS EXEMPT. NUCLEAR SHIELDING ANALYSES CONFIRM THE REQUIRED PROTECTION FOR BIOTA FROM THE EFFECTS OF IONIZING RADIATION IN BOTH THE NORMAL AND POST-ACCIDENT CONDITIONS, CONSERVATIVELY SATISFYING ALL REGULATORY CONDITIONS.

388

FINAL GENERIC ENVIRONMENTAL STATEMENT ON THE USE OF RECYCLE PLUTONIUM IN MIXED OXIDE FUEL IN LIGHT WATER COOLED REACTORS

NUREG-0002, VOL. 3

U.S. NRC

760101

NTIS. 651 P.

U.S. NRC

C,5;C,8;G,1;G,5,A;G,5,B;G,5,C;G,5,D;G,5,E;G,5,F;G,5,H;I,1;I,5,A;I,5,B;I,5,C;I,5,D;I,5,E;I,5,F;I,5,G;I,5,H;J,1;J,5,A;J,5,B;J,5,C;J,5,D;J,5,E;J,5,F;J,5,G;J,5,H;M,1;M,5,A;M,5,B;M,5,C;M,5,D;M,5,E;M,5,F;M,5,G;M,5,H;N,1;N,5,A;N,5,B;N,5,C;N,5,D;N,5,E;N,5,F;N,5,G;N,5,H;O,1;O,5,A;O,5,B;O,5,C;O,5,D;O,5,E;O,5,F;O,5,G;O,5,H;K,1;K,5;L,1;L,5

AN ASSESSMENT IS PRESENTED OF THE HEALTH, SAFETY AND ENVIRONMENTAL EFFECTS OF THE ENTIRE LIGHT WATER REACTOR FUEL CYCLE, CONSIDERING THE COMPARATIVE EFFECTS OF THREE MAJOR ALTERNATIVES: NO RECYCLE, RECYCLE OF U ONLY, AND RECYCLE OF BOTH U AND PU. THE ASSESSMENT COVERS THE PERIOD FROM 1975 THROUGH THE YR 2000 AND INCLUDES THE CUMULATIVE EFFECTS FOR THE ENTIRE PERIOD AS WELL AS PROJECTION FOR SPECIFIC YRS. TOPICS DISCUSSED INCLUDE: THE LWR WITH PU RECYCLE; MIXED OXIDE FUEL FABRICATION; REPROCESSING PLANT OPERATIONS; SUPPORTING U FUEL CYCLE; TRANSPORTATION OF RADIOACTIVE MATERIALS; RADIOACTIVE WASTE MANAGEMENT; STORAGE OF PU; RADIOLOGICAL HEALTH ASSESSMENT; EXTENDED SPENT FUEL STORAGE; AND BLENDING OF PU AND U AT REPROCESSING PLANTS.

389

ALTERNATIVE PROCESSES FOR MANAGING EXISTING COMMERCIAL
HIGH-LEVEL RADIOACTIVE WASTES

NUREG-0043

BATTELLE, PACIFIC NORTHWEST LABORATORIES
760101

NTIS. 166 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES
K,1;K,9;L,1;L,9

A NUMBER OF ALTERNATIVES ARE DISCUSSED FOR MANAGING
HIGH-LEVEL RADIOACTIVE WASTE PRESENTLY STORED AT THE WEST VALLEY,
NY, PLANT OWNED BY NUCLEAR FUEL SERVICES, INC. THESE
ALTERNATIVES (LIQUID STORAGE, CONVERSION TO CEMENT, SHALE
FRACTURING, SHALE CEMENT, CALCINATION, AQUEOUS SILICATE,
CONVERSION TO GLASS, AND SALT CAKE) ARE LIMITED TO CONCEPTS
PRESENTLY UNDER ACTIVE INVESTIGATION BY ERDA. EACH WASTE
MANAGEMENT OPTION IS DESCRIBED AND EXPLAINED REGARDING THE
STATUS OF THE TECHNOLOGY; ITS APPLICATIONS TO MANAGING NFS WASTE;
ITS ADVANTAGES AND DISADVANTAGES; THE R & D NEEDED TO IMPLEMENT
THE OPTION; AND ESTIMATED COSTS AND TIME TO IMPLEMENT THE
PROCESS.

390

TRANSPORTATION OF LIGHT WATER REACTOR FUEL BY GOALS TRAIN -
ESTIMATION OF POTENTIAL RELEASE IN THE EVENT OF
ACCIDENTS

CONF-801115

ANSBACH, W.; SCHNEIDER, K.; BARAN, A.
801101

K.O. STORCK & CO., HAMBURG
TRANSNUKLEAR GMBH, GERMANY

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS, PROC. 6TH
INT. SYMP. PP. 383-391.

C,1;O,1;O,2;O,9

THIS PAPER REPORTS ON A STUDY CONCERNING THE RISK DUE TO
THE RELEASE OF RADIOACTIVE MATERIAL FROM SPENT LR FUEL SHIPPED
IN CASKS BY TRAIN IN GERMANY. A FAULT TREE ANALYSIS IS USED. THE
REFERENCE SCENARIO IS SUMMARIZED AND ACCIDENT CONSEQUENCES ARE
DISCUSSED.

391

CHARACTERIZATION OF THE HANFORD 300 AREA BURIAL GROUNDS -
TASK II - GEOCHEMICAL ANALYSIS

PNL-2656

AMES, L.L.; PHILLIPS, S.J.
790401

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 54 P.
PACIFIC NORTHWEST LABORATORY

N,1;N,5,D;N,5,I;N,5,J;N,5,K;N,5,L;N,9

SUMMARIZED IN THIS REPORT ARE THE APPLICATION OF A
SYSTEMATIC METHODOLOGY DEVELOPED TO EVALUATE U-CONTAMINATED

RADIOACTIVE WASTE AND ITS INTERACTIONS WITH SEDIMENTARY MATERIALS. THE METHODOLOGY COMBINES NEUTRON-ENHANCED AUTORADIOGRAPHY, X-RAY FLUORESCENCE, AND ELECTRON MICROPROBE AND RADIOCHEMICAL ANALYSES. THIS METHODOLOGY WAS APPLIED TO A SPECIFIC RADIOACTIVE WASTE DISPOSAL STRUCTURE ON THE HANFORD SITE. THE UTILITY OF THIS REPORT WILL BE TO PROVIDE GEOCHEMISTS AND OTHER NUCLEAR WASTE MANAGEMENT EXPERTS AN APPLIED METHODOLOGY TO INVESTIGATE PHENOMENA RELATIVE TO MIGRATION OF U FROM STRUCTURES. THE INFORMATION DERIVED FROM THIS INVESTIGATION WILL AID IN DEVELOPMENT OF D&D RECOMMENDATIONS FOR A SPECIFIC DISPOSAL FACILITY AND THOSE SIMILAR FACILITIES CONTAINING THE SAME OR CLOSELY RELATED MATERIALS.

392

AN ASSESSMENT OF THE RISK OF TRANSPORTING LIQUID CHLORINE
BY RAIL

PND-3376

ANDREWS, W.B.; CLARK, M.L.; FRILEY, J.R.; MCNAUGHTON, D.J.;
BUCKINGHAM M.T.; ROSS, B.A.

800301

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 164 P.

PACIFIC NORTHWEST LABORATORY

C,1;C,2;C,3;C,8;C,0

THE RISK OF SHIPPING LIQUID CHLORINE BY RAIL IS GIVEN IN THIS REPORT. THE RA METHODOLOGY USED IN THIS STUDY IS SUMMARIZED IN SECTION 3. THE METHODOLOGY IS PRESENTED IN THE FORM OF A RA MODEL WHICH IS CONSTRUCTED FOR EASE OF PERIODIC UPDATING OF THE DATA BASE SO THAT THE RISK MAY BE REEVALUATED AS ADDITIONAL DATA BECOME AVAILABLE. THE REPORT IS SECTIONED TO CORRESPOND TO SPECIFIC ANALYSIS STEPS IDENTIFIED IN THE MODEL. THE TRANSPORT SYSTEM AND ACCIDENT ENVIRONMENT ARE DESCRIBED IN SECTIONS 4 AND 5. THE RESPONSE OF THE TRANSPORT SYSTEM TO ACCIDENT ENVIRONMENTS IS DESCRIBED IN SECTION 6. RELEASE SEQUENCES ARE POSTULATED IN SECTION 7 AND EVALUATED IN SECTIONS 8 THROUGH 10 TO DETERMINE BOTH THE LIKELIHOOD AND POSSIBLE CONSEQUENCES OF A RELEASE. SUPPORTIVE DATA AND ANALYSES ARE GIVEN IN THE APPENDICES.

393

RISK COMPARISON OF CENTRALIZING OR DECENTRALIZING
PROCESSING FACILITIES FOR DEFENSE TRANSURANIC WASTE

RFP-3159

BROWN, C.M.

810301

ROCKWELL INTERNATIONAL, ROCKY FLATS PLANT, GOLDEN, CO. 62 P.

ROCKWELL INTERNATIONAL, ROCKY FLATS PLANT

C,1;C,2;C,3;C,4;C,5;C,7;C,9;K,1;K,2;K,3,A;K,3,B;K,3,C;K,3,D;K,4,
A;K,4,B;K,4,C;K,4,D;K,5,B;K,5,D;K,7,A;K,7,B;K,7,C;K,7,D;K,9;
K,0,A;K,0,B;K,0,C;K,0,D;L,1;L,2;L,3;L,4;L,5,D;L,7;L,9;L,0

THIS STUDY IS PART OF A SET OF ANALYSIS UNDER THE DIRECTION OF THE TRU WASTE MANAGEMENT PROGRAM DESIGNED TO PROVIDE

COMPREHENSIVE, SYSTEMATIC METHODOLOGY AND SUPPORT NECESSARY TO BETTER UNDERSTAND OPTIONS FOR NATIONAL LONG-TERM MANAGEMENT OF TRU WASTE. SUMMARIZED ARE THE ACTIVITIES TO EVALUATE THE RISKS OF POSSIBLE ALTERNATIVES IN LOCATING FACILITIES TO PROCESS DOE-MANAGED TRU WASTE. THE OPTIONS CONSIDERED ARE: FACILITIES LOCATED AT ALL MAJOR DOE TRU WASTE GENERATING SITES; TWO OR THREE REGIONAL FACILITIES AND CENTRAL PROCESSING FACILITY AT ONLY ONE DOE SITE. THE STUDY CONCLUDES THAT THE RADIOLOGICAL RISKS FROM ANY PROCESSING FACILITY SITING ALTERNATIVE ARE SMALL AND WOULD NOT PROHIBIT PROCESSING AT ANY SITE. THE STUDY SHOWS THAT CENTRAL, REGIONAL, OR INDIVIDUAL SITE PROCESSING ARE ROUGHLY EQUIVALENT OPTIONS BASED ON ENVIRONMENTAL RISK ALTHOUGH SOME REDUCTION IN RISK IS POSSIBLE WITH INDIVIDUAL SITE PROCESSING BECAUSE OF REDUCED TRANSPORTATION REQUIREMENTS.

394

VOLCANIC HAZARD STUDIES

CONF-7909206

CROWE, B.

791013

N115

LCS ALAMOS SCIENTIFIC LABORATORIES

WISAP RELEASE SCENARIO WORKSHOP. ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISOLATION SYSTEMS. PP. 91-93.

N,1;N,3;N,5;N,7;L,1;L,3;L,5;L,7

THE REPORT FORM OF THIS PAPER IS PNL-SA-8257. VOLCANIC HAZARDS STUDIES FOR THE WISAP PROGRAM ARE CONCERNED WITH EVALUATION OF RISK DUE TO FUTURE VOLCANISM, WITH RESPECT TO LONG-TERM ISOLATION OF RADWASTE THROUGH DEEP GEOLOGIC STORAGE. THREE MAJOR AREAS OF RESEARCH HAVE BEEN EXAMINED: (1) REGIONAL DISTRIBUTION OF QUATERNARY VOLCANISM WITH RESPECT TO REPOSITORY SITING; (2) THE CONSEQUENCES OR DISRUPTION EFFECTS DUE TO PENETRATION OF A REPOSITORY BY VOLCANISM; AND (3) PROBABILITY CALCULATIONS OF THE LIKELIHOOD OF DISRUPTION OF A REPOSITORY BY VOLCANISM.

395

SUMMARY OF FOUR RELEASE CONSEQUENCE ANALYSES FOR
HYPOTHETICAL NUCLEAR WASTE REPOSITORIES IN SALT AND
GRANITE

PNL-3548

COLE, C.R.; BOND, F.W.

800101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 131 P.

PACIFIC NORTHWEST LABORATORY

L,1;L,2;L,5,J;L,5,L;L,7;L,9

RELEASE CONSEQUENCE METHODOLOGY DEVELOPED UNDER THE ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISOLATION SYSTEMS (AEGIS) PROGRAM HAS NOW BEEN APPLIED TO FOUR HYPOTHETICAL REPOSITORY SITES. THIS REPORT SUMMARIZES THE RESULTS OF THESE

STUDIES IN ORDER TO DEMONSTRATE THAT THE FAR-FIELD METHODOLOGY DEVELOPED UNDER THE AEGIS PROGRAM OFFERS A PRACTICAL APPROACH TO THE POST-CLOSURE SA OF NUCLEAR WASTE REPOSITORIES SITED IN DEEP CONTINENTAL GEOLOGIC FORMATIONS. THE STUDIES ARE BRIEFLY DESCRIBED AND COMPARED ACCORDING TO THE FOLLOWING GENERAL CATEGORIES: PHYSICAL DESCRIPTION OF THE REPOSITORY; GEOLOGIC AND HYDROLOGIC DESCRIPTION OF THE SITE AND THE CONCEPTUAL HYDROLOGIC MODEL FOR THE SITE; DESCRIPTION OF RELEASE SCENARIO; HYDROLOGIC MODEL IMPLEMENTATION AND RESULTS; ENGINEERING BARRIERS AND LEACH RATE MODELING; TRANSPORT MODEL IMPLEMENTATION AND RESULTS; AND DOSE MODEL IMPLEMENTATION AND RESULTS.

396

ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISOLATION SYSTEMS,
THE FEASIBILITY OF COMPUTER INTERROGATION OF EXPERTS
FOR WISAP

PNL-2862

WIGHT, L.H.

800101

NTIS, 101 P.

TERA CORP.

C,1;C,3;L,1

SIMULATION OF THE RESPONSE OF A WASTE REPOSITORY TO EVENTS THAT COULD INITIATE A FAULT TREE TO BREACH AND FAILURE IS CURRENTLY A KEYSTONE TO THE BAITELLE WASTE ISOLATION SAFETY ASSESSMENT PROGRAM (WISAP). THE REPOSITORY SIMULATION, WHICH IS PART OF THE DISRUPTIVE EVENT ANALYSIS TASK, MODELS THE REPOSITORY FOR ITS ENTIRE DESIGN LIFE, ONE MILLION YRS. THIS IS CLEARLY A CHALLENGING CALCULATION, REQUIRING INPUT UNLIKE ANY OTHER RESPONSE ANALYSIS BY VIRTUE OF THE LONG DESIGN LIFE OF THE FACILITY. WHAT TECHNOLOGY WILL PROVIDE DESIGN CRITERIA FOR A MILLION YR DESIGN LIFE. ANSWERS TO QUESTIONS LIKE THIS CAN, TO SOME EXTENT, BE BASED ON DATA, BUT ALWAYS REQUIRE SOME SUBJECTIVE JUDGEMENT. THE COMPLEXITY OF THE SIMULATION, THE VARIETY OF EXPERTS INVOLVED, AND THE VOLUME OF APPLICABLE DATA ALL SUGGEST THAT THERE MAY BE A MORE DIRECT, ECONOMIC METHOD TO SOLICIT THE EXPERT OPINION. THIS REPORT ADDRESSES THE FEASIBILITY OF SUCH A SYSTEM.

398

ANNUAL REPORT ON THE CHARACTERIZATION OF HIGH-LEVEL WASTE
GLASSES

PNL-2625

ROSS, W.A.; BRADLEY, D.J.; BUNNELL, L.R.; GRAY, W.J.; KATAYAMA,
Y.B.; MELLINGER, G.B.; MENDEL, J.E.; ROBERTS, F.P.;

TURCOTTE, R.P.; WALD, J.W.; WEBER, W.E.; WESTSIK, J.H., JR.

780101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA, 70 P.

PACIFIC NORTHWEST LABORATORY

L,1;L,9;L,0

THE WASTE COMPOSITIONS OF PW-7C AND PW-9 WERE DEFINED AND GLASS DEVELOPMENT WAS COMPLETED. MAJOR VARIATIONS IN MAJOR OXIDE CONCENTRATION WOULD NOT GROSSLY AFFECT THE LEACH RATES OF THE GLASS. IMPACT AND STRENGTH TESTS ON NONRADIOACTIVE GLASS SHOWED THAT THE WASTE GLASSES PRODUCED SLIGHTLY LESS FINE PARTICULATE THAN COMMERCIAL GLASS. ADDITIONAL RESULTS ARE PROVIDED. STORED ENERGY IS NOT A PROBLEM FOR HLW GLASSES. DENSITY CHANGES ARE SMALL AND DO NOT AFFECT THE INTEGRITY OF THE SAMPLES.

399

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT.

IV. MISCELLANEOUS ASPECTS

ORNL/TM-6984

ALEXANDER, C.W.; CROFF, A.G.

800101

NTIS. 76 P.

OAK RIDGE NATIONAL LABORATORY

I,1;U,1;U,1;P,4,C;P,5,D;C,1;C,4,C;C,5,D;M,1;K,2

IN THIS REPORT DISCUSSED ARE SEVEN ASPECTS OF ACTINIDE PARTITIONING-TRANSMUTATION (P-T) WHICH ARE IMPORTANT IN ANY COMPLETE EVALUATION OF THIS WASTE TREATMENT OPTION BUT WHICH DO NOT FALL WITHIN OTHER MAJOR TOPICAL AREAS CONCERNING P-T. THE SO-CALLED "MISCELLANEOUS ASPECTS" CONSIDERED ARE: (1) THE CONCEPTUAL DESIGN OF A SHIPPING CASK FOR HIGHLY NEUTRON-ACTIVE FRESH AND SPENT P-T FUELS, (2) THE POSSIBLE IMPACTS OF P-T ON MIXED-OXIDE FUEL FABRICATION, (3) ALTERNATIVES FOR HANDLING THE EXISTING AND TO-BE-PRODUCED SPENT FUEL AND/OR WASTES UNTIL IMPLEMENTATION OF P-T, (4) THE DECAY AND DOSE CHARACTERISTICS OF P-T AND STANDARD REACTOR FUELS, (5) THE IMPLICATIONS OF P-T ON CURRENTLY EXISTING NUCLEAR POLICY IN THE U.S., (6) THE SUMMARY COSTS OF P-T, AND (7) METHODS FOR COMPARING THE RISKS, COSTS, AND BENEFITS OF P-T.

400

MODELING SAFETY PLANNING IN THE BACK-END FUEL CYCLE CONCEPT

LEVI, H.W.; MEMMERT, G.; WEIS, M.; VENZLAFF, H.; WINGENDER, H.J.

810101

HANDELBLATT GMBH, DUSSELDORF

HAHN-MEITNER-INSTITUT FÜR KERNFORSCHUNG, BERLIN

ATOMWIRTSCHAFT 26(2):71-77.

L,1;L,5,B;L,5,D;L,5,J;L,5,L

AN INTERIM REPORT HAS BEEN COMPILED ON THE WORK CARRIED OUT FOR THE PSE PROJECT; THIS REPORT ALSO GIVES A PICTURE OF THE PROBLEMS AND GOALS OF THIS PROJECT THAT WAS STARTED IN 1977. PSE IS NOT A RISK ANALYSIS BUT AN INSTRUMENT FOR SAFETY PLANNING IN THE WASTE MANAGEMENT CONCEPT. MAJOR RESEARCH CENTERS, UNIVERSITIES AND INDUSTRIAL COMPANIES ARE MAKING CONTRIBUTIONS, E.G. FOR THE CALCULATION OF ACCIDENTAL PROBABILITIES OF REPROCESSING FACILITIES AND THE AMOUNTS OF RADIOACTIVITY

RELEASED FOR THE MODELING OF ACCIDENT SCENARIOS FOR THE FINAL STORAGE SITE, AND FOR THE CALCULATION OF THE DISTRIBUTION OF RELEASED RADIONUCLIDES IN THE ATMOSPHERE AND GROUND WATER. MUCH OF THE PSE EFFORT IS DEVOTED TO THE GEOLOGIC SUBSYSTEM, THE WASTE REPOSITORY. (IN GERMAN)

401

DETERMINATION OF PERFORMANCE CRITERIA FOR HIGH-LEVEL
SOLIDIFIED NUCLEAR WASTE

NUREG-0279

COHEN, J.J.

770101

LAWRENCE LIVERMORE LABORATORY, LIVERMORE, CA. 203 P.

LAWRENCE LIVERMORE LABORATORY

L,1;L,2;L,3;L,5;L,9

THE PURPOSE OF THIS STUDY IS TO IDENTIFY AND RECOMMEND PERFORMANCE ORIENTATED CRITERIA AND/OR STANDARDS, WHICH, IF APPLIED, WOULD REDUCE THE RISK TO THE ENVIRONMENT AND PUBLIC HEALTH AND SAFETY DUE TO SOLID HLW MANAGEMENT OPERATIONS INCLUDING FINAL DISPOSAL. THE STUDY WILL RESULT IN A TWO-PART TECHNICAL REPORT DESCRIBING THE STUDY AND RESULTS AND IN AN EIS. THIS DOCUMENT DESCRIBES THE STUDY APPROACH, THE CALCULATIONAL MODEL DEVELOPED, FACTORS CONSIDERED IN THE EVALUATION, AND THE PRELIMINARY RESULTS OBTAINED TO DATE.

402

PROBABILISTIC SAFETY ANALYSIS FOR SOLIDIFIED HIGH-LEVEL
NUCLEAR WASTE MANAGEMENT SYSTEMS: A STATUS REPORT

NUREG/CR-0577

HECKMAN, R.A.; HOLDSWORTH, T.

790101

NTIS. 293 P.

LAWRENCE LIVERMORE LABORATORY

K,2;K,3;K,5;L,2;L,3;L,5;M,2;M,3;M,5

LLL IS PROVIDING TECHNICAL SUPPORT TO NRC TO HELP DEVELOP STANDARDS FOR THE MANAGEMENT AND DISPOSAL OF NUCLEAR WASTES IN DEEP GEOLOGIC REPOSITORIES. WORK COMPLETED DURING FY 77 IS REPORTED ON THOSE CHARACTERISTICS OF SOLIDIFIED HLW WHICH INFLUENCE RADIOLOGICAL RISK DURING BOTH THE FREEMPLACEMENT PORTION OF THE WASTE MANAGEMENT SYSTEM AND THE REPOSITORY POSTSEALING PERIOD. IT IS INTENDED AS A STATUS REPORT WITH EMPHASIS ON REDUCING THE UNCERTAINTIES ASSOCIATED WITH THE ANALYSES OF THE CHEMICAL AND PHYSICAL PROCESSES INVOLVED IN THE WASTE MANAGEMENT SYSTEM.

405

FINAL GENERIC ENVIRONMENTAL IMPACT STATEMENT ON URANIUM
MILLING AND MINING. PROJECT M-25. VOL. 1, SUMMARY AND
TEXT, VOL. 2. APPENDICES A-F. VOL. 3. APPENDICES G-V

NUREG-0706, VOL. 1-3

U.S. NUCLEAR REGULATORY COMMISSION, OFFICE OF NUCLEAR MATERIAL
SAFETY AND SAFEGUARDS

800101

NTIS; U.S. GPO, NRC, 1000 P.

D,1;D,3;D,4,C;D,5,B;D,5,D;D,5,F;D,5,H;D,5,L;D,9;D,0;E,1;E,3;E,4,
C;E,5,B;E,5,D;E,5,F;E,5,H;E,5,L;E,9;E,0

CUMULATIVE IMPACTS OF THE U.S. U MILLING INDUSTRY WERE
EVALUATED USING CONSERVATIVE ASSUMPTIONS ABOUT THE NEED FOR U
UNIT UNTIL THE YR 2000. NUCLEAR ENERGY GROWTH PROJECTIONS
RESULTING IN A NUCLEAR GENERATING CAPACITY OF 180 GWE IN THE YR
2000 WERE USED IN ESTIMATING U.S. U PRODUCTION NECESSARY TO MEET
ESTIMATED NEEDS. IT WAS CONSERVATIVELY ASSUMED THAT THERE WOULD
BE NO REPROCESSING OF SPENT FUEL OVER THIS TIME PERIOD. THE
RESULTING U DEMAND WOULD REQUIRE THE ADDITION OF THE EQUIVALENT
OF ABOUT 53 ADDITIONAL 1800 MT/DAY CONVENTIONAL MILLS OVER THIS
TIME PERIOD, ASSUMING GROUND GRADE QUALITY OF 0.10% AND AN
ENRICHMENT TAILS ASSAY OF 0.20%. IT IS ASSUMED THAT THE 23
CURRENTLY REQUIRED OPERATING MODEL MILL EQUIVALENTS WOULD BE
REQUIRED AT THE RATE OF ONE/YR. ALL THE NEW MILLS ARE EXPECTED TO
BE LOCATED IN THE WESTERN U.S. THE MODEL MILL IS BASED ON AN
ACID LEACH PROCESS WHICH IS COMMON TO THE INDUSTRY. IN THE BASE
CASE, TAILINGS ARE DEPOSITED IN AN ABOVE-GROUND TAILINGS
IMPOUNDMENT WHICH COMPRISES ABOUT TWO THIRDS OF THE MODEL MILL
SITE OF 150 HA. ABOUT 40% OF THE MILL TAILINGS SURFACE IS EITHER
COVERED OR SATURATED WITH TAILINGS SOLUTION DURING OPERATION,
THE REMAINDER PRESENTING A SOURCE OF RADON AND PARTICULATES. THE
MODEL REGION IS SPARSELY POPULATED WITH AN AVERAGE DENSITY OF
2.85 PERSONS/SQ KM; THE PRINCIPAL ACTIVITIES ARE RANCHING AND
EXTRACTION OF MINERAL RESOURCES.

406

RETRIEVABLE SURFACE STORAGE: INTERIM STORAGE OF SOLIDIFIED
HIGH-LEVEL WASTE

CONF-760701

LARIVIERE, J.R.; NELSON, D.C.

760701

NTIS

ATLANTIC RICHFIELD HANFORD CO.

MANAGEMENT OF WASTES FROM THE LWR FUEL CYCLE. PRCC, INT. SYMP.
PP. 290-204.

K,1

STUDIES HAVE BEEN CONDUCTED ON RETRIEVABLE-SURFACE-STORAGE
CONCEPTS FOR THE INTERIM STORAGE OF SOLIDIFIED HIGH-LEVEL
WASTES. THESE STUDIES HAVE BEEN REVIEWED BY THE PANEL ON
ENGINEERED STORAGE, CONVENED BY THE COMMITTEE ON RADIOACTIVE
WASTE MANAGEMENT OF THE NRC-NAS. THE PANEL HAS CONCLUDED THAT
"RETRIEVABLE SURFACE STORAGE IS AN ACCEPTABLE INTERIM STAGE IN A
COMPREHENSIVE SYSTEM FOR MANAGING HIGH-LEVEL RADIOACTIVE
WASTES." THE SCALED STORAGE CASK CONCEPT, WHICH WAS RECOMMENDED
BY THE PANEL ON ENGINEERED STORAGE, CONSISTS OF PLACING A

CANISTER OF WASTE INSIDE A CARBON-STEEL CASK, WHICH IN TURN IS PLACED INSIDE A THICK CONCRETE CYLINDER. THE WASTE IS COOLED BY NATURAL CONVECTION AIR FLOW THROUGH AN ANNULUS BETWEEN THE CASK AND THE INNER WALL OF THE CYLINDER. THE COMPLETE ASSEMBLY IS PLACED ABOVE GROUND IN AN OUTDOOR STORAGE AREA.

407

TERRESTRIAL EXPOSURE PATHWAYS: POTENTIAL EXPOSURES OF MAN FROM THE ENVIRONMENTAL TRANSPORT OF WASTE NUCLIDES

CONF-760701

HOFFMAN, F.O.; KAYE, S.V.

760101

NTIS

OAK RIDGE NATIONAL LABORATORY

MANAGEMENT OF WASTE FROM THE LWR FUEL CYCLE. PROC. INT. SYM. PP. 524-538.

E,1;E,2;E,5,D;E,9;F,1;F,2;F,5,D;F,9;G,1;G,2;G,5,D;G,9;H,1;H,2;H,5,D;H,9;J,1;J,2;J,5,D;J,9;K,1;K,2;K,5,D;K,9

IN THIS ANALYSIS OF THE NFC THE PRINCIPAL TERRESTRIAL EXPOSURE PATHWAYS TO MAN ARE IDENTIFIED FOR THE NORMAL RELEASE OF AIRBORNE WASTES FROM A MODEL U MILL; MODEL U, CONVERSION, ENRICHMENT, AND FUEL FABRICATION FACILITIES; MODEL LIGHT-WATER REACTORS; AND A MODEL FUEL-REPROCESSING PLANT. THE POTENTIAL IMPORTANCE OF AN EXPOSURE PATHWAY IS DETERMINED BY RELATING THE CALCULATED MAXIMUM INDIVIDUAL EXPOSURE TO THE RECOMMENDED DOSE LIMITS OF THE ICRP, THE PROPOSED LWR FUEL-CYCLE STANDARDS ISSUED BY THE U.S. EPA, AND THE LWR DESIGN OBJECTIVES PROMULGATED BY THE U.S. NRC. THE RESULTS OF THIS STUDY ARE GENERIC; THEREFORE SITE-SPECIFIC INVESTIGATIONS MUST BE RELIED ON IN THE FINAL ANALYSIS BEFORE DECISIONS RELATIVE TO THE IMPLEMENTATION OF ADDITIONAL RADIOLOGICAL PROTECTION MEASURES AND FACILITY MODIFICATIONS ARE MADE.

408

ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISOLATION SYSTEMS.

A SHORT DESCRIPTION OF THE AEGIS APPROACH

PNL-3398

SILVEIRA, D.J.; HARKELL, M.A.; NAPIER, B.A.; ZELLNER, J.T.; BENSON, G.L.

800101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 99 F.

PACIFIC NORTHWEST LABORATORY

C,1;C,2;C,5;C,7;L,1;L,5;L,7;L,9

TO MEET LICENSING CRITERIA AND PROTECTION STANDARDS FOR HLW DISPOSAL, RESEARCH PROGRAMS ARE IN PROGRESS TO DETERMINE ACCEPTABLE WASTE FORMS, CANISTERS, BACKFILL MATERIALS FOR THE REPOSITORY, AND GEOLOGICAL FORMATIONS. METHODS MUST BE DEVELOPED TO EVALUATE THE EFFECTIVENESS OF THE TOTAL SYSTEM. TO MEET THIS NEED, METHODS ARE BEING DEVELOPED TO ASSESS THE LONG-TERM EFFECTIVENESS OF ISOLATING NUCLEAR WASTES IN GEOLOGIC

FORMATIONS. THIS WORK WAS STARTED IN 1976 IN THE WISAP AND CONTINUES IN THE AEGIS PROGRAM. THE EVALUATION OF THIS LONG-TERM EFFECTIVENESS INVOLVES A NUMBER OF DISTINCT STEPS. AEGIS CURRENTLY HAS THE METHODS FOR PERFORMING THESE EVALUATION STEPS. THESE METHODS ARE CONTINUOUSLY BEING IMPROVED TO MEET THE INCREASING LEVEL OF SOPHISTICATION WHICH WILL BE REQUIRED. AEGIS DEVELOPS A CONCEPTUAL DESCRIPTION OF THE GEOLOGIC SYSTEMS AND USES COMPUTER MODELS TO SIMULATE THE EXISTING GROUNDWATER PATHWAYS. AEGIS ALSO USES A TEAM OF CONSULTING EXPERTS, WITH THE ASSISTANCE OF A COMPUTER MODEL OF THE GEOLOGIC PROCESSES, TO DEVELOP AND EVALUATE PLAUSIBLE RELEASE SCENARIOS. THEN OTHER AEGIS COMPUTER MODELS ARE USED TO SIMULATE THE TRANSPORT OF RADIONUCLIDES TO THE SURFACE AND THE RESULTANT RADIATION DOSES TO INDIVIDUALS AND POPULATIONS.

410

WASTE ISOLATION SAFETY ASSESSMENT PROGRAM TECHNICAL
PROGRESS REPORT FOR FY-1979

PNL-2874

BRANDSTETTER, A.; HARNELL, M.A.; HOWES, B.W.; BENSON, G.L.;
BRADLEY, D.J.; RAYMOND, J.R.; SERNE, R.J.; SCHILLING, A.H.
790101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 338 P.

PACIFIC NORTHWEST LABORATORY

C,2;N,1;N,2;N,5;N,6,N,7;L,1;L,2;L,5;L,6;L,7

ASSOCIATED WITH COMMERCIAL NUCLEAR POWER PRODUCTION IN THE U.S. IS THE GENERATION OF POTENTIALLY HAZARDOUS RADWASTES. DOE IS SEEKING TO DEVELOP NUCLEAR WASTE ISOLATION SYSTEMS IN GEOLOGIC FORMATIONS THAT WILL PRECLUDE CONTACT WITH THE BIOSPHERE OF WASTE RADIONUCLIDES IN CONCENTRATIONS WHICH ARE SUFFICIENT TO CAUSE DELETERIOUS IMPACT ON HUMANS OR THEIR ENVIRONMENTS. COMPREHENSIVE ANALYSES OF SPECIFIC ISOLATION SYSTEMS ARE NEEDED TO ASSESS THE EXPECTATIONS OF MEETING THAT OBJECTIVE. THE WASTE ISOLATION SA PROGRAM HAS BEEN ESTABLISHED AT PNL FOR DEVELOPING THE CAPABILITY OF MAKING THOSE ANALYSES. PROGRESS ON THE FOLLOWING TASKS IS REPORTED: RELEASE SCENARIO ANALYSIS, WASTE FROM RELEASE RATE ANALYSIS, RELEASE CONSEQUENCE ANALYSIS, SORPTION-DESORPTION ANALYSIS, AND SOCIETAL ACCEPTANCE ANALYSIS.

411

ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISOLATION SYSTEMS.
PERSPECTIVES ON THE GEOLOGICAL AND HYDROLOGICAL
ASPECTS OF LONG-TERM RELEASE SCENARIO ANALYSES

PNL-2928

STOTTLEMYRE, J.A.; WALLACE, R.W.; BENSON, G.L.; ZELLMER, J.T.
800101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 123 P.

PACIFIC NORTHWEST LABORATORY

N,2;N,7;N,9;L,2;L,7;L,9

INFO THAT MAY BE RELEVANT TO INDIVIDUALS INVOLVED WITH ANALYZING LONG-TERM RELEASE SCENARIOS OF SPECIFIC REPOSITORIES FOR NUCLEAR WASTE IS PRESENTED. THE BULK OF THE INFO IS DERIVED FROM RECENT STUDIES IN W GERMANY AND THE U.S. EMPHASIS IS ON THE SPECIFIC GEOLOGICAL AND HYDROLOGICAL PHENOMENA THAT, ALONE OR IN CONCERT, COULD POTENTIALLY PERTURB THE AREA AROUND SPECIFIC REPOSITORY SITES. RESEARCH IS CONTINUING ON MOST OF THE TOPICS DISCUSSED WITHIN THIS REPORT. BECAUSE RESEARCH IS ONGOING, STATEMENTS AND CONCLUSIONS DESCRIBED IN THIS DOCUMENT ARE SUBJECT TO CHANGE. THE MAIN TOPICS OF THE REPORT ARE: FRACTURING, GEHYDROLOGY, MAGMATIC ACTIVITY, AND GEOMORPHOLOGY.

412

THE "PROJECT-SAFETY-STUDIES ENTSCORGUNG" IN THE FEDERAL REPUBLIC OF GERMANY

STI/PUB/526

LEVI, H.W.

800101

IAEA, VIENNA

HAHN-MEITNER-INSTITUT FUER KERNFORSCHUNG BERLIN GMBH

UNDERGROUND DISPOSAL OF RADIOACTIVE WASTES. FP. 437-450.

N,1;N,2;N,5,D;N,7;L,1;L,2;L,5,D;L,7

WORK ON THE PROJECT'S FIRST PHASE STARTED IN OCT. '77, AND IS PROJECTED TO BE COMPLETED IN 1981. ("ENTSCORGUNG" MEANS BACK-END OF THE FUEL CYCLE). THE PURPOSE OF PSE IS TO ANALYZE IMPORTANT SAFETY ASPECTS OF FRG'S NUCLEAR ENTSCORGUNG CENTER (NEC) IN CONSIDERABLE DEPTH. IT IS A RESEARCH PROJECT RATHER THAN PART OF THE LICENSING PROCEDURE. PSE IS NOT A FORM OF RISK ANALYSIS THOUGH IT EMPLOYS MUCH OF THE METHODOLOGY OF RISK ANALYSIS. OTHER THAN REACTOR SAFETY STUDIES, IT DEALS WITH INSTALLATIONS STILL IN THE DESIGN PHASE. THE PRESENT PURPOSE OF PSE IS TO COLLECT RELIABILITY AND PERFORMANCE DATA, TO ADAPT OR DEVELOP MODELS AND COMPUTER PROGRAMS CONCERNING RADIONUCLIDE RELEASE MECHANISMS AND RELEASE CONSEQUENCES AND EVENTUALLY TO TEST THEM OUT WITH SUITABLE SUBSYSTEMS OF THE NEC. TWO POINTS ARE CONSIDERED IMPORTANT PECULIARITIES OF WASTE REPOSITORY SAFETY ANALYSES: (1) EMPLOYMENT OF A DETERMINISTIC RATHER THAN OF A PROBABILISTIC APPROACH; (2) DEFINITION OF A SIGNIFICANT PERIOD OF WASTE REPOSITORY HAZARD TO SERVE AS A GUIDELINE FOR A TIME LIMITATION OF THE ANALYSIS. THESE ARE DISCUSSED IN THE PAPER AND THE PSE POLICY IS EXPLAINED.

413

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT.

V. PRECONCEPTUAL DESIGNS AND COSTS OF PARTITIONING

FACILITIES AND SHIPPING CASKS (SUMMARY REPORT)

ORNL/TM-6985

SMITH, A.E.; DAVIS, D.F.

800101

N11S. 101 P.

OAK RIDGE NATIONAL LABORATORY
C,1;I,1;I,9;J,1;J,9;O,1;O,9

EVALUATION OF THE INCENTIVES FOR IMPLEMENTING PARTITIONING-TRANSMUTATION (P-T) REQUIRES THAT THE DIFFERENTIAL CAPITAL AND OPERATING COSTS BE ESTIMATED TO PROVIDE A BASIS FOR COMPARISON WITH AN ANALOGOUS GENERIC REFERENCE FUEL CYCLE. PRECONCEPTUAL PROCESS FACILITY DESIGNS BASED ON P-T PROCESS FLOW SHEETS AND A PRECONCEPTUAL SHIPPING CASK DESIGN PROVIDED THE BASIS FOR THE REQUIRED COST ESTIMATES. ESTIMATES OF THE FUEL CYCLE SHIPPING, REPROCESSING AND FUEL FABRICATION COST IMPACT WERE DEVELOPED FOR USE IN THE OVER ALL INCENTIVES EVALUATION.

414

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT.

III. TRANSMUTATION STUDIES

ORNL/TM-6983

WACHTER, J.W.; CROFF, A.G.

800101

NTIS. 54 P.

OAK RIDGE NATIONAL LABORATORY

J,1;P,1

TRANSMUTATION OF THE LONG-LIVED NUCLIDES CONTAINED IN FUEL CYCLE WASTES HAS BEEN SUGGESTED AS A MEANS OF REDUCING THE LONG-TERM TOXICITY OF THE WASTES. A COMPREHENSIVE PROGRAM TO EVALUATE THE FEASIBILITY AND INCENTIVES FOR RECOVERING THE ACTINIDES FROM WASTES (PARTITIONING) AND TRANSMUTING THEM TO SHORT-LIVED OR STABLE NUCLIDES HAS BEEN IN PROGRESS FOR 3 YRS UNDER THE DIRECTION OF ORNL. THIS REPORT CONSTITUTES THE FINAL ASSESSMENT OF TRANSMUTATION IN SUPPORT OF THE PROGRAM. INCLUDED ARE (1) SUMMARY OF RECENT TRANSMUTATION LITERATURE, (2) A GENERIC EVALUATION OF ACTINIDE TRANSMUTATION IN THERMAL, FAST, AND OTHER TRANSMUTATION DEVICES, (3) A PRELIMINARY EVALUATION OF TC-99 AND I-129 TRANSMUTATION, AND (4) A CHARACTERIZATION OF A PRESSURIZED-WATER-REACTOR FUEL CYCLE WITH AND WITHOUT PROVISIONS FOR ACTINIDE RECOVER AND TRANSMUTATION FOR USE IN OTHER PARTS OF THE ORNL PROGRAM. THE PRINCIPAL CONCLUSION OF THE REPORT IS THAT ACTINIDE TRANSMUTATION IS FEASIBLE IN BOTH THERMAL AND FAST REACTOR, SUBJECT TO DEMONSTRATING SATISFACTORY FUEL PERFORMANCE, WITH RELATIVELY LITTLE IMPACT ON THE REACTOR. IT WOULD ALSO APPEAR THAT DECISION TO PROCEED WITH ACTINIDE TRANSMUTATION HAS BEEN MADE BY THE RESPONSIBLE AUTHORITIES.

415

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT.

II. PARTITIONING PROCESSES FOR THE LWR FUEL REPROCESSING AND REFABRICATION PLANT WASTES

ORNL/TM-6982

TEDDER, D.W.; FINNEY, B.C.; BLOMEKE, J.O.

800101

NTIS. 204 P.

OAK RIDGE NATIONAL LABORATORY
I,1;J,1;L,1;N,1

THIS REPORT PRESENTS CHEMICAL PROCESSING FLOWSHEETS THAT WERE DEVELOPED FOR USE IN CONCEPTUAL WASTE TREATMENT FACILITIES (WTFS) FOR PARTITIONING (SEPARATING) ACTINIDES FROM COMMERCIAL LWR REPROCESSING AND REFABRICATION WASTES. THESE FLOWSHEETS MAY BE USED IN CONJUNCTION WITH ACTINIDE TRANSMUTATION, SPACE DISPOSAL OF THE SEPARATED TRANSURANICS, OR ALTERNATIVE MANAGEMENT WITH SPECIALLY DESIGNED ACTINIDE WASTE FORMS. THE CHEMICAL FLOWSHEETS PROVIDE FOR TREATING ALL ALPHA (ACTINIDE-BEARING) WASTES THAT ARE NORMALLY PRODUCED DURING FUEL RECYCLE OPERATIONS, INCLUDING THE HIGH-LEVEL LIQUID WASTE (HLLW); HEPA FILTERS AND CONTAMINATED INCINERATOR ASHES; AND CHEMICAL SALT WASTES SUCH AS THE SODIUM CARBONATE SCRUB SOLUTIONS USED FOR TBP CLEANUP, DECONTAMINATION WASTES, CONTAMINATED SUMP WASTES, ANALYTICAL LAB WASTES, AND ALKALINE OFF-GAS SCRUBBER LIQUORS.

416
HIGH-LEVEL WASTE PROGRAM. PROGRESS REPORT, OCTOBER 1, -
MARCH 31, 1979

ORNL/TM-6866
BLANCO, R.E.; LOTTS, A.L.
790101
NTIS. 52 F.
OAK RIDGE NATIONAL LABORATORY
P,1;P,3;L,1

DEVELOPMENT OF A LOW-LEVEL WASTE MANAGEMENT ANALYSIS COMPUTER CODE HAS BEEN INITIATED. AS PART OF AN ONGOING UPDATE OF THE CRIGIN CODE, MODELS OF PWRs FUELED WITH DENATURED U-233 AND DENATURED U-235 IN THORIUM OXIDE ARE BEING DEVELOPED. INFORMATION ON WASTE MANAGEMENT FOR 18 ALTERNATIVE FUEL CYCLES HAS BEEN ASSEMBLED FOR USE BY NASAP. DOCUMENTATION OF EXPERIMENTAL AND CALCULATIONAL WORK DONE FOR THE ASSESSMENT OF PARTITIONING AND TRANSMUTATION IS PROGRESSING, WHILE THE CONCEPTUAL DESIGN, COST ESTIMATION, AND RISK ANALYSIS OF PARTITIONING AND WASTE DISPOSAL FACILITIES ARE SCHEDULED FOR COMPLETION IN SEPT '79. A SERIES OF CERMET LEACH TESTS CONDUCTED BY PNL HAVE BEEN COMPLETED, AND THE SAMPLES ARE CURRENTLY BEING EXAMINED AT ORNL. RESULTS INDICATE THAT CERMETS EXHIBIT PROMISING LEACH RESISTANCE AND DURABILITY.

417
PARAMETRIC AND SENSITIVITY ANALYSIS OF WASTE ISOLATION IN A
BASALT MEDIUM
RHO-BWI-C-94
ARNETT, R.C.; BACA, R.G.; KING, I.P.; MCLAUGHLIN, D.B.; NORTON,
W.P.
810101
ROCKWELL INTERNATIONAL, ROCKWELL HANFORD OPERATIONS, RICHLAND,

WA, 175 P.
RESOURCE MANAGEMENT ASSOCIATES
L,2;L,3;L,5;L,7;L,8

THIS REPORT PRESENTS THE ANALYSIS AND FINDINGS OF A NUMERICAL MODELING STUDY. THE PURPOSE OF THE STUDY WAS TO EXAMINE THE WASTE ISOLATION CHARACTERISTICS OF THE BASALT FORMATIONS. THE STUDY BASICALLY REPRESENTS A HYDROLOGIC ANALYSIS WHICH CONSIDERS HYPOTHETICAL RELEASE CONDITIONS. A PARAMETRIC AND SENSITIVITY ANALYSIS APPROACH WAS USED IN CONJUNCTION WITH A DECISION-TREE STRATEGY. THIS APPROACH LEADS TO A SYSTEMATIC AND CONSERVATIVE ANALYSIS OF HYDROLOGIC AND TRANSPORT PROCESSES. THE MODELING METHODOLOGY USED IS BASED ON THE USE OF NUMERICAL MODELS WHICH SIMULATE THE COUPLED PROCESSES OF GROUNDWATER FLOW, HEAT TRANSPORT, AND NUCLIDE MIGRATION IN A FRACTURED- POROUS MEDIUM. APPLICATIONS OF THESE MODELS PROVIDED ESTIMATES OF THE CHANGES IN THE THERMAL FIELD, GROUNDWATER FLOW PATTERNS, AND CONTAMINANT PLUMES AS FUNCTIONS OF HYDROLOGIC AND TRANSPORT PARAMETERS. LONG-TERM SIMULATIONS, I.E., 250,000 YRS, INDICATE THAT FOR THE MOST CONSERVATIVE CONDITIONS THE RADIONUCLIDES RELEASED FROM THE REPOSITORY ARE CONTAINED IN THE HOST BASALT FORMATION. THIS SUGGESTS THAT THE NATURAL BARRIERS CAN ACHIEVE A HIGH DEGREE OF WASTE ISOLATION.

418
THE FUNCTIONS OF AN ENGINEERED BARRIER SYSTEM FOR A NUCLEAR
WASTE REPOSITORY IN BASALT
RHU-2W1-LD-23
COONS, W.E.; MOORE, E.L.; SMITH, M.J.; KASER, J.D.
8U0101
ROCKWELL INTERNATIONAL, ROCKWELL HANFORD OPERATIONS, RICHLAND,
WA, 35 P.
N,1;L,1

DEFINED IN THIS REPORT ARE THE FUNCTIONS OF COMPONENTS SELECTED FOR AN ENGINEERED BARRIER SYSTEM FOR A NUCLEAR WASTE REPOSITORY IN BASALT. THE DEFINITIONS PROVIDE A FOCAL POINT FOR BARRIER MATERIAL R & D BY DELINEATING THE PURPOSE AND OPERATIVE LIFETIME OF EACH COMPONENT OF THE ENGINEERED SYSTEM. A FIVE-COMPONENT SYSTEM IS DISCUSSED IN TERMS OF EFFECTIVE OPERATION THROUGHOUT THE COURSE OF REPOSITORY HISTORY, RECOGNIZING THAT THE EMPLACEMENT ENVIRONMENT CHANGES WITH TIME. WHILE COMPONENTS OF THE SYSTEM ARE MUTUALLY SUPPORTING, REDUNDANCY IS PROVIDED BY SUBSYSTEMS OF PHYSICAL AND CHEMICAL BARRIERS WHICH ACT IN CONCERT WITH THE GEOLOGY TO PROVIDE A FORMIDABLE BARRIER TO TRANSPORT OF HAZARDOUS MATERIALS TO THE BIOSPHERE. THE OPERATING PHILOSOPHY OF THE CONCEPTUAL ENGINEERED BARRIER SYSTEM IS CLARIFIED BY EXAMPLES PERTINENT TO STORAGE IN BASALT, AND A TECHNICAL APPROACH TO BARRIER DESIGN AND MATERIAL SELECTION IS PROPOSED. A METHOD FOR SYSTEM VALIDATION AND QUALIFICATION IS ALSO INCLUDED WHICH CONSIDERS PERFORMANCE CRITERIA PROPOSED BY RISK ASSESSMENT TO DEFINE ACCEPTABLE LEVELS OF SYSTEM PERFORMANCE.

419

BASALT WASTE ISOLATION PROJECT REFERENCE CONDITIONS FOR
LONG-TERM RISK ASSESSMENT CALCULATIONS

RHD-BWI-LD-36

STAFF, BASALT WASTE ISOLATION PROJECT

810101

ROCKWELL INTERNATIONAL, ROCKWELL HANFORD OPERATIONS, RICHLAND,
WA, 80 P.

L,1;L,7;L,9;N,1;N,7;N,9

THIS DOCUMENT DEFINES THE REFERENCE CONDITIONS NECESSARY TO PERFORM A LONG-TERM RA FOR A NUCLEAR WASTE REPOSITORY IN BASALT (NWRB). THE BASALT WASTE ISOLATION PROJECT (BWIP) IS COLLECTING GEOLOGIC AND HYDROLOGIC DATA TO DETERMINE IF A SUITABLE REPOSITORY SITE EXISTS IN SE WASHINGTON AT THE HANFORD SITE. MANY OF THE CONCLUSIONS DRAWN FROM THESE DATA, AS WELL AS THE INDIVIDUAL DATA PARAMETERS, ARE NEEDED TO DETERMINE THE RISKS ASSOCIATED WITH A NWRB. WHERE SPECIFIC DATA ARE NOT YET AVAILABLE, BEST-ESTIMATE VALUES ARE DEFINED FOR RISK CALCULATIONS. THE FOLLOWING APPROACH TO RA IS BEING PURSUED BY THE BWIP: (1) DEFINE THE REFERENCE CONDITIONS PERTAINING TO BASALT, (2) DEVELOP RELEASE SCENARIOS, AND (3) PERFORM RA CALCULATIONS FOR THE BASE CASE AND THE SELECTED RELEASE SCENARIOS. THE ANALYTICAL APPROACH BEING USED TO DETERMINE LONG-TERM RISKS FROM AN NWRB IS THE ASSESSMENT METHOD FOR RADIOACTIVE WASTES (AMRAW). THIS DOCUMENT WILL PROVIDE INPUTS TO THE FOLLOWING AMRAW STEPS: INVENTORY AT RISK, CHARACTERIZE REPOSITORY, MULTIPLE BARRIER MODEL, GROUNDWATER TRANSPORT, EVALUATION TIME FRAME, AND AIR DISPERSION.

420

RADIONUCLIDE RELEASE SCENARIO SELECTION PROCESS FOR A
POSSIBLE REPOSITORY IN BASALT

RHD-BWI-SA-83

ARNETT, R.C.; BACA, R.G.; CAGGIANO, J.A.; CARRELL, D.J.; LOGAN,
S.E.

800101

ROCKWELL INTERNATIONAL, ROCKWELL HANFORD OPERATIONS, RICHLAND,
WA, 14 P.

L,2;L,6;L,7;N,2;N,6;N,7

PRELIMINARY RADIONUCLIDE RELEASE SCENARIOS CONSIDERED ARE: INTERCONNECTING FAULT, MAGMATIC DIKE OR SILL INTRUSION, SHAFT SEAL FAILURE, BOREHOLE INTRUSION, AND FRACTURING DUE TO MICROEARTHQUAKE SWARMS. THE PAPER WAS PREPARED FOR PRESENTATION AT: INTERNATIONAL WORKSHOP ON RADIONUCLIDE SCENARIOS FOR GEOLOGIC REPOSITORIES, PARIS, SEPTEMBER 8-12, 1980.

421

IDENTIFICATION OF KEY RADIONUCLIDES IN A NUCLEAR WASTE

REPOSITORY IN BASALT

RHO-241-SI-9

BARNEY, G.S.; WOOD, B.J.

800101

NTIS. 33 P.

ROCKWELL HANFORD OPERATIONS

L,1;L,2;L,5;L,9;N,1;N,2;N,5;N,9

RADIONUCLIDES WERE IDENTIFIED WHICH APPEAR TO POSE THE GREATEST POTENTIAL HAZARD TO MAN DURING LONG-TERM STORAGE OF NUCLEAR WASTE IN A REPOSITORY MINED IN THE COLUMBIA PLATEAU BASALT FORMATION. THE TEN MOST IMPORTANT RADIONUCLIDES IN ORDER OF DECREASING HAZARD ARE: TC-99, I-129, NP-237, RA-226, PD-107, TH-230, PB-210, SN-126, SE-79, AND PU-242. SAFETY ASSESSMENT STUDIES AND THE DESIGN OF ENGINEERED BARRIERS SHOULD CONCENTRATE ON CONTAINMENT OF NUCLIDES IN THIS LIST.

422

ASSESSMENT OF POTENTIAL RADIONUCLIDE TRANSPORT IN
SITE-SPECIFIC GEOLOGIC FORMATIONS

SAND79-2468

DOSCH, R.G.

800101

NTIS. 40 P.

SANDIA NATIONAL LABORATORIES

L,2;L,5;L,9;N,2;N,5;N,9

ASSOCIATED WITH THE DEVELOPMENT OF DEEP, GEOLOGIC REPOSITORIES FOR NUCLEAR WASTE ISOLATION IS A NEED FOR SA OF THE POTENTIAL FOR NUCLIDE MIGRATION. FREQUENTLY USED IN ESTIMATING MIGRATION RATES IS A PARAMETER GENERALLY KNOWN AS A DISTRIBUTION COEFFICIENT WHICH DESCRIBES THE DISTRIBUTION OF A RADIONUCLIDE BETWEEN A SOLID (ROCK) AND A LIQUID (GROUNDWATER) PHASE. LAB STUDIES WERE PERFORMED TO DETERMINE RADIONUCLIDE SORPTION RATES ON ROCKS.

423

DETERMINATION OF ACCEPTABLE RISK CRITERIA FOR NUCLEAR WASTE
MANAGEMENT

UCKL-52404

COHEN, J.J.

770101

NTIS. 71 P.

LAWRENCE LIVERMORE LABORATORY

C,1;C,3;C,5

THE INITIAL PHASE OF THE WORK PERFORMED DURING FY '77 CONSISTED OF PERFORMING A "SCOPING" STUDY TO DEFINE ISSUES, DETERMINE AN OPTIMAL METHODOLOGY FOR THEIR RESOLUTION, AND COMPIL A DATA BASE FOR ACCEPTABLE RISK CRITERIA DEVELOPMENT. THE ISSUES, SPANNING TECHNICAL, PSYCHOLOGICAL, AND ETHICAL DIMENSIONS, WERE CATEGORIZED IN SEVEN MAJOR AREAS: (1) UNPLANNED OR ACCIDENTAL EVENTS, (2) PRESENT VS FUTURE RISKS, (3)

INSTITUTIONAL CONTROLS AND RETRIEVABILITY, (4) DOSE-RESPONSE MECHANISM AND UNCERTAINTY, (5) SPATIAL DISTRIBUTION OF EXPOSED POPULATIONS, (6) DIFFERENT TYPES OF NUCLEAR WASTES, AND (7) PUBLIC PERCEPTION. THE DATA BASE DEVELOPED DURING THE STUDY COMPRISES EXISTING REGULATIONS AND GUIDELINES, MAXIMUM PERMISSIBLE DOSE, NATURAL GEOLOGIC HAZARDS, NONRADIOACTIVE HAZARDOUS WASTE PRACTICES, BIOETHICAL PERSPECTIVES, AND DATA FROM AN OPINION SURVEY.

424

ASSESSMENT OF RADIOLOGICAL IMPACT OF THE INACTIVE
URANIUM-MILL TAILINGS PILE AT SALT LAKE CITY, UTAH

ORNL/TM-5251

HAYWOOD, F.F.; GOLDSMITH, W.A.; PERDUE, P.T.; FOX, W.F.;
SHINPAUGH, W.H.

760101

NTIS. 106 P.

OAK RIDGE NATIONAL LABORATORY

E,5,D;E,5,L

ONE OF THE LARGEST INACTIVE U MILL TAILINGS PILES IN THE U.S. IS LOCATED WITHIN METROPOLITAN SALT LAKE CITY, UT. A RADIOLOGICAL SURVEY WAS PERFORMED AT THIS SITE DURING THE FALL OF '75. A SERIES OF FIELD AND LAB ANALYSES WERE PERFORMED TO CHARACTERIZE THE SPREAD OF CONTAMINATION FROM THE TAILINGS PILE TO SURROUNDING AREAS. THESE ANALYSES PROVIDED A BASIS FOR DISCUSSION OF THE IMPORTANT PATHWAYS FOR TRANSPORT OF RADIOACTIVITY TO MAN. MEASUREMENTS OF RADIONUCLIDE CONCENTRATIONS IN SOIL INDICATED THAT RADIUM HAD MIGRATED UP TO ONE METER INTO SOIL BENEATH THE TAILINGS. TAILINGS MATERIAL WAS FOUND OUT TO DISTANCES OF SEVERAL HUNDRED METERS, MOSTLY IN THE PREVAILING WIND DIRECTIONS. ELEVATED LEVELS OF RA-226, U-238, TH-230, AND PB-210 WERE FOUND IN SEDIMENTS OF STREAMS RUNNING THROUGH THE MILL SITE; BUT IN JORDAN RIVER SAMPLES, RADIONUCLIDE CONCENTRATIONS WERE OF THE SAME MAGNITUDE AS BACKGROUND SAMPLES COLLECTED IN OTHER PARTS OF THE SALT LAKE VALLEY. ATMOSPHERIC DISPERSION OF RADON GAS, WHICH EMANATES FROM THE PILE CONTINUOUSLY, WAS CALCULATED. POTENTIAL HEALTH EFFECTS FOR CONTINUOUS EXPOSURE TO RADON PROGENY AND EXTERNAL GAMMA RADIATION FROM THE PILE IN ITS CURRENT STATE WERE ESTIMATED USING RISK ESTIMATORS PRESENTED IN THE BIER REPORT. FOR THE 400,000 RESIDENTS WITHIN 11 KM (7 MI) OF THE PILE, 0.4 CASES OF LUNG CANCER PER YR WERE ESTIMATED. FOR THE SAME POPULATION EXPOSURE TO NATURAL LEVELS OF RADON PROGENY, 7.2 CASES PER YR WERE ESTIMATED.

425

POTENTIAL CONTAINMENT FAILURE MECHANISMS AND THEIR
CONSEQUENCES AT A RADIOACTIVE WASTE REPOSITORY IN
BEDDED SALT IN NEW MEXICO

ORNL/TM-4639

CLAIBORNE, H.C.

740101

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN. 84 P.

OAK RIDGE NATIONAL LABORATORY

L,1;L,2;L,3;L,5,B;L,5,D;L,5,J;L,5,L;L,6;L,7;L,9;L,0;N,1;N,2;N,3;
N,5,B;N,5,D;N,5,J;N,5,L;N,6;N,7;N,9;N,0;

IN THIS REPORT THE POTENTIAL CONTAINMENT FAILURE MECHANISMS AND ESTIMATES THEIR PROBABILITIES AND CONSEQUENCES, WHEN POSSIBLE, FOR A HYPOTHETICAL WASTE REPOSITORY LOCATED IN BEDDED SALT IN SE NM ARE EXAMINED. THE PRIMARY CONCLUSION OF THIS STUDY IS THAT A SERIOUS BREACH OF CONTAINMENT FOR SUCH A REPOSITORY, EITHER BY HUMAN ACTION OR NATURAL EVENTS, IS ONLY A VERY REMOTE POSSIBILITY AND FALLS INTO THE CATEGORY OF LEAST LIKELY OCCURRENCES WHICH AFFECT SOCIETY. A SEALED REPOSITORY 600 M UNDERGROUND WOULD BE VIRTUALLY SABOTAGE PROOF; EVEN THE SURFACE BURST OF A 50-MEGATON NUCLEAR WEAPON COULD NOT BREACH THE CONTAINMENT. ACCIDENTAL DRILLING OF BOREHOLES THROUGH THE DISPOSAL HORIZON COULD CAUSE RELATIVELY MINOR LOCAL CONTAMINATION. THE MECHANISM OF CONTAINMENT FAILURE WITH THE MOST SERIOUS POTENTIAL CONSEQUENCES SEEMS TO BE THE IMPACT OF A METEORITE THAT PRODUCES A CRATER EXTENDING TO THE DISPOSAL HORIZON. A PATHWAY ANALYSIS SHOWED THAT INDIVIDUALS LIVING EXCLUSIVELY ON FOODSTUFFS PRODUCED IN THE CONTAMINATED AREA WOULD BE EXPOSED TO HIGH RADIATION DOSES.

426

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT.

V1. SHORT-TERM RISK ANALYSIS OF REPROCESSING,
REFABRICATION, AND TRANSPORTATION; REFABRICATION, AND
TRANSPORTATION; APPENDIX

ORNL/SUB-80/31048/1

FULLWOOD, R.R.; JACKSON, E.

800101

NTIS. 355 P.

SCIENCE APPLICATIONS, INC.

I,3;I,4,A;I,4,C;I,4,E;I,4,G;I,5,B;I,5,D;I,5,F;I,5,H; J,3;J,4,A;J,
4,C;J,4,E;J,4,G;J,5,B;J,5,D;J,5,F;J,5,H; L,3;L,4,A;L,4,C;L,
4,E;L,4,G;L,5,B;L,5,D;L,5,F;L,5,H

THE CHEMICAL TECHNOLOGY DIVISION OF ORNL HAS PREPARED A SET OF DOCUMENTS THAT EVALUATE A PT FUEL CYCLE RELATIVE TO A REFERENCE CYCLE EMPLOYING CONVENTIONAL FUEL-MATERIAL RECOVERY METHODS. THE PT CYCLE USES ENHANCED RECOVERY METHODS SO THAT MOST OF THE LONG-LIVED ACTINIDES ARE RECYCLED TO NUCLEAR POWER PLANTS AND TRANSMUTED TO SHORTER-LIVED MATERIALS, THEREBY REDUCING THE WASTE TOXICITY. THIS REPORT COMPARES THE TWO FUEL CYCLES ON THE BASIS OF THE SHORT-TERM RADIOLOGICAL AND NONRADIOLOGICAL RISKS THEY PRESENT TO THE PUBLIC AND TO WORKERS. THE ACCIDENTAL RADIOLOGICAL RISK TO THE PUBLIC IS ANALYZED BY ESTIMATING THE PROBABILITIES OF SETS OF ACCIDENTS; THE CONSEQUENCES ARE CALCULATED USING THE CRAC CODE APPROPRIATELY MODIFIED FOR THE MATERIAL COMPOSITION. ROUTINE RADIOLOGICAL

RISKS TO THE PUBLIC ARE ESTIMATED FROM THE CALCULATED RELEASE AMOUNTS; THE EFFECTS ARE CALCULATED USING THE CRAC CODE. RADIOLOGICAL OCCUPATIONAL RISKS ARE DETERMINED FROM PRIOR EXPERIENCE, PROJECTED STANDARDS, AND ESTIMATES OF ACCIDENT RISK. NONRADIOLOGICAL RISKS ARE CALCULATED FROM THE NUMBER OF PERSONNEL INVOLVED, HISTORICAL EXPERIENCE, AND EPIDEMIOLOGICAL STUDIES. THE RESULTS OF THIS ANALYSIS IS THAT THE SHORT-TERM RISK OF PT IS 2.9 TIMES GREATER THAN THAT OF THE REFERENCE CYCLE, PRIMARILY DUE TO THE LARGER AMOUNT OF INDUSTRY. THIS CONCLUSION IS STRONGLY DOMINATED BY THE NONRADIOLOGICAL RISK, WHICH IS ABOUT 150 TIMES GREATER THAN THE RADIOLOGICAL RISK. THE ABSOLUTE RISK IS ESTIMATED FOR THE FUEL CYCLE PORTIONS CONSIDERED IN THIS REPORT IS 0.91 FATALITIES/GWE-YR FOR THE PT CYCLE AND 0.34 FATALITIES/GWE-YR FOR THE REFERENCE CYCLE. THIS SHOULD BE COMPARED WITH INHABER'S ESTIMATE OF 1.5 FOR NUCLEAR AND 150 FOR COAL. ALL OF THE RISKS ASSUMED HERE ARE ASSOCIATED WITH THE PRODUCTION OF ONE BILLION WATTS OF ELECTRICITY (GWE)/YR.

427

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM. FINAL REPORT.

VII. LONG-TERM RISK ANALYSIS OF THE GEOLOGIC

REPOSITORY: APPENDIX

ORNL/SUP-80/31038/1

LOGAN, S.E.; CONARTY, R.L.; NG, H.S.; RAHAL, L.J.; SHIRLEY, C.G.
800101

NTIS. 612 P.

LCS ALAMOS TECHNICAL ASSOCIATES, INC.

J,1;L,1;L,2;L,3;L,5,J;L,5,L;L,9

THIS REPORT IS AN APPENDIX TO ORNL/TM-6987 (ACN=169). THE CHEMICAL TECHNOLOGY DIVISION OF ORNL HAS PREPARED A SET OF DOCUMENTS THAT EVALUATE PT FUEL CYCLE RELATIVE TO A REFERENCE CYCLE EMPLOYING CONVENTIONAL FUEL-MATERIAL RECOVERY METHODS. THE PT CYCLE USES ENHANCED RECOVERY METHODS SO THAT MOST OF THE LONG-LIVED ACTINIDES ARE RECYCLED TO NUCLEAR POWER PLANTS AND TRANSMUTED TO SHORTER-LIVED MATERIALS, THEREBY REDUCING WASTE TOXICITY. DATA PERTAINING TO THE LONG-TERM RISK ANALYSIS OF WASTE GENERATED FROM THE PT FUEL CYCLE ARE PRESENTED.

428

KRYPTON-85 HYDROFRACTURE ENGINEERING FEASIBILITY AND SAFETY

EVALUATION

ORNL/ENG/TM-22

PERETZ, F.J.; MULLER, M.E.; PAN, P.Y.

810101

NTIS. 196 P.

OAK RIDGE NATIONAL LABORATORY

J,1;P,1;

ENGINEERING STUDIES HAVE BEEN MADE TO DETERMINE THE HAZARDS ASSOCIATED WITH THE DISPOSAL OF KR-85 USING THE HYDROFRACTURE PROCESS. TO ASSESS THE HAZARDS, AN EFFORT HAS BEEN MADE TO

IDENTIFY THE EQUIPMENT REQUIRED TO ENTRAIN AND DISSOLVE THE NOBLE GAS INTO THE GROUT STREAM AT HYDROFRACTURE PRESSURE. OFF-THE-SHELF OR SLIGHTLY MODIFIED EQUIPMENT HAS BEEN IDENTIFIED FOR SAFE AND EFFECTIVE COMPRESSION AND GAS-GROUT MIXING. NO INSURMOUNTABLE SAFETY OR ENGINEERING PROBLEMS HAVE BEEN IDENTIFIED.

429

RARE EVENTS: A STATE OF THE ART

ORNL/CSD-73

UPPULURI, V.R.R.

800101

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN, 44 P.

OAK RIDGE NATIONAL LABORATORY

C,1;C,3;

THE STUDY OF RARE EVENTS HAS BECOME INCREASINGLY IMPORTANT IN THE CONTEXT OF NUCLEAR SAFETY. SOME PHILOSOPHICAL CONSIDERATIONS, SUCH AS THE FRAMEWORK FOR THE DEFINITION OF A RARE EVENT, RARE EVENTS AND SCIENCE, RARE EVENTS AND TRANS-SCIENCE, AND RARE EVENTS AND PUBLIC PERCEPTION, ARE DISCUSSED. THE TECHNICAL WORK OF THE TASK FORCE ON PROBLEMS OF RARE EVENTS IN THE RELIABILITY ANALYSIS OF NUCLEAR PLANTS (1976-1978), SPONSORED BY OECD, IS REVIEWED. SOME RECENT TECHNICAL CONSIDERATIONS ARE DISCUSSED, AND CONCLUSIONS ARE PRESENTED. THE APPENDIX CONTAINS AN ESSAY WRITTEN BY ANNE E. BEACHEY, UNDER THE TITLE: A STUDY OF RARE EVENTS - PROBLEMS AND PROMISES.

431

DIRECTORY OF PARAMETERS USED IN A SERIES OF ASSESSMENT APPLICATIONS OF THE AIRDOS-EPA AND DARTAB COMPUTER CODES

ORNL-5710

BAES, C.F., III; SHARP, R.D.

810101

NTIS. 86 P.

OAK RIDGE NATIONAL LABORATORY

C,1;C,2;C,3;C,4;C,5;C,7

BETWEEN JAN-SEPT '80, ORNL PERFORMED A SERIES OF RADIOLOGICAL DOSE AND RA FOR THE U.S. EPA OF 79 FACILITIES IN THE U.S. WHICH RELEASE RADIONUCLIDES TO THE ATMOSPHERE ON A ROUTINE BASIS. THE AIRDOS-EPA COMPUTER CODE WAS USED TO SIMULATE ATMOSPHERIC AND TERRESTRIAL TRANSPORT AND TO CALCULATE RESULTING ENVIRONMENTAL EXPOSURES OF INDIVIDUALS AND POPULATIONS TO CONTAMINATED GROUND SURFACES, AIR, MEAT, MILK, AND VEGETABLES. DOSES AND RISKS FROM THESE EXPOSURES WERE CALCULATED SEPARATELY IN THE COMPUTER CODE DARTAB USING DOSE AND RISK FACTORS DEVELOPED THROUGH THE RADRISK AND INREM II COMPUTER CODES. BECAUSE OF THE IMPORTANCE OF THESE ASSESSMENTS IN DETERMINING EPA ACTIONS CONCERNING THESE FACILITIES AND THE POSSIBILITY OF

CONFLICT OF INTEREST (ORNL WAS ONE OF THE FACILITIES ASSESSED), TEKNEKON RESEARCH, INC., WAS GIVEN RESPONSIBILITY FOR PROVIDING SITE-SPECIFIC INFO, INCLUDING FACILITY CODE NAME, LOCATION, SURROUNDING POPULATION, METEOROLOGICAL INFO., ETC. ORNL WAS GIVEN RESPONSIBILITY FOR SUPPLYING NUCLIDE-SPECIFIC INFO AND FOR RUNNING THE ASSESSMENT CODES. THIS REPORT DESCRIBES AND LISTS THE NUCLIDE-SPECIFIC PARAMETERS SUPPLIED BY ORNL, AND FOR READER CONVENIENCE, SOME OF THE SITE-SPECIFIC PARAMETERS USED IN RUNNING THE CODES.

432

ASSESSMENT OF THE RADIOLOGICAL IMPACT OF THE INACTIVE
URANIUM-MILL TAILINGS AT GRAND JUNCTION, COLORADO

ORNL-5457

HAYWOOD, F.F.; GOLDSMITH, W.A.; JACOBS, D.G.; PERDUE, P.T.;
ELLIS, B.S.; HUBBARD, H.M., JR.; SHINPAUGH, W.H.

800101

NTIS. 92 P.

OAK RIDGE NATIONAL LABORATORY

E,1;E,2;E,5,J;E,5,L

RESULTS OF A RADIOLOGICAL SURVEY OF THE INACTIVE U-MILL SITE AT GRAND JUNCTION, CO, MADE IN MAY-JUNE '76, ARE PRESENTED ALONG WITH DESCRIPTIONS OF TECHNIQUES AND EQUIPMENT USED TO OBTAIN THE DATA AND AN ASSESSMENT OF INCREASED RISK OF HEALTH EFFECTS ATTRIBUTABLE TO RADIATION AND RADIONUCLIDES FROM THE TAILINGS. AN ESTIMATE OF POTENTIAL HEALTH EFFECTS OF EXPOSURE TO GAMMA RAYS AROUND THE FORMER MILL BUILDING AND TO RADON DAUGHTERS PRODUCED BY RADON DISPERSED FROM THE TAILINGS HAS BEEN MADE FOR OCCUPANTS OF THE SITE.

433

STATUS REPORT ON RADIOACTIVITY MOVEMENT FROM BURIAL GROUNDS
IN MELTON AND BETHEL VALLEYS

ORNL-5017

DUGUID, J.O.

750101

NTIS. 64 P.

OAK RIDGE NATIONAL LABORATORY

L,5,B;L,5,D;L,5,J;L,5,L;L,9;N,5,B;N,5,D;N,5,J;N,5,L;N,9

THE OFFSITE RADIOACTIVITY RELEASES IN THE CLINCH RIVER ARE LESS THAN 1% OF THE AMOUNT ALLOWABLE FOR UNRESTRICTED USE OF WATER BY A POPULATION. HOWEVER, IN KEEPING WITH ERDA'S OBJECTIVE TO MAINTAIN RELEASES "AS LOW AS PRACTICABLE," STUDIES DIRECTED TOWARD LOCATING SOURCES OF RADIOACTIVITY RELEASE AND TOWARD SEEKING METHODS FOR REDUCING OR ELIMINATING THEM HAVE BEEN CONTINUED. THIS PARTICULAR STUDY, INITIATED IN APRIL, 1973, IS CONCERNED PRIMARILY WITH DETERMINING THE RADIOACTIVITY CONTRIBUTIONS TO THE CLINCH RIVER FROM THE BURRIEL WASTE AT ORNL AND WITH IMPLEMENTING CORRECTIVE MEASURES. THE RESEARCH CONDUCTED FOR THE DEVELOPMENT OF CORRECTIVE MEASURES WILL ALSO

INDICATE MODIFICATIONS IN CURRENT BURIAL PROCEDURES THAT WILL REDUCE RADIONUCLIDE TRANSPORT FROM NEW BURIAL SITES. THE STUDY ENCOMPASSES ALL WASTE DISPOSAL SITES AT ORNL. THE PURPOSE OF THIS REPORT IS TO DOCUMENT THE PROGRESS OF THE INVESTIGATION.

434

CONSIDERATIONS IN THE LONG-TERM MANAGEMENT OF HIGH-LEVEL
RADIOACTIVE WASTES

ORNL-4762

GERA, F.; JACOBS, D.G.

720101

NTIS. 151 P.

OAK RIDGE NATIONAL LABORATORY

L,1;L,2;L,5,J;L,5,L;L,7;L,9;

THE HIGH-LEVEL RADWASTE FROM REPROCESSING SPENT FUEL ELEMENTS IN THE NUCLEAR INDUSTRY REQUIRE A WASTE MANAGEMENT SCHEME. LONG-LIVED TRANSURANICS REQUIRE THE ASSURANCE OF WASTE CONTAINMENT FOR HUNDREDS OF THOUSANDS OF YRS THAT ONLY DEEP, STABLE GEOLOGIC FORMATIONS OFFER. THE AMOUNTS OF RADIOACTIVE WASTES ACCUMULATED TO 2020 ARE PROJECTED, AND IMPORTANT RADIONUCLIDES IN THE WASTE ARE COMPARED. BASED ON THESE CONSIDERATIONS, THE MOST PRUDENT SCHEME OF MANAGEMENT OF THESE WASTES INVOLVES SOLIDIFICATION WITH FINAL DISPOSAL INTO A DEEP GEOLOGIC FORMATION, WITH FURTHER HANDLING MINIMIZED. POSSIBLE MECHANISMS OF ACTIVITY RELEASE FROM THE GEOLOGIC FORMATION ARE DESCRIBED.

435

PROJECT SALT VAULT: A DEMONSTRATION OF THE DISPOSAL OF
HIGH-ACTIVITY SOLIDIFIED WASTE IN UNDERGROUND SALT
MINES

ORNL-4555

MCCLAIN, W.C.; BRADSHAW, R.L., (EDS.)

710101

NTIS. 360 P.

OAK RIDGE NATIONAL LABORATORY

L,1;L,2;L,9;L,0;0,1;0,2

THIS REPORT DOCUMENTS THE BACKGROUND, DESIGN, INSTALLATION, OPERATION, AND CONCLUSIONS DERIVED FROM PROJECT SALT VAULT. PROJECT SALT VAULT WAS A DEMONSTRATION OF THE DISPOSAL OF HIGH-LEVEL SOLIDIFIED RADIOACTIVE WASTES IN A SALT MINE IN LYONS, KA. CHAPT. 9 EVALUATES THE SAFETY OF THE DEMONSTRATION FOR CASE DESIGN, SHIPPING HAZARDS, TRANSFER OPERATIONS, FISSION PRODUCT CONTAINMENT, AND ACCIDENT CAUSATION.

436

SITING OF FUEL REPROCESSING PLANTS AND WASTE MANAGEMENT
FACILITIES

ORNL-4451

OAK RIDGE NATIONAL LABORATORY

700101

NTIS. 415 P.

J,1;J,9;K,1;K,9;L,1;L,9;O,1;O,9

RESULTS OF A STUDY TO IDENTIFY AND CHARACTERIZE THE FACTORS THAT MAY INFLUENCE THE GROWTH PATTERNS OF THE FUEL REPROCESSING INDUSTRY ARE PRESENTED. EMPHASIS IS PLACED ON THE SITING OF REPROCESSING PLANTS AND WASTE STORAGE AND DISPOSAL FACILITIES, PARTICULARLY THOSE FOR HLW. A COMPILATION OF THE KEY ISSUES UNDER CONSIDERATION AND THE PRINCIPAL CONCLUSIONS OF THE STUDY ARE PRESENTED. THE TECHNICAL INFORMATION FOUND IN THE BODY OF THE REPORT RELATING TO THESE ISSUES AND CONCLUSIONS IS SUMMARIZED. BASIC DATA ON REACTOR AND FUEL CHARACTERISTICS, PROJECTIONS OF SPENT-FUEL PROCESSING LOADS, FUEL SHIPPING REQUIREMENTS, AND WASTE CHARACTERISTICS AND PRODUCTION ARE INCLUDED. FUEL REPROCESSING IS DISCUSSED VERY BRIEFLY AND WASTE MANAGEMENT TECHNOLOGY IS CONSIDERED IN SIGNIFICANT DETAIL. CASK DESIGN AS RELATED TO SAFETY IN TRANSPORTING SPENT FUEL AND SOLIDIFIED WASTE ARE DISCUSSED. FUEL REPROCESSING AND WASTE MANAGEMENT COSTS ARE CONSIDERED ALONG WITH ENVIRONMENTAL AND GEOGRAPHICAL CONSIDERATIONS OF SITING AND HEALTH AND SAFETY ASPECTS.

437

HAZARDOUS MATERIALS TRANSPORTATION: RADIOACTIVE MATERIALS AND WASTES, 1964 - SEPTEMBER, 1981. (CITATIONS FROM THE NTIS DATA BASE)

PB-82-800335

EDITOR, NATIONAL TECHNICAL INFORMATION SERVICE

810501

NTIS. 1 P.

NTIS

O,1;O,2;O,3;O,5

THIS BIBLIOGRAPHY CITES STUDIES ON THE HAZARDS, RISKS, AND UNCERTAINTY OF TRANSPORTING RADIOACTIVE WASTES AND MATERIALS. THE DESIGN OF SHIPPING CONTAINERS AND SPECIAL LABELS FOR IDENTIFICATION PURPOSES FOR TRANSPORTING FUELS AND WASTES ARE ALSO CITED. STUDIES INCLUDED ON LEGISLATION DEALING WITH THE SAFETY AND HEALTH OF THE POPULATION AND THE ENVIRONMENTAL PROBLEMS ASSOCIATED WITH TRANSPORTING RADIOACTIVE MATERIALS. THIS UPDATED BIBLIOGRAPHY CONTAINS 250 ABSTRACTS, 55 OF WHICH ARE NEW ENTRIES TO THE PREVIOUS EDITION. THIS BIBLIOGRAPHY SUPERSEDES PB80-811490 AND NTIS/PS-79/0704.

438

ACCIDENT RISKS IN NUCLEAR FACILITIES. 1981-MARCH 1982.
(CITATIONS FROM THE NTIS DATA BASE)

PB82-808163

KENTON, E.

820101

NTIS. 105 P.

NTIS

D,1;D,2;D,3;D,4;D,5,B;D,5,D

THE BIBLIOGRAPHY PRESENTS RISK ANALYSIS AND HAZARDS EVALUATION OF THE DESIGN, CONSTRUCTION, AND OPERATION OF NUCLEAR FACILITIES, INCLUDING THE RISK AND HAZARDS OF TRANSPORTING RADIOACTIVE MATERIALS TO AND FROM THESE FACILITIES. RADIOLOGICAL CALCULATIONS FOR ENVIRONMENTAL EFFECTS OF NUCLEAR ACCIDENTS ARE ALSO INCLUDED. THIS BIBLIOGRAPHY SUPERSEDES PB81-801490, AND PB80-801269.

439

REVIEW AND EVALUATION OF THE NUCLEAR REGULATORY COMMISSION SAFETY RESEARCH PROGRAM FOR FISCAL YEAR 1981: REPORT TO THE CONGRESS OF THE UNITED STATES OF AMERICA

NUREG-0657

U.S. NRC, ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

800101

NTIS. 53 P.

C,1

INFORMATION IS PRESENTED CONCERNING IMPLICATIONS OF THE ACCIDENT AND NEW DIRECTIONS IN RESEARCH: SYSTEMS ENGINEERING; LOFT; CODE DEVELOPMENT; FUEL BEHAVIOR; PRIMARY SYSTEM INTEGRITY; SEISMIC, ENGINEERING, AND SITE SAFETY; ADVANCED REACTORS; REACTOR ENVIRONMENTAL EFFECTS; FUEL CYCLE; WASTE MANAGEMENT; SAFEGUARDS; RISK ASSESSMENT; AND IMPROVED REACTOR SAFETY.

440

WHY BE QUANTITATIVE ABOUT RADIATION RISK ESTIMATES?

POCHIN, E.E.

780101

NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS, WASHINGTON, DC

UKAEA, HARWELL

LAURISTON S. TAYLOR LECT. SER. RAD. PROTECT. MEASUR. NO. 2. 36 P. C,3;C,4;C,5;P,3;P,4;P,5

TOPICS COVERED IN THE ADDRESS ARE: ACCURACY, GENETIC RISKS, RISKS OF SOMATIC EFFECTS (LEUKAEMIA, THYROID CANCER, BREAST CANCER, LUNG CANCER, BONE CANCER, RISK OF TUMOURS IN OTHER ORGANS, AND RELATIVE IMPORTANCE OF DIFFERENT ORGANS OR TISSUES IN DEVELOPING MALIGNANCIES), RADIATION PROTECTION STANDARDS, AND CONCLUSIONS. PROTECTION AGAINST RADIATION SHOULD BE EVALUATED IN ITS PROPER PERSPECTIVE, IN RELATION TO OTHER HARMFUL AGENTS, RADIATION RISK ESTIMATES SHOULD BE QUANTITATIVE.

441

KR-85 MANAGEMENT TRADE-OFFS: A PERSPECTIVE TO TOTAL RADIATION DOSE COMMITMENT

PNL-3176

MELLINGER, P.J.; HUENES, G.R.; BRACKENBUSH, L.W.; GREENBERG, J.
800101

NTIS. 126 P.

PACIFIC NORTHWEST LABORATORY

C,1;C,2;C,3;C,4,C;C,5,D;C,8;C,9;C,9 ;J,1;J,4,A;J,4,C;J,5,B;J,5,D

RADIOLOGICAL CONSEQUENCES ARISING FROM THE TRADE-OFFS FOR
KR-85 WASTE MANAGEMENT FROM POSSIBLE NUCLEAR FUEL RESOURCE
RECOVERY ACTIVITIES HAVE BEEN INVESTIGATED. THE REFERENCE
MANAGEMENT TECHNIQUE IS TO RELEASE ALL THE WASTE GAS TO THE
ATMOSPHERE WHERE IT IS DILUTED AND DISPERSED. A POTENTIAL
ALTERNATIVE IS TO COLLECT, CONCENTRATE, PACKAGE AND SUBMIT THE
GAS TO LONG-TERM STORAGE. THIS STUDY COMPARES THE RADIATION DOSE
COMMITMENT TO THE PUBLIC AND TO THE OCCUPATIONALLY EXPOSED WORK
FORCE FROM THESE ALTERNATIVES. THE RESULTS INDICATE THAT IT
MAKES LITTLE DIFFERENCE TO THE MAGNITUDE OF THE WORLD POPULATION
DOSE WHETHER KR-85 IS CAPTURED AND STORED OR CHRONICALLY
RELEASED TO THE ENVIRONMENT. FURTHER, COMPARISONS OF RADIATION
EXPOSURES AT VERY LOW DOSE RATES TO VERY LARGE POPULATIONS WITH
EXPOSURES TO A SMALL NUMBER OF OCCUPATIONALLY EXPOSED WORKERS
WHO EACH RECEIVE MUCH HIGHER DOSE RATES MAY BE MISLEADING.
FINALLY, COST STUDIES SHOW THAT ALREADY EXTREMELY SMALL 80-YR
CUMULATIVE WORLD POPULATION DOSE OF 0.05 MREM/PERSON (LESS THAN
0.001% OF NATURAL BACKGROUND RADIATION FOR THE SAME TIME PERIOD).

442

ANALYSIS OF CRITICALITY SAFETY

PNL-3300, PT. 5

LLOYD, R.C.; CLAYTON, E.D.; CONVERSE, W.E.

800101

NTIS.

PNL ANN. RPT. 1979. PT. 5. P. 69.

J,1;J,9;I,1;I,9;F,1;F,9

THE PREVIOUS DATA COLLECTION WAS BROADLY EXPANDED DURING
THE YEAR TO INCLUDE OVER 400 VIOLATIONS OF THE CRITICALITY
SAFETY SPECIFICATIONS COVERING VARIOUS OTHER OPERATIONS WITHIN
DOE FACILITIES. WITH THIS BROADER, MORE COMPLETE DATA BASE, A
MORE DEFINITIVE RESULT OF THE STATUS OF OVERALL CRITICALITY
SAFETY WILL BE POSSIBLE. THE ADDITIONAL DATA COLLECTED DURING
THE YEAR ARE BEING USED IN A FAULT-TREE ANALYSIS IN WHICH CAUSES
ARE ASSIGNED FREQUENCY VALUES. ON COMPLETION OF THE ANALYSIS,
THE MOST FREQUENT CAUSES OF VIOLATIONS CAN BE IDENTIFIED AND
SUGGESTIONS MADE TO EFFECT FURTHER IMPROVEMENTS IN CRITICALITY
SAFETY CONTROL.

443

AN INCREMENT OF ANALYSIS. ESTIMATED AIRBORNE RELEASE OF
PLUTONIUM FROM THE EXXON NUCLEAR MIXED OXIDE FUEL
PLANT AT RICHLAND, WASHINGTON AS A RESULT OF
POSTULATED DAMAGE FROM SEVERE WIND AND EARTHQUAKE

HAZARD

PNL-3340

MISHIMA, J.; SCHWENDIMAN, L.C.; AYER, J.E.; CZARSKI, E.L.
800201

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 47 P.

PACIFIC NORTHWEST LABORATORY

1,1;1,2;1,3;1,4,A;1,5,B;1,7,A;1,7,B;1,9;1,0,A;1,0,B

THE POTENTIAL AIRBORNE RELEASES OF PU FROM POSTULATED DAMAGE SUSTAINED BY THE EXXON NUCLEAR COMPANY'S MCX FABRICATION PLANT AT RICHLAND, WA, AS A RESULT OF VARIOUS LEVELS OF WIND AND EARTHQUAKE HAZARD, ARE ESTIMATED. THE RELEASES ARE BASED ON DAMAGE SCENARIOS THAT RANGE UP TO 250 MPH FOR WIND HAZARD AND IN EXCESS OF 1.0 G GROUND ACCELERATION FOR SEISMIC HAZARD, WHICH WERE DEVELOPED BY OTHER SPECIALISTS. THE APPROACHES AND FACTORS USED TO ESTIMATE THE RELEASES (INVENTORIES OF DISPERSIBLE MATERIALS AT RISK, DAMAGE LEVELS AND RATIOS, FRACTIONAL AIRBORNE RELEASES OF DISPERSIBLE MATERIALS UNDER STRESS, ATMOSPHERE EXCHANGE RATES, AND SOURCE TERM RANGES) ARE DISCUSSED. RELEASE ESTIMATES RANGE FROM LESS THAN $10(E-7)$ G TO GREATER THAN 14 G OF PU OVER A 4-DAY PERIOD.

444

TOPICAL REPORT ON RELEASE SCENARIO ANALYSIS OF LONG-TERM MANAGEMENT OF HIGH-LEVEL DEFENSE WASTE AT THE HANFORD SITE

PNL-3303

WALLACE, R.W.; LANDSTROM, D.K.; BLAIR, S.C.; HOWES, B.W.; KUBIN, M.A.; BENSON, G.L.; REISENAUER, A.E.; WALTERS, W.H.;
ZIMMERMAN, M.G.

800101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 223 P.

PACIFIC NORTHWEST LABORATORY

C,2;K,2;K,5

POTENTIAL RELEASE SCENARIOS FOR THE DEFENSE HLW ON THE HANFORD SITE ARE PRESENTED. THERE ARE THREE COMPONENTS NECESSARY FOR EVALUATING THE VARIOUS ALTERNATIVES UNDER CONSIDERATION FOR LONG-TERM MANAGEMENT OF HANFORD DEFENSE HLW: IDENTIFICATION OF SCENARIOS AND EVENTS WHICH MIGHT DIRECTLY OR INDIRECTLY DISRUPT RADIONUCLIDE CONTAINMENT BARRIERS; GEOTRANSPORT CALCULATIONS OF WASTE MIGRATION THROUGH THE SITE MEDIA; AND CONSEQUENCE (DOSE) ANALYSES BASED ON GROUNDWATER AND AIR PATHWAYS CALCULATIONS. THE SCENARIOS DESCRIBED IN THIS REPORT PROVIDE THE NECESSARY PARAMETERS FOR RADIONUCLIDE TRANSPORT AND CONSEQUENCE ANALYSIS. SCENARIOS ARE CATEGORIZED AS EITHER BOUNDING OR NONBOUNDING. BOUNDING SCENARIOS CONSIDER WORST CASE OR WHAT IF SITUATIONS WHERE AN ACTUAL AND SIGNIFICANT RELEASE OF WASTE MATERIAL TO THE ENVIRONMENT WOULD HAPPEN IF THE SCENARIO WERE TO OCCUR. BOUNDING SCENARIOS INCLUDE BOTH NEAR-TERM AND LONG-TERM SCENARIOS. NEAR-TERM SCENARIOS ARE EVENTS WHICH OCCUR AT 100 YRS FROM 1990. LONG TERM SCENARIOS ARE POTENTIAL EVENTS CONSIDERED TO OCCUR AT 1000 AND 10,000 YRS FROM 1990. NONBOUNDING SCENARIOS CONSIDER

EVENTS WHICH RESULT IN INSIGNIFICANT RELEASES OR NO RELEASE AT ALL TO THE ENVIRONMENT.

445

SAFETY ASSESSMENT OF THE LIQUID-FED CERAMIC MELTER PROCESS
PNL-3493

BUELT, J.L.; PARTAIN, W.L.

800101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 113 P.

PACIFIC NORTHWEST LABORATORY

L,1

AS PART OF ITS DEVELOPMENT PROGRAM FOR THE SOLIDIFICATION OF HIGH-LEVEL NUCLEAR WASTE, PNL ASSESSED THE SAFETY ISSUES FOR A COMPLETE LIQUID-FED CERAMIC MELTER (LFCM) PROCESS. THE LFCM PROCESS, AN ADAPTION OF COMMERCIAL GLASS-MAKING TECHNOLOGY, IS BEING DEVELOPED TO CONVERT HIGH-LEVEL LIQUID WASTE FROM THE NUCLEAR FUEL CYCLE INTO GLASS. THIS SAFETY ASSESSMENT UNCOVERED NO UNRESOLVED SIGNIFICANT SAFETY PROBLEMS WITH THE LFCM PROCESS. ALTHOUGH IN THIS ASSESSMENT THE LFCM PROCESS WAS NOT DIRECTLY COMPARED WITH OTHER SOLIDIFICATION PROCESSES, THE SAFETY HAZARDS OF THE LFCM PROCESS ARE COMPARABLE TO THOSE OF OTHER PROCESSES. THE HIGH PROCESSING TEMPERATURES OF THE GLASS IN THE LFCM POSE NO ADDITIONAL SIGNIFICANT SAFETY CONCERNS, AND THE DISPERSIBLE INVENTORY OF DRIED WASTE (CALCINE) IS SMALL. THIS SA WAS BASED ON THE NUCLEAR POWER WASTE FLOW SHEET, SINCE POWER WASTE IS MORE RADIOACTIVE THAN DEFENSE WASTE AT THE TIME OF SOLIDIFICATION, AND ALL ACCIDENT CONDITIONS FOR THE POWER WASTE WOULD HAVE GENERATED RADIOLOGICAL CONSEQUENCES THAN THOSE FOR DEFENSE WASTE. AN EXHAUSTIVE LIST OF POSSIBLE OFF-STANDARD CONDITIONS AND EQUIPMENT FAILURES WAS COMPILED. THESE ACCIDENTS WERE THEN CLASSIFIED ACCORDING TO SEVERITY OF CONSEQUENCE AND TYPE OF ACCIDENT. RADIONUCLIDE RELEASES TO THE STACK WERE CALCULATED FOR EACH GROUP OF ACCIDENTS USING CONSERVATIVE ASSUMPTIONS REGARDING THE RETENTION AND DECONTAMINATION FEATURES OF THE PROCESS AND FACILITY. TWO RECOMMENDATIONS THAT SHOULD BE CONSIDERED BY PROCESS DESIGNERS ARE GIVEN IN THE SA.

446

ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISOLATION SYSTEMS.
GEOLOGIC SIMULATION MODEL FOR A HYPOTHETICAL SITE IN
THE COLUMBIA PLATEAU

PNL-3542

PETRIE, G.M.; ZELMER, J.T.; LINDBERG, J.W.; FOLEY, M.G.

810101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 603 P.

PACIFIC NORTHWEST LABORATORY

C,7;C,8;C,9;L,1;L,2;L,5,J;L,5,L;L,9;N,1;N,2;N,5,J;N,5,L;N,9;

THIS REPORT DESCRIBES THE STRUCTURE AND OPERATION OF THE ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISOLATION SYSTEMS (AEGIS) GEOLOGIC SIMULATION MODEL, A COMPUTER SIMULATION MODEL

OF THE GEOLOGY AND HYDROLOGY OF AN AREA OF THE COLUMBIA PLATEAU, WA. THE MODEL IS USED TO STUDY THE LONG-TERM SUITABILITY OF THE COLUMBIA PLATEAU BASALTS FOR THE STORAGE OF NUCLEAR WASTE IN A MINED REPOSITORY. IT IS ALSO A STARTING POINT FOR ANALYSES OF SUCH REPOSITORIES IN OTHER GEOLOGIC SETTINGS. THE GEOLOGIC SIMULATION MODEL WILL AID IN FORMULATING DESIGN DISRUPTIVE SEQUENCES FROM THE SPECTRUM OF HYPOTHETICAL GEOLOGICAL AND HYDROLOGICAL DEVELOPMENTS THAT COULD RESULT IN TRANSPORT OF RADIONUCLIDES OUT OF A REPOSITORY. QUANTITATIVE AND AUDITABLE EXECUTION OF THIS TASK, HOWEVER, IS IMPOSSIBLE WITHOUT COMPUTER SIMULATION. THE COMPUTER SIMULATION MODEL AIDS THE GEOSCIENTIST BY GENERATING THE WIDE SPECTRUM OF POSSIBLE FUTURE EVOLUTIONARY PATHS OF THE AREA GEOLOGY AND HYDROLOGY, IDENTIFYING THOSE THAT MAY AFFECT THE REPOSITORY INTEGRITY. THE MODEL SIMULATES THE GEOLOGIC AND HYDROLOGIC SYSTEMS OF A HYPOTHETICAL REPOSITORY SITE AND REGION FOR A MILLION YRS FOLLOWING REPOSITORY DECOMMISSIONING. THE GEOLOGIC SIMULATION MODEL OPERATES IN BOTH SINGLE-RUN AND MONTE CARLO MODES.

447

AN INCREMENT OF ANALYSIS--ESTIMATED AIRBORNE RELEASE OF PLUTONIUM FROM THE 102 BUILDING AT THE GENERAL ELECTRIC VALLECITOS NUCLEAR CENTER, VALLECITOS, CALIFORNIA, AS A RESULT OF POSTULATED DAMAGE FROM SEVERE WIND AND EARTHQUAKE HAZARD

PNL-3601

MISHIMA, J.; AYER, J.E.; HAYS, I.D.

801201

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 42 F.

PACIFIC NORTHWEST LABORATORY

1,1;1,2;1,4,A;1,5,B;1,7,8;1,9;1,0,B

THIS REPORT ESTIMATES THE POTENTIAL AIRBORNE RELEASES OF PU AS A CONSEQUENCE OF VARIOUS SEVERITIES OF EARTHQUAKE AND WIND HAZARD POSTULATED FOR THE 102 BUILDING AT THE GENERAL ELECTRIC VALLECITOS NUCLEAR CENTER IN CALIFORNIA. THE RELEASES ARE BASED ON DAMAGE SCENARIOS DEVELOPED BY OTHER SPECIALISTS. THE HAZARD SEVERITIES PRESENTED RANGE UP TO A NOMINAL VELOCITY OF 230 MPH FOR WIND HAZARD AND ARE IN EXCESS OF 0.8 G LINEAR ACCELERATION FOR EARTHQUAKES. THE CONSEQUENCES OF THRUST FAULTING ARE CONSIDERED. THE APPROACHES AND FACTORS USED TO ESTIMATE THE RELEASES ARE DISCUSSED. RELEASE ESTIMATES RANGE FROM 0.003 TO 3 G PU.

448

CALCULATIONS OF RELEASES OF RADIOACTIVE MATERIALS IN GASEOUS AND LIQUID EFFLUENTS FROM LIGHT-WATER-COOLED POWER REACTORS

REG/G-1,112(5-77)

U.S. NRC, OFFICE OF STANDARDS DEVELOPMENT

760101

U.S. NRC., WASHINGTON, DC. 13 P.
P,1;P,5

THIS REGULATORY GUIDE REFERENCES TWO NUREG REPORTS THAT PROVIDE ACCEPTABLE METHODS FOR CALCULATING ANNUAL AVERAGE EXPECTED RELEASES OF RADIOACTIVE MATERIAL IN LIQUID AND GASEOUS EFFLUENTS FROM LIGHT-WATER-COOLED NUCLEAR POWER REACTORS. THE PROCEDURES AND MODELS PROVIDED IN THE REFERENCED NUREG REPORTS WILL BE SUBJECT TO CONTINUING REVIEW BY THE NRC STAFF WITH THE AIM OF EMPLOYING THE BEST AVAILABLE EXPERIMENTAL DATA AND CALCULATIONAL MODELS IN ORDER TO ACHIEVE INCREASED ACCURACY AND REALISMS. AS A RESULT OF SUCH REVIEWS, IT IS EXPECTED THAT ALTERNATIVE ACCEPTABLE METHODS FOR CALCULATION WILL BE MADE AVAILABLE TO APPLICANTS AND THAT CALCULATION AS PROCEDURES FOUND TO BE UNNECESSARY WILL BE ELIMINATED. THE GUIDE SUPERSEDES PORTIONS OF REGULATORY GUIDE 1.42, REV. 1, INTERIM GASEOUS RADIOIODINE RELEASES FROM LIGHT-WATER-COOLED NUCLEAR POWER REACTORS, WHICH HAS BEEN WITHDRAWN.

449

NUCLEAR WASTE REPOSITORY IN BASALT PROJECT B-301
PRECONCEPTUAL DESIGN REPORT

RHO-BWI-CD-35

ROCKWELL INTERNATIONAL CORP., ENERGY SYSTEMS GROUP
800101

NTIS. 730 P.

L,1;L,9;N,1;N,9

THE FUNCTIONS AND DESIGN REQUIREMENTS ARE CONSISTENT WITH THE DOE INITIALLY APPROVED FUNCTIONAL DESIGN CRITERIA. THE REFERENCE PRECONCEPTUAL DESIGN MEETS THE INITIALLY APPROVED CRITERIA WITH TWO SIGNIFICANT EXCEPTIONS. CODES, STANDARDS, AND REGULATIONS GOVERNING THE DESIGN ARE SUMMARIZED. MANY DESIGN CRITERIA ARE YET TO BE DETERMINED. DOCUMENTATION REGARDING THE NUCLEAR WASTE FORECAST USED IS PRESENTED. THIS FORECAST PROVIDES A CONSERVATIVE BASIS FOR REPOSITORY SIZING, BUDGETING, RISK ASSESSMENT, AND LICENSE PLANNING DURING THE EARLY DESIGN STAGES AND WAS USED IN PREFERENCE TO MORE RECENT FORECASTS.

451

I-131 RELEASE PROBABILITY DISTRIBUTION FOR FUEL HANDLING
ACCIDENT

CONF-800607

BUSLIK, A.J.; KRIEGER, T.J.

800601

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

BROOKHAVEN NATIONAL LABORATORY

TRANS. AM. NUCL. SOC. 34:441-442.

M,2;M,3,A;M,3,B;M,4,A;M,4,B;M,8,A;M,8,B;M,0,A;M,0,B

THIS PAPER GIVES A CALCULATION OF THE PROBABILITY OF RADIOACTIVE RELEASES OF DIFFERENT MAGNITUDES FOR A FUEL HANDLING ACCIDENT IN THE SPENT-FUEL STORAGE POOL OF A PWR. THE

METHODOLOGY DEVELOPED WAS USED FOR I-131 RELEASES; NOBLE-GAS RELEASES WERE TREATED IN ANOTHER PART OF A STUDY AT BNL ON CLASS 3 TO 8 ACCIDENTS. IN A FUEL HANDLING ACCIDENT THERE IS A POSSIBILITY OF FUEL ROD CLADDING RUPTURE WITH THE RELEASE OF THE FISSION PRODUCTS IN THE FUEL ROD GAP. THE AMOUNT OF RELEASE DEPENDS ON SEVERAL VARIABLES.

452

FINAL REPORT ON SPECIAL IMPACT TESTS OF PLUTONIUM SHIPPING CONTAINERS. DESCRIPTION OF TEST RESULTS

SAND76-0437; NUREG-766515

BONZON, L.L.

770201

SANDIA LABORATORIES, ALBUQUERQUE, NM, 153 P.

SANDIA LABORATORIES

O,1;O,2;O,4,B;O,7;O,0

THE REPORT PRESENTS THE RESULTS FROM TESTS CONDUCTED TO DETERMINE THE STRUCTURAL RESPONSE OF THE LLD-1, MODEL 1518-6H, AND FL-10 PU SHIPPING PACKAGES WHEN SUBJECTED TO HIGH-SPEED IMPACTS (170 TO 760 FT/SEC) ONTO UNYIELDING, CONCRETE, AND SOIL TARGETS.

453

SPENT FUEL HEATUP FOLLOWING LOSS OF WATER DURING STORAGE

NUREG/CR-0649; SAND77-11371-RJ

BENJAMIN, A.S.; MCCLOSKEY, D.J.; POWERS, D.A.; DUPREE, S.A.

790301

U.S. NRC, WASHINGTON, DC, 170 P.

SANDIA LABORATORIES

M,1;M,2;M,4,A;M,9;M,0

AN ANALYSIS OF SPENT FUEL HEATUP FOLLOWING A HYPOTHETICAL ACCIDENT INVOLVING DRAINAGE OF THE STORAGE POOL IS PRESENTED. COMPUTATIONS BASED UPON A NEW COMPUTER CODE CALLED SFUEL HAVE BEEN PERFORMED TO ASSESS THE EFFECT OF DECAY TIME, FUEL ELEMENT DESIGN, STORAGE RACK DESIGN, PACKING DENSITY, ROOM VENTILATION, DRAINAGE LEVEL, AND OTHER VARIABLES ON THE HEATUP CHARACTERISTICS OF THE SPENT FUEL AND TO PREDICT THE CONDITIONS UNDER WHICH CLAD FAILURE WILL OCCUR. POSSIBLE STORAGE POOL DESIGN MODIFICATIONS AND/OR ONSITE EMERGENCY ACTION HAVE ALSO BEEN CONSIDERED. IT HAS BEEN FOUND THAT THE LIKELIHOOD OF CLAD FAILURE DUE TO RUPTURE OF MELTING FOLLOWING A COMPLETED DRAINAGE IS EXTREMELY DEPENDENT ON THE STORAGE CONFIGURATION AND THE SPENT FUEL DECAY PERIOD, AND THAT THE MINIMUM PREREQUISITE DECAY TIME TO PRECLUDE CLAD FAILURE MAY VARY FROM LESS THAN 10 DAYS FOR SOME STORAGE CONFIGURATIONS TO SEVERAL YEARS FOR OTHERS. THE POTENTIAL FOR REDUCING THIS CRITICAL DECAY TIME EITHER BY MAKING REASONABLE DESIGN MODIFICATIONS OR BY PROVIDING EFFECTIVE EMERGENCY COUNTER MEASURES HAS BEEN FOUND TO BE SIGNIFICANT.

455

CONCENTRATION AND STORAGE OF HIGH LEVEL RADIOACTIVE WASTES
- AN OVERVIEW

BURNS, R.E.; IRISH, E.R.

760101

AICHE

BATTELLE, PACIFIC NORTHWEST LABORATORIES

AICHE SYMP. SER. 72(154):17-21.

J,9;J,0;K,9;K,0;N,9;N,0

THIS PAPER IS A REVISION OF BNWL-SA-5477 (ACN=281).
RECOGNIZED PROBLEMS IN CONCENTRATION AND STORAGE OPERATIONS OF
HLW PRODUCED IN THE REPROCESSING OF COMMERCIAL POWER REACTOR
FUEL ARE CITED AND DISCUSSED. THE HANFORD PUREX PLANT AND
ASSOCIATED STORAGE OPERATIONS ARE SIMILAR TO THOSE IN COMMERCIAL
PLANTS, EXCEPT THAT THE WASTE IS MADE ALKALINE BEFORE STORAGE.
DESIGNS AND PROCEDURES HAVE BEEN DEVELOPED TO COPE EFFECTIVELY
WITH THESE PROBLEMS AND TO MAKE THE OPERATIONS SAFE AND RELIABLE.

456

SPENT-FUEL HEATUP FOLLOWING LOSS OF WATER DURING STORAGE
CONF-780622

BENJAMIN, A.S.; MCCLOSKEY, D.J.

780601

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

SANDIA NATIONAL LABORATORIES

TRANS. AM. NUCL. SOC. 28:333-334.

M,1;M,2;M,4,A;M,9;P,0

THE REPORT FORM OF THIS PAPER IS SAND78-0194C. SPENT-FUEL
ASSEMBLIES FROM LIGHT-WATER REACTORS ARE TYPICALLY STORED FOR
ONE YR OR MORE IN THE REACTOR SPENT-FUEL POOL AND THEN
TRANSPORTED FOR LONG-TERM STORAGE AT AN OFF-SITE LOCATION.
BECAUSE OF THE DESIGN, CONSTRUCTION, AND OPERATION FEATURES OF
SPENT-FUEL STORAGE POOLS, AN ACCIDENT THAT MIGHT DRAIN MOST OF
THE WATER FROM A POOL IS ASSESSED AS BEING EXTREMELY IMPROBABLE.
AS A LIMITING CASE, HOWEVER, A HYPOTHETICAL INCIDENT INVOLVING
INSTANTANEOUS DRAINING OF ALL THE WATER FROM A STORAGE POOL HAS
BEEN POSTULATED, AND THE SUBSEQUENT HEATUP OF THE SPENT-FUEL
ELEMENTS HAS BEEN EVALUATED. THE MODEL IS ANALYZED, AND THE
RESULTS ARE SUMMARIZED.

458

COST/RISK/BENEFIT ANALYSIS REPORT ON THE DECONTAMINATION
AND DECOMMISSIONING OF Z-PLANT

RHO-CD-761

MELVIN, J.P.; SEXTON, R.A.; FURT, M.L.; NUNN, S.E.

791001

ROCKWELL HANFORD OPERATIONS, RICHLAND, WA, 104 F.

ROCKWELL HANFORD OPERATIONS

P,1;P,2;P,4,K;P,5,J;P,7,J;P,0

THIS STUDY WAS PERFORMED TO ESTIMATE THE COST OF D&D Z-PLANT. ALL OF THE BUILDINGS IN THE Z-PLANT EXCLUSION AREA EXCEPT BUILDING 2736-Z, THE PU STORAGE VAULT, ARE INCLUDED IN THIS STUDY. THE STUDY ALSO EXCLUDES ALL UNDERGROUND FACILITIES WITHIN THE EXCLUSION AREA WHICH ARE NOT CONTAINED WITHIN A BUILDING AND ALL Z-PLANT RELATED FACILITIES OUTSIDE THE PERIMETER FENCE. THE CONTAMINATION IN Z-PLANT IS PRIMARILY PU-239 WHICH HAS A HALF-LIFE OF 24,360 YRS. BECAUSE OF THE LONG HALF-LIFE OF PU-239, IT IS NOT PRACTICAL TO CONSIDER THE ISOLATION OF THE FACILITY TO AWAIT REDUCTION OF THE CONTAMINATION LEVEL BY NATURAL DECAY. THIS STUDY ANALYZES THE COSTS, RISK AND BENEFIT OF DECONTAMINATING Z-PLANT TO FOUR DIFFERENT LEVELS OF RESIDUAL CONTAMINATION. THE THREE PRINCIPLE CRITERIA USED IN THE ANALYSIS ARE COST, THE RISK OF OFFSITE DOSE TO THE PUBLIC, AND THE OCCUPATIONAL EXPOSURE TO ONSITE PERSONNEL.

459

PRELIMINARY INVESTIGATION INTO THE THEORY AND TECHNIQUES OF MODELING THE NATURAL MOISTURE MOVEMENT IN UNSATURATED SEDIMENTS

RHO-LD-47

FINLAYSON, B.A.; NELSON, R.W.; BACA, R.G.

780101

ROCKWELL HANFORD OPERATIONS, RICHLAND, WA. 148 P.

ROCKWELL HANFORD OPERATIONS

C,1;C,5;C,7;L,1;L,5;L,7;N,1;N,5;N,7

A STUDY WAS PERFORMED ON THE PROBLEMS OF DEVELOPING A GENERAL COMPUTER MODEL OF FLUID FLOW PROCESSES IN ARID SITE SOIL SYSTEMS. MAJOR FOCUS OF THE STUDY WAS THE INVESTIGATION OF TRADITIONAL NUMERICAL TECHNIQUES FOR SOLVING THE STRONGLY NONLINEAR EQUATIONS OF UNSATURATED FLOW THEORY. A GENERALIZED MATHEMATICAL MODEL IS FORMULATED WHICH CONSIDERES THE FLUID FLOW PROCESSES OF CAPILLARITY, GRAVITY, THERMALLY INDUCED LIQUID AND VAPOR TRANSPORT, AND HEAT CONDUCTION. FUTURE TESTING WOULD BE NEEDED TO FULLY CHECK OUT THIS PRELIMINARY MODEL.

460

WIPP CONCEPTUAL DESIGN REPORT, ADDENDUM G. ACCIDENT ANALYSIS FOR WASTE ISOLATION PILOT PLANT

SAND-77-0274 (ADD. G)

SHEFFELBINE, H.C.; METCALF, J.H.

770101

NTIS. 19 P.

SANDIA LABORATORIES

L,1;L,2;L,9;N,1;N,2;N,9

THE TYPES OF ACCIDENTS OR RISKS PERTINENT TO THE WASTE ISOLATION PLANT ARE PRESENTED. DESIGN FEATURES ADDRESSING THESE RISKS ARE DISCUSSED. ALSO DISCUSSED ARE DESIGN FEATURES THAT PROTECT THE PUBLIC.

461

URANIUM MILL TAILINGS AND RADON

SAND-80-2142

HANCHEY, L.A.

810101

NIIS. 30 P.

SANDIA NATIONAL LABORATORIES

E,3;E,5,B;E,5,D;E,5,J;E,5,L

THE MAJOR HEALTH HAZARD FROM U MILL TAILINGS IS PRESUMED TO BE RESPIRATORY CANCER RESULTING FROM THE INHALATION OF RADON DAUGHTER PRODUCTS. A REVIEW OF STUDIES ON INHALATION OF RADON AND ITS DAUGHTERS INDICATES THAT THE HAZARD FROM THE TAILINGS IS EXTREMELY SMALL. IF THE ASSUMPTIONS USED IN THE STUDIES ARE CORRECT, ONE OR TWO PEOPLE PER YR IN THE U.S. MAY DEVELOP CANCER AS A RESULT OF RADON EXHALED FROM ALL OF THE URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM SITES. THE REMEDIAL ACTION SHOULD REDUCE THE HAZARD FROM THE TAILING BY A FACTOR OF ABOUT 100.

462

PROBABILISTIC SHORT-TERM RISK MODELING FOR BACK-END FUEL

CYCLE AND WASTE MANAGEMENT FACILITIES

STUDSVIK-K2-79-188

KJELLBERT, N.A.

800101

STUDSVIK ENERGITEKNIK AB, NYKUEPING, SWEDEN. 129 P.

C,1;C,2;C,3;C,4;C,5;C,6

THE STUDY OF PROBABILISTIC SHORT-TERM RISK MODELING OF BACK-END FUEL CYCLE AND WASTE MANAGEMENT FACILITIES REPRESENTS THE CONTINUATION OF WORK STARTED IN 1977. THE PURPOSE OF THE REPORT IS TO PRESENT A MORE DETAILED SURVEY OF MODELS AND ANALYSIS TECHNIQUES THAT MAY BE APPLICABLE. THE DEFINITION OF THE RISK CONCEPT AND THE NATURE OF THE FACILITIES AND EVENTS WHICH ARE TO BE ANALYZED ARE DESCRIBED. THE MOST IMPORTANT CRITERIA ARE THAT THE MODEL OR METHOD SHALL BE QUANTITATIVE, LOGICALLY/SCIENTIFICALLY BASED, AND BE ABLE TO HANDLE SYSTEMS OF SOME COMPLEXITY. SEVERAL FORMALIZED ANALYSIS METHODS ARE DESCRIBED, MOST OF THEM EMANATING FROM RELIABILITY THEORY. NO SINGLE MODEL WILL FULFILL ALL CRITERIA SIMULTANEOUSLY, TO THE DEGREE DESIRED. NEVERTHELESS, FAULT TREE ANALYSIS SEEMS TO BE AN EFFICIENT TOOL IN MANY APPLICATIONS, ALTHOUGH IT MUST PROBABLY BE USED TOGETHER WITH OTHER MODELS IN MOST CASES. OTHER METHODOLOGIES DESCRIBED CAN ALSO BE USEFUL, SUCH AS FAILURE MODES AND EFFECTS ANALYSIS, RENEWAL THEORY AND MARKOV CHAINS, RELIABILITY METHODOLOGY, MONTE CARLO SIMULATION, AND, OFTEN NECESSARY, VARIOUS CONSEQUENCE MODELING TECHNIQUES.

463

BASALT WASTE ISOLATION DISRUPTIVE EVENTS ANALYSIS

RHO-BWI-C-43

LEE, W.H.L.; NAIR, K.; SMITH, G.

780101

NTIS. 129 P.

WOODWARD-CLYDE CONSULTANTS

L,1;L,2;L,3;L,7

THIS STUDY IS A PRELIMINARY EFFORT IN RISK QUANTIFICATION FOR A BASALT REPOSITORY OF SPENT FUEL. NO ATTEMPT HAS BEEN MADE TO PERFORM A RISK EVALUATION. THE HAZARD OF UNDETECTED BOREHOLES WAS ANALYZED. THIS STUDY USED BOTH EVENT TREES AND FAULT TREES. THE ANALYSIS IN THE CURRENT STUDY FORMALIZES THE PRECONCEIVED NOTION THAT GROUNDWATER INTRUSION AND TECTONIC PROCESSES ARE THE MOST IMPORTANT DISRUPTIVE EVENTS TO A REPOSITORY. THE SHAFT SEAL IS SHOWN TO BE A KEY LINK. ALTHOUGH SHAFT SEAL FAILURE IS NOT IN ITSELF A DISRUPTION-INITIATING EVENT, IT IS A KEY CONDITIONAL EVENT. THE LENGTHS OF THE OPERATING PHASE AND THE LONG-TERM ISOLATION PHASE ARE CRITICAL ASSUMPTIONS. THE NUMBER OF ASSUMPTIONS MADE BY THE ANALYSTS IS INVERSELY PROPORTIONAL TO THE AMOUNT OF DATA, SUGGESTING THAT A FULL-SCALE RA SHOULD NOT BE COMPLETED BEFORE THE SELECTION OF A SITE AND CONCEPTUAL DESIGN IS COMPLETED.

464

ANALYSIS OF RISKS IN THE NUCLEAR FUEL CYCLE

BOECK, H.

810101

SPRINGER-VERLAG, NEW YORK

ATOMINSTITUT DER OESTERREICHISCHEN UNIVERSITAETEN, VIENNA

ELEKTROTECH. MASCHINENBAU 98:149-157.

P,1;P,2;P,3;P,5

THE RISKS INVOLVED IN THE USE OF NUCLEAR FUEL IN POWER STATIONS ARE COMPARED WITH THE RISKS INVOLVED IN TECHNOLOGICAL AND NATURAL CATASTROPHES. THE RISKS OF NUCLEAR-FUEL ACCIDENTS ARE ANALYZED ON THE BASIS OF A SUCCESSION OF PROBABILITIES. (IN GERMAN)

465

CRASH TESTING OF SPENT-NUCLEAR FUEL SHIPPING SYSTEMS

CONF-780316

YOSHIMURA, H.R.

780301

UNIV. OF ARIZONA, TUCSON, AZ

SANDIA LABORATORIES

WASTE MANAGEMENT FUEL CYCLES '78. PP. 511-525.

O,1;O,2;O,4;O,5

IN AN ATTEMPT TO UNDERSTAND THE DYNAMICS OF EXTRA SEVERE TRANSPORTATION ACCIDENTS AND TO EVALUATE CURRENT ANALYTICAL AND SCALE MODELING TECHNIQUES FOR PREDICTING THE DYNAMIC RESPONSE OF SPENT-NUCLEAR-FUEL SHIPPING CONTAINERS INVOLVED IN SEVERE SYSTEM

CRASHES, THE ENVIRONMENTAL CONTROL TECHNOLOGY DIVISION OF THE U.S. DOE UNDERTOOK A PROGRAM WITH SANDIA TO INVESTIGATE THESE AREAS. AS A RESULT OF THE FULL SCALE TESTING TO DATE, THE TESTS HAVE VERIFIED THAT CURRENT ANALYTICAL TOOLS AND THE USE OF SCALE MODEL TESTING ARE BOTH ACCURATE METHODS FOR PREDICTING SHIPPING CASK RESPONSE TO SEVERE ACCIDENT CONDITIONS. FURTHERMORE, THE CONTAINERS TESTED ARE CAPABLE OF SURVIVING SEVERE TRANSPORTATION ACCIDENTS.

466

SYSTEMS ANALYSIS STUDY FOR WASTE MANAGEMENT CRITERIA

CONF-780316

HECKMAN, R.A.; JOHNSON, W.A.; HOLDSWORTH, T.

780101

UNIV. OF ARIZONA, TUCSON, AZ

LAWRENCE LIVERMORE LABORATORY

WASTE MANAGEMENT FUEL CYCLES '78. PP. 139-154.

L,1;L,2;L,5;L,6,D

LLL IS PROVIDING TECHNICAL SUPPORT TO THE NRC IN THE DEVELOPMENT OF STANDARDS FOR THE MANAGING AND DISPOSAL OF HIGH-LEVEL AND TRU WASTES. THE PROBLEM LOGICALLY SPLITS INTO TWO PHASES: THE PRE-EMPLACEMENT PHASE OF THE WASTE MANAGEMENT SYSTEM AND THE REPOSITORY POST-SEALING PHASE. USING A SYSTEM ANALYSIS APPROACH, THE MODELING EFFORT IS STRUCTURED IN SUCH A WAY AS TO PRODUCE SOCIETAL RISK EVALUATIONS AT STATED CONFIDENCE LEVELS SO THAT THE NRC CAN DEVELOP REGULATIONS FOR THE BROADEST SET OF CONDITIONS POSSIBLE. A MULTIPLE APPROACH IN DEVELOPING THE SOCIETAL RISK EVALUATIONS IS USED. THE MODELING EFFORT USES A THREE LEVEL CONCEPT.

467

APPROACH TO RADIOLOGICAL ASSESSMENT FOR COMMERCIAL WASTE MANAGEMENT

CONF-780316

SHIPLER, D.B.; NELSON, I.C.

780305

UNIV. OF ARIZONA, TUCSON, AZ

PACIFIC NORTHWEST LABORATORY

WASTE MANAGEMENT FUEL CYCLES '78. PP. 446-453.

I,4,A;I,4,B;I,4,C;I,4,D;I,4,I;I,4,J;I,4,K;I,4,L;I,5,B;I,5,D;I,5,J;I,5,L;J,4,A;J,4,B;J,4,C;J,4,D;J,4,I;J,4,J;J,4,K;J,4,L;J,5,B;J,5,D;J,5,J;J,5,L;K,4,A;K,4,B;K,4,C;K,4,D;K,4,I;K,4,J;K,4,K;K,4,L;K,5,B;K,5,D;K,5,J;K,5,L;L,4,A;L,4,B;L,4,C;L,4,D;L,4,I;L,4,J;L,4,K;L,4,L;L,5,B;L,5,D;L,5,J;L,5,L;L,6;L,7;M,4,A;M,4,B;M,4,C;M,4,D;M,4,I;M,4,J;M,4,K;M,4,L;M,5,B;M,5,D;M,5,J;N,5,L;N,4,A;N,4,B;N,4,C;N,4,D;N,4,I;N,4,J;N,4,K;N,4,L;N,5,B;N,5,D;N,5,J;N,5,L;O,4,A;O,4,B;O,4,C;O,4,D;O,4,I;O,4,J;O,4,K;O,4,L;O,5,B;O,5,D;O,5,J;O,5,L

THE REPORT FORM OF THIS PAPER IS PNL-SA-6729. A RADIOLOGICAL ASSESSMENT WAS CONDUCTED IN SUPPORT OF THE GENERIC

EIS FOR MANAGEMENT OF COMMERCIALY GENERATED RADIOACTIVE WASTE. THE ASSESSMENT CONSIDERED FOR INDIVIDUALS AND POPULATIONS THE EFFECTS OF AIRBORNE RELEASES OF RADIOACTIVE MATERIALS FROM PLANNED OPERATIONS, DECOMMISSIONING, AND POSTULATED ACCIDENTS. DOSES TO WORK FORCES FROM DIRECT RADIATION WERE ESTIMATED AND HEALTH EFFECTS IN POPULATIONS WERE CALCULATED. THE PRELIMINARY DRAFTS OF THE STATEMENT AND THE DETAILED EA ARE BEING REVIEWED BY DOE.

468

NUCLEAR WASTE MANAGEMENT

TASK COMMITTEE ON NUCLEAR EFFECTS OF THE COMMITTEE ON AIR, NOISE, AND RADIATION MANAGEMENT OF THE ENVIRONMENTAL ENGINEERING DIVISION

820101

AMERICAN SOCIETY FOR CIVIL ENGINEERS, NEW YORK

J. ENVIRON. ENG. DIV., ASCE 108(EE1):1-50.

L,1;L,5;L,6;D;L,7 ;N,1;N,5;N,6;N,7;J,1;

THE TASK COMMITTEE REPORT TO THE MEMBERS OF ASCE REVIEWS THE CURRENT TECHNOLOGY AND MANY OF THE KEY TECHNICAL ISSUES CONCERNED WITH THE LONG-TERM STORAGE AND DISPOSAL OF HIGH-LEVEL AND INTERMEDIATE-LEVEL NUCLEAR WASTES FROM THE COMMERCIAL NUCLEAR FUEL CYCLE. ALTHOUGH NATIONAL POLICY IS NOT FIRM, MAJOR EFFORTS ARE FOCUSED ON PERMANENT STORAGE OF NUCLEAR WASTES IN ENGINEERED WASTE REPOSITORIES WITH MULTIPLE BARRIERS TO TRANSPORT TO THE BIOSPHERE. MANY OF THE ISSUES FOCUS ON THE DESIRE FOR ASSURANCES THAT THE WASTE CAN BE ISOLATED FROM THE BIOSPHERE FOR GEOLOGIC TIME PERIODS IN EXCESS OF THOUSANDS OF YRS. THE REPORT REVIEWS THE ORIGIN OF NUCLEAR WASTES FROM THE TOTAL FUEL CYCLE, THE BIOLOGICAL AND ENVIRONMENTAL SIGNIFICANCE OF THE WASTES, AND TECHNICAL OPTIONS FOR WASTE REPOSITORIES, BOTH FOR SHALLOW LAND BURIAL AND FEDERAL REPOSITORIES. THE REPORT DISCUSSES PRESSING ISSUES ON SPENT FUEL REPROCESSING AND CONCLUDES WITH RECOMMENDATIONS THAT COULD ACCELERATE ACTIVITIES TO RELIEVING NATIONAL NEED FOR NUCLEAR WASTE DISPOSAL FACILITIES.

469

PROBABILITY ANALYSIS OF GEOLOGICAL PROCESSES: A USEFUL TOOL FOR THE SAFETY ASSESSMENT OF RADIOACTIVE WASTE DISPOSAL

D'ALESSANDRO, M.; MURRAY, C.N.; BERTOZZI, G.; GIRARDI, F.

800101

HARWOOD ACADEMIC PUBL., NEW YORK

COMMISSION OF THE EUROPEAN COMMUNITIES, ISPRA

RADIOACT. WASTE MANAGE. 1(1):25-42.

L,1;L,2;L,3;L,5,J;L,5,L;L,7;N,1;N,2;N,3;N,5,J;N,5,L;N,7

IN THE DEVELOPMENT OF METHODS FOR RA ASSOCIATED WITH THE DISPOSAL OF RADWASTES OVER PERIODS UP TO 10 MEGA YRS, MUCH DISCUSSION HAS OCCURRED ON THE USE OF PROBABILITY ANALYSIS FOR

GEOLOGICAL PROCESSES. THE APPLICABILITY AND LIMITATIONS OF THIS CONCEPT ARE RELATED TO THE PROPER USE OF THE GEOLOGICAL DATA-BASE AND THE CRITICAL INTERPRETATION OF PROBABILITY DISTRIBUTIONS. THE INTERPRETATION OF GEOLOGICAL PHENOMENA IN TERMS OF PROBABILITY IS DISCUSSED AND AN EXAMPLE OF APPLICATION TO THE DETERMINATION OF FAULTING PROBABILITY IS ILLUSTRATED. THE METHOD HAS BEEN USED FOR THE DETERMINATION OF FAILURE PROBABILITY OF GEOLOGICAL SEGREGATION OF A WASTE REPOSITORY IN A CLAY FORMATION.

470

ENVIRONMENTAL IMPACTS OF THE PRODUCTION AND USE OF NUCLEAR ENERGY: A SUMMARY OF THE UNITED NATIONS ENVIRONMENT PROGRAMME STUDY

AHMED, J.U.; DAW, H.T.

800101

IAEA, VIENNA

IAEA

INT. AT. ENERGY AGENCY BULL. 22(2):23-29.

D,5,A;D,5,B;D,5,C;D,5,D;E,5,A;E,5,B;E,5,C;E,5,D;F,5,A;F,5,B;F,5,C;F,5,D;G,5,A;G,5,B;G,5,C;G,5,D;H,5,A;H,5,B;H,5,C;H,5,D;J,5,A;J,5,B;J,5,C;J,5,D;K,5,A;K,5,B;K,5,C;K,5,D;L,5,A;L,5,B;L,5,C;L,5,D;O,5,A;O,5,B;O,5,C;O,5,D

IN ORDER TO ASSESS THE ENVIRONMENTAL IMPACTS OF NUCLEAR ENERGY, THE PAPER CONSIDERS THE VARIOUS OPERATIONS INVOLVED IN THE NUCLEAR POWER INDUSTRY. THESE OPERATIONS ARE THE MINING AND MILLING OF THE U, ENRICHMENT, FABRICATION OF FUEL ELEMENTS, REACTOR OPERATION, REPROCESSING OF IRRADIATED FUELS, THE MANAGEMENT OF RADWASTES PRODUCED IN ALL STEPS OF THE NUCLEAR FUEL CYCLE, DECOMMISSIONING OF NUCLEAR FACILITIES, AND TRANSPORT OF RADIOACTIVE MATERIALS. THE ENVIRONMENTAL IMPACTS OF THE VARIOUS OPERATIONS HAVE BEEN NORMALIZED TO THE NET PRODUCTION OF ONE GIGAWATT-YR.

471

INTERIM STORAGE OF SOLIDIFIED HIGH-LEVEL RADIOACTIVE WASTES

TID-27189

NATIONAL ACADEMY OF SCIENCES

750101

NATIONAL ACADEMY OF SCIENCES, WASHINGTON, DC. 90 P.

NATIONAL ACADEMY OF SCIENCES

J,1;K,1

THE FEASIBILITY, SAFETY, AND TECHNOLOGICAL ASPECTS OF STORAGE OF HIGH-LEVEL SOLIDIFIED WASTES IN AN ENGINEERED STORAGE FACILITY AT OR NEAR THE EARTH'S SURFACE FOR AN INTERIM PERIOD OF UP TO 100 YRS ARE REVIEWED AND EVALUATED. SEVERAL METHODS OF PROVIDING SURFACE STORAGE ARE CONSIDERED: THE USE OF SEALED STORAGE CASKS, WATER BASINS, AND AIR-COOLED VAULTS ARE ASSESSED WITH REGARD TO THE ADVANTAGES OF EACH IN TERMS OF TECHNOLOGY,

PUBLIC SAFETY, RESOURCES FOR PRODUCTION, COST ESTIMATES, AND LAND REQUIREMENTS. OTHER TOPICS INCLUDE FUEL REPROCESSING AND WASTE SOLIDIFICATION, SEGREGATION OF TRANSURANIC ELEMENTS, DETERMINATION OF OPTIMUM CONSTRUCTION MATERIALS AND INTEGRITY OF WASTE CONTAINERS, AND SAFEGUARDING.

472

SYSTEMS SAFETY ANALYSIS AND FAULT TREE ANALYSIS

UCID-16238

LAMBERT, H.E.

730101

NTIS. 74 P.

LAWRENCE LIVERMORE LABORATORY

C,1;C,2;C,3;C,8

THIS MANUAL DESCRIBES SYSTEMS SAFETY ANALYSIS METHODOLOGY FROM ITS BASIC CONCEPTS TO ITS APPLICATION. IT IS A SYSTEMATIC PROCESS OF IDENTIFYING THE HAZARDOUS CONDITIONS WITHIN A SYSTEM. THE TWO PRINCIPAL METHODS OF SA ARE LISTED AS INDUCTIVE AND DEDUCTIVE ANALYSIS. INDUCTIVE TECHNIQUES GIVEN INCLUDE PRELIMINARY HAZARDS ANALYSIS, FAILURE MODE AND EFFECTS, CRITICALITY ANALYSIS, FAULT HAZARDS ANALYSIS, DECISION TREES, AND MARKOVIAN PROCESSES. THEY ARE BEST APPLIED TO GENERIC EQUIPMENT HAZARDS. THE DEVELOPMENT OF SUBSYSTEM FUNCTIONAL FAULTS ARE SAID TO REQUIRE DEDUCTIVE ANALYSIS, SPECIFICALLY FAULT TREE ANALYSIS. THE RISK ANALYSIS METHODS AND APPROACH PRESENTED PROVIDE USEFUL BACKGROUND INFORMATION FOR CONDUCTING A RA OF A NUCLEAR WASTE STORAGE FACILITY.

473

SITE SUITABILITY CRITERIA FOR SOLIDIFIED HIGH LEVEL WASTE REPOSITORIES

UCID-17830

HECKMAN, R.A.; HOLDSWORTH, T.; TOWSE, D.F.

790101

NTIS. 125 P.

LAWRENCE LIVERMORE LABORATORY

C,1;C,2;C,3;C,5;C,7;C,8;L,1;L,2;L,3;L,5;L,7;L,8

ACTIVITIES DEVOTED TO DEVELOPMENT OF REGULATIONS, CRITERIA, AND STANDARDS FOR STORAGE OF SOLIDIFIED HIGH-LEVEL RADWASTES ARE REPORTED. THE WORK IS SUMMARIZED IN SECTIONS ON SITE SUITABILITY REGULATIONS, RISK CALCULATIONS, GEOLOGICAL MODELS, AQUIFER MODELS, HUMAN USAGE MODEL, CLIMATOLOGY MODEL, AND REPOSITORY CHARACTERISTICS. PROPOSED ADDITIONAL ANALYTICAL WORK IS ALSO SUMMARIZED.

474

DISRUPTIVE EVENT UNCERTAINTIES IN A PERTURBATION APPROACH TO NUCLEAR WASTE REPOSITORY RISK ANALYSIS

UCID-17893

HARVEY, T.F.

800101

NTIS. 59 P.

LAWRENCE LIVERMORE LABORATORY

C,2;C,3;C,7;C,8;L,2;L,3;L,7;L,8;

A METHODOLOGY WAS DEVELOPED FOR INCORPORATING A FULL RANGE OF THE PRINCIPAL FORECASTING UNCERTAINTIES INTO A RA OF A NUCLEAR WASTE REPOSITORY. THE RESULT OF THE METHODOLOGY WAS A SET OF RISK CURVES SIMILAR TO THOSE USED BY RASMUSSEN IN WASH-1400. THE SET OF CURVES IS PARTIALLY DERIVED FROM A PERTURBATION APPROACH TO ANALYZE POTENTIAL DISRUPTIVE EVENT SEQUENCES. SUCH A SCHEME COULD BE USEFUL IN TRUNCATING THE NUMBER OF DISRUPTIVE EVENT SCENARIOS AND PROVIDING GUIDANCE TO THOSE ESTABLISHING DATA-BASE DEVELOPMENT PRIORITIES.

475

METEOROLOGY AND DEMOGRAPHY MODELS FOR RISK ASSESSMENT OF
ACCIDENTAL ATMOSPHERIC RELEASE OF NUCLEAR WASTE. PHASE
2 METHODOLOGY

UCID-17930

PETERSON, K.R.; HARVEY, T.F.

800901

NTIS. 20 P.

LAWRENCE LIVERMORE LABORATORY

C,1;C,2;C,3;C,5,B;C,9;J,3;J,5,B;J,9;L,3;L,5,B;L,9;N,3;N,5,B;N,9;
O,3;O,5,B;O,9

MODELS ARE DERIVED FOR DETERMINING THE RISK OF RELEASE TO THE ATMOSPHERE OF RADIOACTIVE MATERIALS DURING NUCLEAR WASTE HANDLING. SUCH RELEASES MIGHT OCCUR IN THREE PHASES OF THE NUCLEAR WASTE HANDLING CYCLE: (1) AT FUEL REPROCESSING PLANTS DURING HANDLING AND INTERIM STORAGE, (2) DURING TRANSPORTATION TO A PERMANENT STORAGE AREA, OR (3) AT THE PERMANENT DISPOSAL AREA (FEDERAL WASTE REPOSITORY). GAUSSIAN DIFFUSION EQUATIONS FOR BOTH PLUME- AND PUFF-TYPE RELEASES ARE USED WITH DEMOGRAPHIC MODELS TO ASSESS RELATIVE INTEGRATED POPULATION DOSES. GIVEN A UNIT RELEASE AND ASSUMING AN EQUAL ACCIDENT PROBABILITY, IT IS CONCLUDED THAT THE LARGEST RISK WOULD BE FROM A TRANSPORTATION ACCIDENT IN A METROPOLITAN AREA. THE EFFECT OF A RELEASE DURING TRANSPORTATION IN A RURAL AREA OR AT A FUEL REPROCESSING PLANT WOULD BE ONE TO TWO ORDERS OF MAGNITUDE LESS, WHILE AT A FEDERAL REPOSITORY THE POPULATION DOSE WOULD BE THREE OR MORE ORDERS OF MAGNITUDE LESS THAN FOR THE METROPOLITAN TRANSPORTATION ACCIDENT.

476

DETERMINATION OF PERFORMANCE CRITERIA FOR HIGH-LEVEL
SOLIDIFIED NUCLEAR WASTE

UCID-18121

HECKMAN, R.A.; HOLDSWORTH, T.

790501

LAURENCE LIVERMORE LABORATORY, LIVERMORE, CA. 281 P.

LAWRENCE LIVERMORE LABORATORY

K,1;K,2;K,3;K,4;K,5,B;K,5,D;K,7;K,9;K,0,A;K,0,B;K,0,D;L,1;L,2;L,3;L,4;L,5;L,9;L,0,A;L,0,B;L,0,D;O,1;O,2;O,3;O,4;O,5,B;L,5,D;O,9;O,0,A;O,0,B;O,0,D;C,1;C,3

TO MINIMIZE RADIOLOGICAL RISK FROM THE OPERATION OF A WASTE MANAGEMENT SYSTEM, PERFORMANCE LIMITS ON VOLATILIZATION, PARTICULATE DISPERSION, AND DISSOLUTION CHARACTERISTICS OF SOLIDIFIED HIGH-LEVEL WASTE MUST BE SPECIFIED. THE RESULTS SHOW CLEARLY THAT THE PRE-EMPLACEMENT ENVIRONS ARE MORE LIMITING IN ESTABLISHING THE WASTE FORM PERFORMANCE CRITERIA THAN THE POST-EMPLACEMENT ENVIRONS. ABSOLUTE VALUES OF EXPECTED RISK ARE VERY SENSITIVE TO MODELING ASSUMPTIONS. THE TRANSPORTATION AND INTERIM STORAGE OPERATIONS APPEAR TO BE MOST LIMITING IN DETERMINING THE PERFORMANCE CHARACTERISTICS REQUIRED. THE EXPECTED VALUES OF RISK DO NOT RELY UPON THE REPOSITORIES REMAINING INTACT OVER THE POTENTIALLY HAZARDOUS LIFETIME OF THE WASTE.

477

ABSTRACTS: NRC WASTE MANAGEMENT PROGRAM REPORTS

UCID-18133 (REV. 1)

HECKMAN, R.A.; MINICHINO, C.

790101

NTIS. 150 P.

LAWRENCE LIVERMORE LABORATORY

K,1;L,1;M,1;N,1

THIS DOCUMENT CONSISTS OF ABSTRACTS OF ALL REPORTS PUBLISHED BY THE NRC WASTE MANAGEMENT PROGRAM AT LLL. IT WILL BE UPDATED AT REGULAR INTERVALS. REPORTS ARE ARRANGED IN NUMERICAL ORDER, WITHIN EACH CATEGORY, UNLESS OTHERWISE SPECIFIED.

478

SAFETY ANALYSIS (SA) OF THE DECONTAMINATION FACILITY,
BUILDING 419, AT THE LAWRENCE LIVERMORE NATIONAL
LABORATORY

UCID-18886

ODELL, B.N.

800101

NTIS. 35 P.

LAWRENCE LIVERMORE LABORATORY

C,1;C,3;C,4;C,5

THIS SA WAS PERFORMED FOR THE MANAGER, PLANT SERVICES AT LLL AND FULFILLS THE REQUIREMENTS OF DOE ORDER 5481.1. THE ANALYSIS WAS BASED ON FIELD INSPECTIONS, DOCUMENT REVIEW, COMPUTER CALCULATIONS, AND EXTENSIVE INPUT FROM WASTE MANAGEMENT PERSONNEL. IT WAS CONCLUDED THAT THE MAXIMUM QUANTITIES OF RADIOACTIVE MATERIALS THAT SAFETY PROCEDURES ALLOW TO BE HANDLED IN THIS BUILDING DO NOT POSE UNDUE RISKS ON- OR OFF-SITE EVEN IN POSTULATED SEVERE ACCIDENTS. RISK FROM THE VARIOUS HAZARDS AT THIS FACILITY VARY FROM LOW TO MODERATE AS SPECIFIED IN THE DOE

ORDER. RECOMMENDATIONS ARE MADE FOR IMPROVEMENTS THAT WILL REDUCE RISKS EVEN FURTHER.

479

SAFETY ASSESSMENT DOCUMENT FOR THE ENVIRONMENTAL TEST
COMPLEX (BUILDING B34) AT SITE 300

UCID-18945

ODELL, B.N.; PFEIFER, H.E.

810101

NTIS. 102 P.

LAWRENCE LIVERMORE LABORATORY

C,1;C,2;C,4;C,5;C,7;C,9

A SA WAS PERFORMED TO DETERMINE IF ACCIDENTS OCCURRING AT THE B34 COMPLEX AT SITE 300 COULD PRESENT UNDUE HAZARDS TO THE GENERAL PUBLIC, PERSONNEL AT SITE 300, OR HAVE AN ADVERSE EFFECT ON THE ENVIRONMENT. THE CREDIBLE ACCIDENTS THAT MIGHT HAVE AN EFFECT ON THESE FACILITIES OR HAVE OFF-SITE CONSEQUENCES WERE CONSIDERED. THESE WERE EARTHQUAKE, EXTREME WIND (INCLUDING MISSILES), LIGHTNING, FLOOD, CRITICALITY, HIGH EXPLOSIVE DETONATION THAT DISPERSES U AND BE, SPONTANEOUS OXIDATION OF PU, EXPLOSIONS DUE TO FINELYDIVIDED PARTICLES, AND A FIRE. RESULTS ARE DESCRIBED.

480

MATHEMATICAL METHODS OF PROBABILISTIC SAFETY ANALYSIS

UCLA-ENG-7464

APOSTOLAKIS, G.

740101

NTIS. 60 P.

UNIV. OF CALIFORNIA, LOS ANGELES

C,2;C,3;C,6;C,8

THE REPORT PRESENTS MATHEMATICAL METHODS THAT ARE USEFUL IN RELIABILITY AND SAFETY STUDIES. THESE METHODS ARE BUILT ON THE FOLLOWING BASES: PROBABILITY THEORY, STATISTICS, AND LOGIC. IN GENERAL, THE METHODS DEAL WITH THE PREDICTION OF THE PROBABILITY THAT A SPECIFIED FUNCTION WILL BE PERFORMED SATISFACTORILY WITHIN A GIVEN PERIOD OR PER DEMAND, AND THE IDENTIFICATION OF EVENTS AND THEIR PROBABILITIES THAT MAY LEAD TO UNFAVORABLE CIRCUMSTANCES ENDANGERING THE HEALTH OF THE PUBLIC. TOPICS COVERED INCLUDE ELEMENTS OF PROBABILITY THEORY AND STATISTICS, THE FAILURE COMPONENT, SIMPLE SYSTEMS, MAINTENANCE MODELS, LOGIC DIAGRAMS, COMMON MODE FAILURES, HUMAN FACTORS AND SOFTWARE RELIABILITY, AND ANALYSIS WITHOUT LOGIC DIAGRAMS.

481

RISK-BENEFIT METHODOLOGY AND APPLICATION: SOME PAPERS
PRESENTED AT THE ENGINEERING FOUNDATION WORKSHOP,
SEPTEMBER 22-26, 1975, ASILOMAR, CALIFORNIA

UCLA-ENG-7598; PB-261 920

OKRENT, D., (ED.)

750101

NTIS. 200 P.

UNIV. OF CALIFORNIA, LOS ANGELES

C,1;C,2;C,3;C,4;C,5;C,8

THE GOAL OF THIS WORKSHOP WAS TO ASSESS QUANTITATIVELY THE STATE OF THE ART ON RISK-BENEFIT METHODOLOGY. TWO LARGE-SCALE TECHNOLOGY AREAS WERE CONSIDERED: NUCLEAR REACTORS, AND SHIPMENT AND STORAGE OF LIQUEFIED NATURAL GAS. BOTH OF THESE TECHNOLOGIES CAN PROVIDE INCIDENTS OF LARGE CONSEQUENCE SHOULD FAILURES OCCUR. MANY OF THE PAPERS PRESENTED ARE ON SUBJECTS APPLICABLE TO A POTENTIAL RA OF THE UNDERGROUND STORAGE OF NUCLEAR WASTES. THESE INCLUDE PAPERS DEALING WITH RA METHODOLOGY, AND POLITICAL, LEGAL, AND ACCEPTANCE ASPECTS OF RISKS.

482

PROBABILITY INTERVALS FOR THE TOP EVENT UNAVAILABILITY OF
FAULT TREES

UCLA-ENG-7663

LEE, Y.T.; APOSTOLAKIS, G.E.

760202

NTIS.

UNIV. OF CALIFORNIA, LOS ANGELES

C,3;C,8

THIS WORK DEALS WITH ESTIMATING PROBABILITY INTERVALS FOR THE EXISTENCE OF THE TOP EVENT OF A FAULT TREE. GIVEN THE UNCERTAINTIES OF THE PRIMARY INPUT DATA, A METHOD IS DESCRIBED FOR THE EVALUATION OF THE FIRST FOUR MOMENTS OF THE TOP EVENT OCCURRENCE PROBABILITY. THESE MOMENTS ARE THEN USED TO ESTIMATE CONFIDENCE BOUNDS BY SEVERAL APPROACHES BASED ON STANDARD INEQUALITIES (E.G., CHEBYCHEV AND CANIELLI) OR ON EMPIRICAL DISTRIBUTIONS (THE JOHNSON FAMILY). SEVERAL EXAMPLES INDICATE THAT THE JOHNSON FAMILY OF DISTRIBUTIONS YIELDS RESULTS THAT ARE IN GOOD AGREEMENT WITH THOSE PRODUCED BY MONTE CARLO SIMULATION. THESE TECHNIQUES COULD BE USEFUL IN A RA OF THE UNDERGROUND STORAGE OF NUCLEAR WASTE IN ESTABLISHING CONFIDENCE LIMITS FOR THE ESTIMATED RISK.

484

HIGH LEVEL WASTE REPOSITORY SITE SUITABILITY CRITERIA,
ENVIRONMENTAL IMPACT STATEMENT METHODOLOGY

UCRL-13739

TEKNEKRON, INC.

770101

NTIS. 61 P.

C,1;C,2;C,3;C,4;C,5;C,9;L,1;L,2;L,3;L,4;L,5;L,9

THE APPROACH (METHODOLOGY) WHICH HAS BEEN DEVELOPED FOR THE PREPARATION OF THE EIS IS DESCRIBED. A SUGGESTED OUTLINE IS PRESENTED FOR THE HLW REPOSITORY SITE SUITABILITY CRITERIA EIS TOGETHER WITH A DETAILED DESCRIPTION OF THE APPROACH TO BE USED

IN PREPARING THE EIS, A METHODOLOGY IS PRESENTED BY WHICH THE NECESSARY COST/BENEFIT/RISK COMPARISONS OF ALTERNATIVE SETS OF SITE SUITABILITY CRITERIA CAN BE MADE. THE TERA ENVIRONMENTAL RESEARCH DATA BANK, A COMPUTERIZED DATA BANK WHICH CONTAINED INFO ON CURRENT AND HISTORICAL LICENSING ACTIVITIES FOR POWER PLANTS WAS MODIFIED TO INCLUDE INFO ON GENERIC OR PROGRAMMATIC EIS RELATED ISSUES. THE CONTENT OF THE MODIFIED DATA BANK WAS UTILIZED TO DEVELOP THE EIS OUTLINE PRESENTED IN THIS REPORT. THE REPORT RECOMMENDS THAT A MODIFIED MATRIX EVALUATION APPROACH BE USED TO MAKE THE COST/BENEFIT/RISK COMPARISONS. THE SUGGESTED MATRIX IS DESIGNED TO FACILITATE BETWEEN CRITERIA COMPARATIVE ANALYSES OF ECONOMIC, ENVIRONMENTAL, SOCIOLOGICAL AND RADIOLOGICAL RISK FACTORS. THE QUANTITATIVE COMPOSITING OF DOLLAR COST AND BENEFITS, ENVIRONMENTAL AND SOCIOLOGICAL IMPACTS, AND RADIOLOGICAL RISKS IS TO BE PERFORMED USING A SEMI-ANALYTICAL, SEMI-VISUAL PROCEDURE BASED ON THE CONCEPT OF "DECISION SURFACES."

485

ASPECTS OF NUCLEAR WASTE MANAGEMENT. VOL. 2. POST-
EMPLACEMENT HAZARDS

UCRL-13766, VOL. 2

ROSS, B.I.; BERMAN, L.E.; HOUGH, M.E.; POLLAK, G.D.

790101

ANALYTIC SCIENCES CORP., READING, MA, 159 P.

ANALYTIC SCIENCES CORP.

C,4;C,5;C,8;K,1;K,4;K,5,B;K,7;K,8;K,0; L,1;L,2;L,3;L,5;L,7;L,8;L,9;L,0,R

STUDIES OF TECHNICAL ISSUES RELATING TO NUCLEAR WASTE MANAGEMENT ARE DESCRIBED. IT SUPPLEMENTS PREVIOUS TASC REPORTS ON THIS TOPIC. VOL. 2 DEALS WITH THE POSSIBLE RELEASE OF WASTE FROM A GEOLOGIC REPOSITORY. ASPECTS OF LONG-TERM REPOSITORY PERFORMANCE WHICH ARE DISCUSSED INCLUDE WATER FLOW AROUND SHAFTS AND BOREHOLES AND USE OF WATER FROM CONTAMINATED WELLS. NEW METHODS AND RESULTS PERTAINING TO THE ANALYSIS OF UNCERTAINTIES IN LONG-TERM RISK PREDICTIONS ARE ALSO PRESENTED.

486

DRAFT ENVIRONMENTAL IMPACT STATEMENT. HIGH-LEVEL WASTE
REPOSITORY SITE SUITABILITY CRITERIA

UCRL-13804

TERA CORP.

780101

NTIS. 147 P.

L,1;L,2;L,3;L,9

THE PURPOSE OF HL-RSSC IS TO PRESENT GUIDELINES WHICH WILL HELP IN THE DEVELOPMENT OF SAFE WASTE MANAGEMENT SCHEMES. CURRENT REGULATIONS REQUIRE SOLIDIFICATION OF ALL HIGH-LEVEL WASTE WITHIN 5 YRS OF THEIR GENERATION AND TRANSFER TO A FEDERAL WASTE REPOSITORY WITHIN 10 YRS. DEVELOPMENT OF THE PROPOSED

HLWRSSC IS PART OF THE OVERALL NRC PROGRAM TO CLOSE THE "BACK END" OF THE COMMERCIAL LWR FUEL CYCLE. IN THE DOCUMENT, THE NEED FOR HLWRSSC IS REVIEWED, AND THE NATIONAL ENERGY POLICY, THE NEED FOR ELECTRICAL ENERGY, AND THE NUCLEAR FUEL CYCLE ARE DISCUSSED. CONSIDERATIONS FOR HLWRSSC ARE PRESENTED, INCLUDING THE NATURE OF THE REPOSITORY, IMPORTANT SITE-RELATED FACTORS, AND RADIOLOGICAL RISK METHODOLOGY. RADIOLOGICAL AND NONRADIOLOGICAL ENVIRONMENTAL IMPACTS ASSOCIATED WITH HLWRSSC ARE DEFINED. ALTERNATIVES TO THE CRITERIA ARE PRESENTED, AND THE COST-BENEFIT-RISK EVALUATION IS REVIEWED.

487

INDEX OF HAZARD FOR RADIOACTIVE WASTE (REVISED). INTERIM TECHNICAL REPORT PR 78-10-60R

UCLL-13668-1

WATSON, S.R.

780101

NIIS. 60 P.

LAWRENCE LIVERMORE LABORATORY

C,2;C,3;C,5;C,7;C,8;C,9;L,2;L,3;L,5;L,7;L,8;L,9; N,2;N,3;N,5;N,7; N,8;N,9

THIS INTERIM REPORT IS A STUDY TO ESTABLISH A RISK MEASURE FOR RADWASTE REPOSITORIES AND TO GENERATE RADIOLOGICAL PERFORMANCE OBJECTIVES. THE PROBLEM OF REGULATING RADWASTE REPOSITORIES IS REVIEWED, AND THE DIFFICULTIES ASSOCIATED WITH THIS ACTIVITY ARE DISCUSSED. RISK-BENEFIT ANALYSIS AS A TOOL FOR REGULATION HAS BEEN SUGGESTED, AND ITS CONTRIBUTION IS ASSESSED. DECISION ANALYSIS AS A DEVELOPMENT OF RISK-BENEFIT ANALYSIS IS SUGGESTED AS AN ALTERNATIVE APPROACH, IN PARTICULAR, EMPLOYING THE CONCEPT OF EXPECTED UTILITY.

489

ANALYSIS OF SOME NUCLEAR WASTE MANAGEMENT OPTIONS. VOL. 1. ANALYSIS AND INTERPRETATION, VOL. 2 APPENDICES

UCLL-13917

BERMAN, W.R.; ENSMINGER, D.A.; GIUFFRÉ, M.S.; KOPLIK, C.M.;

OSTON, S.G.; POLLAK, G.D.; ROSS, B.J.

780101

LAWRENCE LIVERMORE LABORATORY, LIVERMORE, CA. 135, 315 P.

ANALYTIC SCIENCES CORP.

C,1;J,2;J,3;J,4,B;J,5,B;J,7;J,8;J,9;J,0,B;K,2;K,3;K,4,B;K,5,B;K,7;K,8;K,9;K,0,B;L,2;L,3;L,4,B;L,5,B;L,7;L,8;L,9;L,0,B;O,2;O,3;O,4,B;O,5,B;O,7;O,8;O,9;O,0,B; P,2;P,3;P,4,B;P,5,B;P,7;P,9;P,0,B

THIS REPORT DESCRIBES RISK ANALYSES PERFORMED ON THAT PORTION OF A NUCLEAR FUEL CYCLE WHICH BEGINS FOLLOWING SOLIDIFICATION OF HLW. RISKS ASSOCIATED WITH HANDLING, INTERIM STORAGE AND TRANSPORTATION OF THE WASTE ARE ASSESSED, AS WELL AS THE LONG TERM IMPLICATIONS OF DISPOSAL IN DEEP MINED CAVITIES. THE RISK IS EXPRESSED IN TERMS OF EXPECTED DOSE TO THE GENERAL

POPULATION AND PEAK DOSE TO INDIVIDUALS IN DETAILS FOR THE WORK PERFORMED. THE POPULATION. VOL. 1 DESCRIBES THE ANALYSES AND DISCUSSES THE RESULTS. VOL. 2 CONSISTS OF APPENDICES WHICH PROVIDE TECHNICAL DETAILS OF THE WORK PERFORMED.

490

NOTES ON THE NEXT GENERATION MACROMODEL: A UNIFIED
COMPUTATIONS SYSTEM FOR PREDICTING POST SEALING WASTE
DEPOSITORY PERFORMANCE

UCRL-13997

KAPLAN, S.; KAUFMAN, A.M.; LATHROP, J.W.

780101

NTIS. 28 P.

KAPLAN AND ASSOCIATES, INC., IRVINE, CA

C,2;C,3;C,4;C,5;C,8;L,1;L,2;N,1;N,2

DEVELOPMENT AND IMPROVEMENT ACTIVITIES ARE UNDERWAY ON COMPUTER SOFTWARE AND ON SEVERAL ANALYTICAL IDEAS RELATED TO THE CALCULATIONS OF THE RISK FROM WASTE MIGRATION AFTER SEALING OF A DEPOSITORY. PURPOSE OF THIS REPORT IS TO PULL TOGETHER THESE SOFTWARE AND ANALYTICAL IDEAS INTO AN OVERALL PORTRAYAL OR BLUEPRINT OF THE NEW MACROMODEL THAT IS EVOLVING, IN ORDER TO CLARIFY THE RELATIONSHIP OF THE COMPONENTS AND THE INTERFACES REQUIRED, TO FACILITATE THE ALIGNMENT OF ALL PARTIES CONCERNED AND TO ALLOW A DEFINITIVE SPECIFICATION OF THE WORK REMAINING TO BE DONE.

491

NOTES ON THE LLL/NRC WASTE DISPOSAL STUDY. 1. ANALYTICAL
FRAMEWORK

UCRL-13998-1

KAPLAN AND ASSOCIATES, INC.

780101

NTIS. 22 P.

KAPLAN AND ASSOCIATES, INC., IRVINE, CA

C,1;L,1;N,1

PURPOSE OF THESE NOTES IS TO SUGGEST SOME LANGUAGE (NOTATION, PUBLIC HEALTH RISK), IDEAS, AND POINTS OF VIEW WHICH MAY BE USEFUL IN FOCUSING DISCOURSE AND WORK ON THE NRC WASTE DISPOSAL STUDY.

492

NOTES ON THE LLL/NRC WASTE DISPOSAL STUDY. 2. PROBABILISTIC
ARITHMETIC

UCRL-13998-2

KAPLAN AND ASSOCIATES, INC.

780101

NTIS. 20 P.

KAPLAN AND ASSOCIATES, INC., IRVINE, CA

C,3;L,1;L,3;N,1;N,3

UCRL-13998-1 OUTLINED A FORMALISM FOR RA OF NUCLEAR WASTE DISPOSAL SYSTEMS. THIS NOTE LOOKS MORE DEEPLY AT THE PROBABILISTIC CALCULATIONS NECESSARY FOR ITS IMPLEMENTATION. BOTH THE UNDERLYING PHILOSOPHY AND THE COMPUTATION TECHNIQUE OF THESE CALCULATIONS ARE DISCUSSED.

493

NOTES FOR A WORKSHOP ON RISK ANALYSIS AND DECISION UNDER UNCERTAINTY. THE PRACTICAL USE OF PROBABILISTIC AND BAYESIAN METHODOLOGY IN REAL LIFE RISK ASSESSMENT AND DECISION PROBLEMS

UCRL-15007

KAPLAN AND ASSOCIATES, INC.

790101

NTIS. 197 P.

KAPLAN AND ASSOCIATES, INC., IRVINE, CA

C,1;C,3;C,4;C,5;C,7;C,8

THE USE OF PROBABILISTIC, AND ESPECIALLY BAYESIAN, METHODS IS EXPLAINED. THE CONCEPTS OF RISK AND DECISION, AND PROBABILITY AND FREQUENCY ARE ELUCIDATED. THE MECHANICS OF PROBABILITY AND PROBABILISTIC CALCULATIONS IS DISCUSSED. THE USE OF THE METHOD FOR PARTICULAR PROBLEMS, SUCH AS THE FREQUENCY OF AIRCRAFT CRASHES AT A SPECIFIED NUCLEAR REACTOR SITE, IS ILLUSTRATED.

494

SUPPLEMENTARY ANALYSIS OF NUCLEAR WASTE MANAGEMENT OPTIONS

UCRL-15048

KOPLIK, C.M.; POLLAK, G.D.; RUSS, B.I.

790101

NTIS. 60 P.

ANALYTIC SCIENCES CORP., READING, MA

C,2;C,5;L,1;L,2;L,5

THIS REPORT DESCRIBES STUDIES PERTAINING TO LONG-TERM RISKS FROM THE DISPOSAL OF HLW IN DEEP MINED CAVITIES. THE RESULTS PRESENTED SUPPLEMENT PREVIOUSLY REPORTED WORK. PREVIOUSLY STUDIED SCENARIOS ARE EXAMINED IN GREATER DEPTH, AND THE ANALYSIS IS EXTENDED TO DEAL WITH ALTERNATIVE FUEL CYCLES.

495

SEISMIC RISK ANALYSIS FOR THE BABCOCK AND WILCOX FACILITY, LEECHBURG, PENNSYLVANIA

UCRL-15078

TERA CORP.

771001

LAURENCE LIVERMORE LABORATORY, LIVERMORE, CA, 46 P.

TERA CORP.

I,1;I,2;I,3;I,4;I,7;I,8;I,9;I,0

THE RESULTS OF A DETAILED SEISMIC RISK ANALYSIS OF THE B & W PLUTONIUM FUEL FABRICATION FACILITY ARE PRESENTED. THIS REPORT

FOCUSES ON EARTHQUAKES; THE OTHER NATURAL HAZARDS, BEING ADDRESSED IN SEPARATE REPORTS, ARE SEVERE WEATHER (STRONG WINDS AND TORNADOS) AND FLOODS. THE CALCULATIONAL METHOD USED IS BASED ON CORNELL'S WORK (1968); IT HAS BEEN PREVIOUSLY APPLIED TO SAFETY EVALUATIONS OF MAJOR PROJECTS. THE HISTORICAL SEISMIC RECORD WAS ESTABLISHED AFTER A REVIEW OF AVAILABLE LITERATURE, CONSULTATION WITH OPERATORS OF LOCAL SEISMIC ARRAYS AND EXAMINATION OF APPROPRIATE SEISMIC DATA BASES. BECAUSE OF THE ASEISMICITY OF THE REGION AROUND THE SITE, AN ANALYSIS DIFFERENT FROM THE CONVENTIONAL CLOSEST APPROACH IN A TECTONIC PROVINCE WAS ADAPTED. EARTHQUAKES AS FAR FROM THE SITE AS 1,000 KM WERE INCLUDED, AS WERE THE POSSIBILITY OF EARTHQUAKES AT THE SITE. IN ADDITION, VARIOUS UNCERTAINTIES IN THE INPUT WERE EXPLICITLY CONSIDERED IN THE ANALYSIS. THE RESULTS OF THE RISK ANALYSIS, WHICH INCLUDE A BAYESIAN ESTIMATE OF THE UNCERTAINTIES, ARE PRESENTED, EXPRESSED AS RETURN PERIOD ACCELERATIONS. THE BEST ESTIMATE CURVE INDICATES THAT THE B & W FACILITY WILL EXPERIENCE 0.05 G EVERY 220 YEARS AND 0.10 G EVERY 1400 YRS. THE BOUNDING CURVES ROUGHLY REPRESENT THE ONE STANDARD DEVIATION CONFIDENCE LIMITS ABOUT THE BEST ESTIMATE, REFLECTING THE UNCERTAINTY IN CERTAIN OF THE INPUT. DETAILED EXAMINATION OF THE RESULTS SHOW THAT THE ACCELERATIONS ARE VERY INSENSITIVE TO THE DETAILS OF THE SOURCE REGION GEOMETRIES OR THE HISTORICAL EARTHQUAKE STATISTICS IN EACH REGION AND THAT EACH OF THE SOURCE REGIONS CONTRIBUTES ALMOST EQUALLY TO THE CUMULATIVE RISK AT THE SITE. IF REQUIRED FOR STRUCTURAL ANALYSIS, ACCELERATION RESPONSE SPECTRA FOR THE SITE CAN BE CONSTRUCTED BY SCALING THE MEAN RESPONSE SPECTRUM FOR ALLUVIUM IN WASH-1255 BY THESE PEAK ACCELERATIONS.

496

SEISMIC RISK ANALYSIS FOR THE ATOMICS INTERNATIONAL NUCLEAR MATERIALS DEVELOPMENT FACILITY, SANTA SUSANA, CALIFORNIA

UCRL-15080

TERA CORP.

781201

LAWRENCE LIVERMORE LABORATORY, LIVERMORE, CA. 49 F.

TERA CORP.

C,3;C,7;H,7;I,7

THIS REPORT PRESENTS THE RESULTS OF A DETAILED SEISMIC RISK ANALYSIS OF THE NUCLEAR MATERIALS DEVELOPMENT FACILITY (NMDF) OPERATED BY ATOMICS INTERNATIONAL AT SANTA SUSANA, CA. THE HISTORICAL SEISMIC RECORD WAS ESTABLISHED AFTER A REVIEW OF AVAILABLE LITERATURE, CONSULTATION WITH OPERATORS OF LOCAL SEISMIC ARRAYS AND EXAMINATION OF APPROPRIATE SEISMIC DATA BASES INCLUDING THE USGS, CAL TECH, AND NTIS DATA BASES. THE RESULTING SEISMIC RECORD, COVERING THE PERIOD OF 1969 TO 1977, WAS USED TO IDENTIFY ALL POSSIBLE SOURCES OF SEISMICITY THAT COULD AFFECT THE SITE. THE BEST ESTIMATE CURVE INDICATES THAT THE FACILITY WILL EXPERIENCE A 30% G WITH A RETURN PERIOD OF 55 YRS AND 60% G

WITH A RETURN PERIOD OF 750 YRS.

497

SEISMIC RISK ANALYSIS FOR THE WESTINGHOUSE ELECTRIC
FACILITY, CHESWICK, PENNSYLVANIA

UCKL-15082

TERA CORP.

771001

LAWRENCE LIVERMORE LABORATORY, LIVERMORE, CA. 47 F.
TERA CORP.

C,3;C,5;I,1;I,2;I,5;I,7;I,8

THIS REPORT PRESENTS THE RESULTS OF A DETAILED SEISMIC RISK ANALYSIS OF THE WESTINGHOUSE ELECTRIC PLUTONIUM FUEL DEVELOPMENT FACILITY AT CHESWICK, PA. THIS REPORT FOCUSES ON EARTHQUAKES. THE HISTORICAL SEISMIC RECORD WAS ESTABLISHED AFTER A REVIEW OF AVAILABLE LITERATURE, CONSULTATION WITH OPERATORS OF LOCAL SEISMIC ARRAYS AND EXAMINATION OF APPROPRIATE SEISMIC DATA BASES. BECAUSE OF THE SEISMICITY OF THE REGION AROUND THE SITE, AN ANALYSIS DIFFERENT FROM THE CONVENTIONAL CLOSEST APPROACH IN A TECTONIC PROVINCE WAS ADAPTED. EARTHQUAKES AS FAR FROM THE SITE AS 1,000 KM WERE INCLUDED, AS WERE THE POSSIBILITY OF EARTHQUAKES AT THE SITE. IN ADDITION, VARIOUS UNCERTAINTIES IN THE INPUT WERE EXPLICITLY CONSIDERED IN THE ANALYSIS. FOR EXAMPLE, ALLOWANCE WAS MADE FOR BOTH THE UNCERTAINTY IN PREDICTING MAXIMUM POSSIBLE EARTHQUAKES IN THE REGION AND THE EFFECT OF THE DISPERSION OF DATA ABOUT THE BEST FIT ATTENUATION RELATION. THE ATTENUATION RELATIONSHIP IS DERIVED FROM TWO OF THE MOST RECENT, ADVANCED STUDIES RELATING EARTHQUAKE INTENSITY REPORTS AND ACCELERATION. RESULTS OF THE RISK ANALYSIS, WHICH INCLUDE A BAYESIAN ESTIMATE OF THE UNCERTAINTIES, ARE PRESENTED AS RETURN PERIOD ACCELERATIONS. THE BEST ESTIMATE CURVE INDICATES THAT THE WESTINGHOUSE FACILITY WILL EXPERIENCE 0.05 G EVERY 220 YRS AND 0.10 G EVERY 1400 YRS. THE ACCELERATIONS ARE VERY INSENSITIVE TO THE DETAILS OF THE SOURCE REGION GEOMETRIES OR THE HISTORICAL EARTHQUAKE STATISTICS IN EACH REGION AND EACH OF THE SOURCE REGIONS CONTRIBUTES ALMOST EQUALLY TO THE CUMULATIVE RISK AT THE SITE.

499

PRE-SEALING RISK ANALYSIS

UCRL-15168

ENSMINGER, D.A.; HUGH, M.E.; OSTON, S.G.

600101

NTIS. 85 P.

ANALYTIC SCIENCES CORP., READING, MA

L,1;L,2;L,3;L,5;L,9;N,1;N,2;N,3;N,5;N,9

THIS REPORT DESCRIBES STUDIES OF ACCIDENTS INVOLVING HLW BEFORE SEALING THE WASTE INTO A REPOSITORY. WORK DONE DURING FY '78 IS SUMMARIZED. MODELS OF ACCIDENT PROBABILITY, SEVERITY, AND CONSEQUENCES ARE REFINED AND EXTENDED.

500

STATE-OF-THE-ART FOR EVALUATING THE POTENTIAL EFFECTS OF
EROSION AND DEPOSITION ON A RADIOACTIVE WASTE
REPOSITORY

UCRL-15268

GEOTECHNICAL ENGINEERS, INC.

800101

NTIS. 64 P.

L,1;L,7; N,1;N,7

THE STUDY IDENTIFIES THE POTENTIAL CONSEQUENCES OF SURFACE
EROSION AND DEPOSITION ON SUB-SURFACE REPOSITORY CONTAINMENT
CHARACTERISTICS AND ASSESSES THE ABILITY TO MEASURE AND PREDICT
QUANTITATIVELY THE RATES AND CORRESPONDING EXTENT OF THESE IN
THE LONG TERM. AGENTS OF SEDIMENTATION ARE NOT TREATED IN THE
REPORT BECAUSE OF THEIR MINOR IMPACT ON A DEEP REPOSITORY.

501

DEVELOPING CRITERIA FOR THE MANAGEMENT OF NUCLEAR WASTES

UCRL-52000-77-10

HECKMAN, R.A.

770101

LAWRENCE LIVERMORE LABORATORY, LIVERMORE, CA

LAWRENCE LIVERMORE LABORATORY

ENERGY TECHNOL. REV. PP. 9-17.

C,1;C,2;C,3;C,5;C,7;L,1;L,2;L,3;L,5;L,7;N,1;N,2;N,3;N,5;N,7;O,1;
O,2;O,3;O,4;O,5

THIS STUDY HAS DEVELOPED THE MATHEMATICS FOR COMPREHENSIVE
AND SYSTEMATIC MODELING OF COMPLETE NUCLEAR WASTE DISPOSAL
SCENARIOS. FOR THE WIDELY ACCEPTED WASTE DISPOSAL SCHEME OF DEEP
BURIAL, THIS RESEARCH SUGGESTS THAT TRANSPORTATION TO THE
DISPOSAL SITE IS POTENTIALLY THE MOST HAZARDOUS ASPECT.

502

STORAGE OF HIGH-LEVEL WASTE IN ENGINEERED STRUCTURES:

AIR-COOLED AND WATER-COOLED CONCEPTS

EUR-7340

AHNER, S.; DEKAIS, J.J.; PUTKE, J.J.; STANEK, P.

810101

COMMISSION OF THE EUROPEAN COMMUNITIES, LUXEMBOURG. 138 P.

COMMISSION OF THE EUROPEAN COMMUNITIES

C,1;K,1;K,2;K,3;K,4,B;K,4,D;K,9;K,0,B;K,0,D

IN THE FRAME OF THE INDIRECT ACTION, "1975 TO 1979", OF THE
CEC-PROGRAM ON RADIOACTIVE WASTE MANAGEMENT AND STORAGE, NUKEM
JOINTLY WITH BELGONUCLEAIRE PERFORMED A COMPARATIVE STUDY ON AN
AIR COOLED AND A WATER COOLED INTERMEDIATE STORAGE FOR VITRIFIED,
HIGH LEVEL RADIOACTIVE WASTE, IN OVERGROUND INSTALLATIONS. FOR
THIS PURPOSE, DURING STAGE 1 OF THIS STUDY NUKEM DETERMINED
REFERENCE DATA AND COMMON SAFETY AND DESIGN CRITERIA. DURING

STAGE 2 EACH NUKEM AND BELGONUCLEAIRE CARRIED OUT THE CONCEPTUAL DESIGN OF AN AIR COOLED AND OF A WATER COOLED STORAGE RESPECTIVELY. STAGE 3 WAS DEVOTED TO A COMPARATIVE SAFETY ANALYSIS AND AN ECONOMIC ANALYSIS OF BOTH CONCEPTS.

503

STUDIES AND RESEARCH CONCERNING BNFP: NUCLEAR SPENT FUEL
TRANSPORTATION STUDIES

AGNS-35900-1.4-59

ANDERSON, R.T.; MAIER, J.B.

791101

ALLIED-GENERAL NUCLEAR SERVICES, BARNWELL, SC. 63 P.

ALLIED-GENERAL NUCLEAR SERVICES

H,270,1;0,7;0,9

CURRENTLY, THERE ARE A NUMBER OF INSTITUTIONAL PROBLEMS ASSOCIATED WITH THE SHIPMENT OF SPENT FUEL ASSEMBLIES FROM COMMERCIAL NUCLEAR POWER PLANTS. THESE PROBLEMS INCLUDE NEW AND CONFLICTING REGULATIONS, EMBARGOING OF CERTAIN ROUTES, IMPOSITION OF TRANSPORT SAFEGUARDS, PHYSICAL SECURITY IN-TRANSIT, AND A LACK OF DEFINITION OF WHEN AND WHERE THE FUEL WILL BE MOVED. THIS REPORT PRESENTS A SUMMARY OF THESE TYPES AND KINDS OF PROBLEMS. IT WAS PREPARED AT ALLIED-GENERAL NUCLEAR SERVICES UNDER CONTRACT TO THE DEPARTMENT OF ENERGY. IT REPRESENTS THE RESULTS OF EVALUATIONS PERFORMED RELATIVE TO FUEL RECEIPT AT THE BARNWELL NUCLEAR FUEL PLANT. CASE STUDIES WERE MADE WHICH ADDRESS EXISTING REACTOR SITES WITH NEAR-TERM SPENT FUEL TRANSPORTATION NEEDS. SHIPMENT BY EITHER HIGHWAY, RAIL, WATER, OR INTERMODAL WATER-RAIL WAS CONSIDERED. THE REPORT IDENTIFIES THE IMPACT OF NEW REGULATIONS AND UNCERTAINTY CAUSED BY INTERMEDIATE REGULATORY POLICY AND LACK OF ACTION ON SPENT FUEL ACCEPTANCE AND STORAGE. THIS STAGNANT SITUATION HAS MADE IT IMPOSSIBLE FOR INDUSTRY TO DETERMINE REALISTIC TRANSPORTATION SCENARIOS FOR BUSINESS PLANNING AND FINANCIAL RISK ANALYSIS. A CURRENT LACK OF PRIVATE INVESTMENT IN NUCLEAR TRANSPORTATION EQUIPMENT IS EXPECTED TO FURTHER PROLONG THE PROBLEMS ASSOCIATED WITH NUCLEAR SPENT FUEL AND WASTE DISPOSITION. THESE PROBLEMS ARE EXPECTED TO INTENSIFY IN THE 1980S AND IN CERTAIN CASES WILL MAKE CONTINUING REACTOR PLANT OPERATION DIFFICULT OR IMPOSSIBLE.

504

SEISMIC EVALUATION OF COMMERCIAL PLUTONIUM FABRICATION
PLANTS IN THE UNITED STATES

UCRL-52705

BERNREUTER, D.L.; COALS, D.W.; MURRAY, R.C.; TOKARZ, F.J.

790101

LAWRENCE LIVERMORE LABORATORY, LIVERMORE, CA. 69 P.

LAWRENCE LIVERMORE LABORATORY

C,3;C,7;1,1;1,7;1,8;1,9;1,0

THIS REPORT IS AN OVERVIEW OF LLNL'S SEISMIC ASSESSMENT OF SIX COMMERCIAL PLUTONIUM FABRICATION PLANTS LICENSED BY THE U.S.

NRC BEFORE SEPTEMBER 2, 1971, THE SEISMIC ASSESSMENT GENERALLY HAS THREE PARTS: (1) DOCUMENTATION OF THE STRUCTURAL CONDITION OF EACH FACILITY AND ITS CRITICAL EQUIPMENT; (2) CHARACTERIZATION OF THE SEISMIC HAZARD (I.E., DETERMINATION OF PEAK GROUND ACCELERATION VS RETURN PERIOD FOR EACH SITE); AND (3) EVALUATION OF SEISMIC CAPACITY TO DETERMINE GROUND MOTION LEVELS AT WHICH CRITICAL STRUCTURES AND EQUIPMENT FAIL. THE FAILURE EVALUATION USED STRUCTURAL CAPACITIES OF MEDIAN-CENTERED STRENGTH CHARACTERISTICS OF THE AS-BUILT CONFIGURATIONS FROM (1) AND SEISMIC HAZARD INPUT FROM (2). RESULTS OF THE ASSESSMENT WERE PARTIAL INPUT FOR AN OVERALL NATURAL RISKS STUDY BY THE NRC.

505

LATEST RESEARCH AND ADVANCES IN THE TREATMENT OF LOW- AND INTERMEDIATE-LEVEL RADIOACTIVE WASTES IN BULGARIA, HUNGARY, THE USSR AND CZECHOSLOVAKIA

ORNL-TR-4417

BALUKOVA, V.D.; KULICHENKO, V.V.; MAZAROV, A.I.; SIPEREV, A.V.; RAUZEN, F.V.

651201

NTIS. 29 P.

STATE COMMISSION ON THE USE OF ATOMIC ENERGY OF THE USSR, MOSCOW N,1/P,1

THIS IS A TRANSL. OF A PAPER PUBLISHED IN PRACTICES IN THE TREATMENT OF LOW- AND INTERMEDIATE-LEVEL RADIOACTIVE WASTE (STI/PUB/118, CONF-651202). COAGULATION, ION EXCHANGE, EVAPORATION, ELECTRODIALYSIS, FOAM EXTRACTION, AND FREEZING WERE CONSIDERED AS METHODS FOR PURIFYING WATER OF RADIOACTIVE WASTES. THE COAGULATION METHOD WAS SUCCESSFUL IN REMOVING 70-80% OF THE RADIOACTIVE ISOTOPES BY USE OF FERRIC HYDROXIDE AT PH 8-10. THE "SEDIMENT" HAD A COMBINED RADIOACTIVITY OF $10(E+4)$ TO $10(E+3)$ CURIES PER LITER. RADIOISOTOPES OF METALS WITH A VALENCE GREATER THAN 2 DECREASED IN CONTENT BETWEEN 50 TO 1000 TIMES DURING COAGULATION DEPENDING ON THE ISOTOPE AND CHEMICAL COMPOSITION. DETERGENTS (SODIUM HEXAMETAPHOSPHATE, ETC.) DECREASE THE PURIFICATION FACTORS OF ZR AND RU WHILE NO EFFECT WAS NOTED ON SR AND CS. THE ION EXCHANGE METHOD FOR PURIFYING LOW-LEVEL LIQUID WASTES WAS FOUND EFFECTIVE AS A TWO-STAGE METHOD OR IN CONJUNCTION WITH COAGULATION. FURTHER RESEARCH WAS UNDERWAY PARTICULARLY ON NATURAL SORBENTS SUCH AS TUFF AND PUMICE RHYOLITE. EVAPORATION, WHILE STILL EXPERIMENTAL, HAD A PURIFICATION COEFFICIENT OF $10(E+4)$ TO $10(E+6)$. ELECTRODIALYSIS ALSO SHOWED PROMISE BECAUSE THERE WAS NO PERIODIC REGENERATION OF THE ION EXCHANGERS. LIQUID WASTES WITH AN INTERMEDIATE LEVEL OF RADIOACTIVITY (1 CURIE/L) WERE REMOVED FROM SOLUTIONS AFTER ALKALI PRECIPITATION BY MINERAL SORBENTS SUCH AS MANGANESE ORES. CONSIDERATION WAS ALSO GIVEN TO VITRIFICATION AND CEMENT-FIXATION OF SR-90 AND CS-137.

506

EXPOSURE STANDARDS FOR URANIUM MINING

CROSS, F.I.

791201

PERGAMON PRESS LTD., LONDON
PACIFIC NORTHWEST LABORATORY
HEALTH PHYS. 37(6):765-772.
D,4,C

A DISCUSSION IS PRESENTED OF THE SUITABILITY OF THE RADON DAUGHTER WORKING LEVEL MONTH (WLM) STANDARD AND THE RADON GAS MAXIMUM PERMISSIBLE CONCENTRATION (MPC) STANDARD FOR MEASUREMENT OF THE POTENTIAL HARM FROM INHALATION OF URANIUM PINE AEROSOLS. FACTORS SUCH AS DISEQUILIBRIUM OF RADON DAUGHTERS AND THEIR DEGREE OF UNATTACHMENT TO CARRIER AEROSOLS INFLUENCE THE RADIATION DOSIMETRY. DOSE-ENHANCEMENT FACTORS DERIVED FOR UNATTACHED DAUGHTERS ARE USED TO MODIFY THE CALCULATED WORKING LEVELS (WLS) AND ALLOWABLE CUMULATIVE WLM EXPOSURES. IT IS CONCLUDED THAT EVEN THOUGH THE WL AND MPC MEASUREMENTS OFFER COMPARABLE PROTECTION UNDER EXPOSURE CONDITIONS TYPICAL OF MANY MINES, A STANDARD BASED ON WL FOCUSES ATTENTION ON THE RADON DAUGHTERS (THE PRINCIPAL HAZARD), RATHER THAN THE PRECURSOR RADON GAS.

507

NUCLEAR WASTE MANAGEMENT QUARTERLY PROGRESS REPORT JULY
THROUGH SEPTEMBER 1980

PNL-3000-7

CHIKALLA, T.D.; POWELL, J.A.
801101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA, 134 P..
PACIFIC NORTHWEST LABORATORY
E,1;J,1;L,2;L,3,D;L,4,D;L,0,D;M,1;M,2;N,1

THIS QUARTERLY PROGRESS REPORT INCLUDED 26 REPORTS ON VARIOUS NUCLEAR WASTE MANAGEMENT AREAS OF WORK. RESEARCH IS REPORTED ON: HIGH-LEVEL WASTE IMMOBILIZATION, ALTERNATIVE WASTE FORMS, TRU WASTE IMMOBILIZATION AND DECONTAMINATION, KR SOLIDIFICATION, THERMAL OUTGASSING, I-129 FIXATION, UNSATURATED ZONE TRANSPORT, WELL-LOGGING INSTRUMENTATION, WASTE MANAGEMENT SYSTEM AND SAFETY STUDIES, EFFECTIVENESS OF GEOLOGIC ISOLATION SYSTEMS, WASTE/ROCK INTERACTIONS, ENGINEERED BARRIERS, BACKFILL MATERIAL, SPENT FUEL STORAGE (CRITICALITY), BARRIER SEALING AND LINERS FOR U MILL TAILINGS, AND REVEGETATION OF INACTIVE U TAILINGS SITES.

508

EVALUATION OF THE SEISMIC INTEGRITY OF A PLUTONIUM-HANDLING
FACILITY

UCRL-85456

COATS, D.W.
810201

LAWRENCE LIVERMORE NATIONAL LABORATORY, LIVERMORE, CA. 8 P.
LLNL

1,5/P,5

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE STRUCTURAL MECHANICS IN REACTOR TECHNOLOGY 6TH INT. CONF. (CCNF-810801). MANY STUDIES HAVE BEEN MADE BY AND FOR THE LAWRENCE LLNL TO ENSURE THE SEISMIC SAFETY OF ITS PLUTONIUM FACILITY (BUILDING 332). THESE STUDIES HAVE INCLUDED SEISMOLOGICAL AND GEOLOGIC FIELD INVESTIGATIONS TO DEFINE THE ACTUAL SEISMIC HAZARD EXISTING AT THE LABORATORY SITE AS WELL AS STRUCTURAL STUDIES OF THE FACILITY ITSELF, BECAUSE THE BASIC SEISMIC DESIGN CRITERIA HAS UNDERGONE CHANGES OVER THE YEARS, NUMEROUS STRUCTURAL STUDIES AND UPGRADES HAVE BEEN COMPLETED, THE SEISMIC CRITERIA IN USE AT THE LLNL SITE IS REVIEWED ON A CONTINUING BASIS AS NEW INFORMATION ON THE SEISMICITY AND GEOLOGY OF THE LIVERMORE VALLEY IS OBTAINED. AT PRESENT, THE LABORATORY'S EARTH SCIENCES DIVISION IS CONDUCTING A MULTI-MILLION DOLLAR PROGRAM TO IDENTIFY AND CHARACTERIZE THE GEOLOGIC HAZARDS AT THE LIVERMORE SITE, WITH THE PRIMARY EMPHASIS ON EARTHQUAKE HAZARDS IN THE LIVERMORE VALLEY. THIS EFFORT IS UNDERGOING AN INDEPENDENT REVIEW BY WOODWARD-CLYDE ASSOCIATES. ADDITIONALLY, BECAUSE OF INCREASED CONCERNS OVER THE SEISMIC SAFETY OF BUILDING 332, THE LABORATORY HAS INITIATED AN INDEPENDENT STRUCTURAL REVIEW. THIS REVIEW EFFORT WILL BE MONITORED BY THE CALIFORNIA SEISMIC SAFETY COMMISSION TO ENSURE ITS INDEPENDENCE. BOTH OF THESE STUDIES ARE IN THEIR EARLY STAGES AND RESULTS ARE NOT YET AVAILABLE.

509

DATA BASE FOR RADIOACTIVE WASTE MANAGEMENT, VOL. 1. REVIEW
OF RADIOACTIVE WASTE DISPOSAL HISTORY

NUREG/CR-1759, VOL. 1

CLANCY, J.J.; GRAY, D.F.; OZTUNALI, O.I.

810101

U.S. NRC, WASHINGTON, DC. 190 P.

DAMES AND MOORE, INC.

N,1/N,9

IN THIS REPORT, A REVIEW OF PREVIOUSLY EMPLOYED TECHNOLOGIES FOR LLW DISPOSAL IS PRESENTED. THIS REVIEW INCLUDES AN INTERPRETIVE OVERVIEW OF THE HISTORY OF THIS TECHNOLOGY FROM ITS INCEPTION DURING THE WORLD WAR II MANHATTAN PROJECT TO THE PRESENT. SUMMARIES ARE PROVIDED OF THE GEOLOGY, HYDROLOGY, METEOROLOGY, CLIMATE, AND OPERATIONS OF SIX COMMERCIAL DISPOSAL SITES AS WELL AS FIVE MAJOR AND SEVERAL OTHER SMALLER GOVERNMENT DISPOSAL SITES. IN SECTION 2.0 OF THIS REPORT, A BRIEF BACKGROUND AND OVERVIEW OF LLW DISPOSAL PRACTICES IS PRESENTED. SUMMARIES OF THE CHARACTERISTICS AND HISTORIES OF THE SIX EXISTING COMMERCIAL SITES ARE PRESENTED IN SECTION 3.0 WHILE SUMMARIES OF THE CHARACTERISTICS AND HISTORIES OF THE FIVE MAJOR AND SEVERAL MINOR DOE DISPOSAL SITES ARE PRESENTED IN SECTION 4.0.

510

SOME ASPECTS OF THE RISKS ASSOCIATED WITH A MIXED OXIDE
FUEL FABRICATION PLANT

CONF-780507

CANDOLFO, G.; LOMAZZI, F.; CAKETIA, A.; MANCINI, G.; ROCCO, P.;
SCHNEIDER, H.

780501

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

AGIP NUCLEARE, MILAN

PROBABILISTIC ANALYSIS OF NUCLEAR REACTOR SAFETY. PP.

IX.2-1-IX.2-6.

C,1;1,1;1,2;1,3;1,4,A;1,4,B;1,7;1,9;1,0,A;1,0,B

THE RISKS ASSOCIATED WITH A MOX FUEL FABRICATION PLANT ARE
REVIEWED. THE STUDY FOCUSES ON A DETAILED PROBABILISTIC ANALYSIS
OF ONE OF THE MAJOR CONCEIVABLE INTERNAL ACCIDENTS: FIRE IN A
HOT CELL. THE PROBABILISTIC METHODOLOGY USED CALLS FOR A
DEVELOPMENT OF THE ACCIDENT EVENT TREE WITH THE RELATED ANALYSIS
OF THE INTERVENING SYSTEM FAULT-TREES; MOREOVER, A SPECTRUM OF
POSSIBLE FIRE MAGNITUDES IS ASSUMED AND FOR EACH FIRE EVENT THE
PU-RELEASE AT THE STACK IS EVALUATED BY AN ORIGINAL COMPUTER
MODEL. THE FINAL RESULTS, DEPICTED IN FORM OF A HISTOGRAM, SHOW
THE LOW RISK TO BE ASSOCIATED WITH THE FIRE ACCIDENT AND, MORE
GENERALLY, WITH INTERNAL ACCIDENTS. HOWEVER, HIGH BUILDING
CONTAMINATION VALUES CAN BE ATTAINED IN SOME OF THE EVENTS
CONSIDERED.

511

DETERMINATION OF PERFORMANCE CRITERIA FOR HIGH-LEVEL

SOLIDIFIED NUCLEAR WASTE FROM THE COMMERCIAL NUCLEAR

FUEL CYCLE: A PROBABILISTIC SAFETY ANALYSIS

UCRL-80927, REV. 1

HECKMAN, R.A.

780101

NTIS. 12 P.

LAWRENCE LIVERMORE LABORATORY

L,1;L,3;L,5;L,7;L,8;0,1;0,3;0,4;0,5;0,8

THE MINIMUM WASTE FORM CHARACTERISTICS THAT MUST BE
SPECIFIED ARE THE RADIONUCLIDE VOLATILIZATION FRACTION, AIRBORNE
PARTICULATE DISPERSION FRACTION, AND THE AQUEOUS DISSOLUTION
CHARACTERISTICS. THE RESULTS INDICATE THAT THE PRE-EMPLACEMENT
ENVIRONS ARE MORE LIMITING IN ESTABLISHING THE WASTE FOR
PERFORMANCE CRITERIA THAN THE POST-EMPLACEMENT ENVIRONS. THE
ACTUAL VALUES OF EXPECTED RISK ARE SENSITIVE TO MODELING
ASSUMPTIONS AND DATA BASE UNCERTAINTIES. THE TRANSPORTATION STEP
APPEARS TO BE THE MOST LIMITING IN DETERMINING THE REQUIRED
PERFORMANCE CHARACTERISTICS.

512

CALCULATED RADIONUCLIDE MIGRATION FROM A GEOLOGIC HIGH

LEVEL WASTE REPOSITORY

UCL-81148

KAUFMAN, A.M.; ISHERWOOD, D.J.; ROSS, B.

780101

NTIS. 26 P.

LAWRENCE LIVERMORE LABORATORY

L,1;L,2;L,3;L,5,D;L,7;L,9

THIS PAPER WAS PREPARED FOR THE ASTM CONFERENCE IN BOULDER, CO, 10 JUL 1978. TRANSPORT BY GROUNDWATER IS THE MOST LIKELY MEANS OF ESCAPE FOR RADWASTE CONTAINED IN A GEOLOGIC REPOSITORY. THE ROCK FORMATIONS THROUGH WHICH THE GROUNDWATER FLOWS ARE CHARACTERIZED BY INHOMOGENEITIES ON ALL DISTANCE SCALES. LARGE SCALE INHOMOGENEITIES CAUSE PULSES OF DISSOLVED POLLUTANTS TO SPREAD BOTH IN THE DIRECTION OF MOTION AND TRANSVERSE TO IT. SIMILARLY, INHOMOGENEITIES IN THE CHEMICAL PROPERTIES OF THE ROCK WILL CAUSE THIS SPREADING TO BE GREATER FOR SPECIES WHOSE MOVEMENT THROUGH THE ROCK IS RETARDED BY WASTE ROCK CHEMICAL INTERACTIONS. PREVIOUS RISK ANALYSIS OF NUCLEAR WASTE DISPOSAL WHICH HAVE IGNORED MACROSCOPIC DISPERSION FOUND THAT PREDICTED RADIATION DOSES TO INDIVIDUALS ARE VERY SENSITIVE TO THE WASTE DISSOLUTION TIME. WHEN MACROSCOPIC DISPERSION IS INCORPORATED INTO THE ANALYSIS, HOWEVER, THE SENSITIVITY OF RISK TO DISSOLUTION TIME IS GREATLY REDUCED.

513

SORPTION OF LONG-LIVED RADIONUCLIDES IN CLAY AND ROCK, PT.

1. DETERMINATION OF DISTRIBUTION COEFFICIENTS

UCL-TRANS-11340

ALLARD, B.; KIPATSI, H.; RYDBERG, J.

770101

NTIS. 60 P.

CHALLMERS TEKNISKA HOEGSKOLA, GOETEBORG

L,1;L,2;L,7;L,9;N,1;N,2;N,7;N,9

AN OVERVIEW OF THE MECHANISMS OF SORPTION OF WATER SOLUBLE SPECIES IN GROUND MATERIAL IS GIVEN, AND RELEVANT PHYSICAL-CHEMICAL PARAMETERS AND THEIR EFFECTS ON SORPTION ARE DISCUSSED. THE RADIOCHEMICAL AND RADIOBIOLOGICAL PROPERTIES OF THE ELEMENTS FOUND IN BURNED-OUT REACTOR FUEL ARE DISCUSSED, AND 14 OF THE RADIOACTIVE PRODUCTS HAVE BEEN SELECTED FOR STUDIES OF SORPTION PHENOMENA IN VARIOUS GROUND MATERIALS. THESE ELEMENTS ARE SR, ZR, TC, I, CS, CE, ND, EU, RA, TH, U, HP, PU, AND AM. AVAILABLE ANALYSIS DATA FROM GROUND WATER COMPOSITION IN GRANITIC BEDROCK HAVE BEEN STUDIED AND TWO STANDARD WATER COMPOSITIONS, ONE WITH A HIGH SALT CONTENT AND ANOTHER WITH A LOW SALT CONTENT, HAVE BEEN SELECTED FOR USE IN THE PRACTICAL MEASUREMENTS. EQUILIBRIA BETWEEN WATER, ROCK AND CLAY HAVE ALSO BEEN CONSIDERED. A BATCH TECHNIQUE HAS BEEN DEVELOPED FOR MEASURING DISTRIBUTION COEFFICIENTS BETWEEN SOLID MATERIALS AND WATER.

514

SAFETY OF NUCLEAR POWER REACTORS AND RELATED FACILITIES

WASH-1250

U.S. ATOMIC ENERGY COMMISSION

730101

NTIS. 510 P.

C,1;C,2;C,3;C,4;C,5 ;P,1;P,2;P,3;P,4;P,5

CHAPTERS ARE INCLUDED ON DESCRIPTIONS OF LIGHT WATER NUCLEAR POWER PLANTS AND RELATED FACILITIES, BASIC PHILOSOPHY AND PRACTICES FOR ASSURING SAFETY, THE GOVERNMENT'S REGULATORY ROLE, RADIOACTIVE EFFLUENTS, EVALUATIONS OF POSTULATED ACCIDENTS, CURRENT APPROACHES TO THE ASSESSMENT OF SOCIETAL RISKS, THE WATER-REACTOR SAFETY RESEARCH PROGRAM, AND SELECTED TOPICS IN AREAS OF SPECIAL INTEREST. APPENDICES INCLUDE BACKGROUND MATERIAL, INFO ON THE DISCHARGE OF HEAT TO THE ENVIRONMENT, AND A DISCUSSION OF PUBLIC ATTITUDES.

515

REVIEW OF THE METHODOLOGY FOR STATISTICAL EVALUATION OF REACTOR SAFETY ANALYSIS

WCAP-8555

MAZUMDAR, M.; MARSHALL, J.A.; AWATE, P.A.; CLAY, S.C. MCLAIR, D.K.

750101

NTIS.

WESTINGHOUSE ELECTRIC CORP.

C,3;C,4;C,5;C,8

THIS REPORT REVIEWS THE CURRENT STATISTICAL METHODOLOGY FOR ESTIMATING THE PROBABILITY OF A SPECIFIED OUTCOME, GIVEN THE UNCERTAINTIES ASSOCIATED WITH THE INITIATING EVENTS AND THE RELATIONSHIP BETWEEN THE OUTCOME AND THE INITIATING VARIABLES. THE WORK IS DIRECTED TOWARD METHODOLOGY THAT MIGHT BE USEFUL IN ASSESSING THE PROBABILITIES OF ACCIDENT SEQUENCES WITHIN NUCLEAR POWER REACTOR SYSTEMS AND THE CONSEQUENCES OF THESE ACCIDENTS. METHODS DESCRIBED INCLUDE SENSITIVITY ANALYSIS, MONTE CARLO ANALYSIS, STRATIFIED SAMPLING, CONTROL VARIABLES, IMPORTANCE SAMPLING, NUMERICAL INTEGRATIONS, AND RESPONSE SURFACE. THESE METHODS MAY HAVE SOME APPLICATION IN ASSESSING PROBABILITIES ASSOCIATED WITH RISKS IN THE UNDERGROUND STORAGE OF RADWASTE.

516

SOME IMPLICATIONS OF IN SITU URANIUM MINING TECHNOLOGY DEVELOPMENT, EXECUTIVE SUMMARY

PNL-3439-ES

COWAN, C.E.; PARKHURST, M.A.; COLE, R.J.; KELLER, D.; MELLINGER, J.; WALLACE, R.W.

800101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 16 P.

PACIFIC NORTHWEST LABORATORY

D,1

SOME IMPLICATIONS OF IN SITU U MINING TECHNOLOGY DEVELOPMENT IS A DETAILED REPORT THAT WAS PREPARED FOR THE TECHNOLOGY ASSESSMENTS DIVISION OFFICE OF ENVIRONMENTAL ASSESSMENTS UNDER ASSISTANT SECRETARY OF THE ENVIRONMENT IN DOE. IT HAS BEEN DISTRIBUTED TO REGULATORY, INDUSTRY AND INTEREST GROUP REPRESENTATIVES. THE REPORT WILL BE USED AS A SOURCE DOCUMENT FOR THE DOE'S TECHNOLOGY ASSESSMENT OF IN SITU U MINING. THIS IS THE EXECUTIVE SUMMARY OF THAT REPORT AND INCLUDES SUFFICIENT INFORMATION FOR A READER TO GAIN AN UNDERSTANDING OF THIS NEW TECHNOLOGY AND THE MAJOR FINDINGS OF THE STUDY.

517

AN ASSESSMENT OF THE RADON CONCENTRATIONS IN AIR CAUSED BY EMISSIONS FROM MULTIPLE SOURCES IN A URANIUM MINING AND MILLING REGION. A CASE STUDY OF THE AMBROSIA LAKE REGION OF NEW MEXICO

PNL-4033

DROPPA, J.G.; GLISSMEYER, J.A.

810101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 65 P.

PACIFIC NORTHWEST LABORATORY

D,1;D,5,D;D,9;E,1;E,5,D;E,9

SOURCE STRENGTHS FOR UNDERGROUND MINE VENTS WERE ESTIMATED FROM FIELD MEASUREMENTS MADE IN PREVIOUS STUDIES. EMISSION RATES FOR ACTIVE AND INACTIVE MILL TAILINGS PILES WERE ESTIMATED USING DATA FROM SEVERAL OF THE SITES. EMISSION ESTIMATES WERE MADE FOR SITES WITH NO DATA. ANNUAL AVERAGE RADON CONCENTRATIONS WERE COMPUTED FROM THE OVER 100 VENT AND FOUR MILL TAILINGS PILE SOURCES USING A SECTOR AVERAGE GAUSSIAN DISPERSION MODEL. RESULTS SHOW THAT VENTS ARE BY FAR THE GREATEST SOURCE OF THE COMPUTED RADON CONCENTRATIONS IN THE IMMEDIATE AREA OF THE OPERATIONS. A COMPARISON BETWEEN COMPUTED RADON CONCENTRATIONS AND MONITORING DATA AT SELECTED POINTS DEMONSTRATES ORDER OF MAGNITUDE AGREEMENT. THE COMPARISON IS LIMITED BY DIFFERENT TIME PERIODS FOR THE COMPUTED AND MONITORED VALUES, BUT DOES NOT SHOW THAT THE ELEVATED RADON CONCENTRATIONS MONITORED IN SUCH REGIONS ARE OF THE SAME ORDER AS COMPUTED FROM THE U MINING AND MILLING EMISSIONS.

520

STATE-OF-THE-ART: URANIUM MINING, MILLING, AND REFINING INDUSTRY

EPA/660-2-74-038

CLARK, D.A.

740101

NTIS. 113 P.

U.S. EPA, ROBERT S. KERR LABORATORY

D,1;D,5,D;D,7;D,9;E,1;E,5,D;E,7;E,9

RADIOACTIVITY MEASUREMENTS OF 4 TYPES OF SAMPLES (WATER,

SEDIMENT, BIOTA AND CROP) ARE USEFUL IN DEMONSTRATING THE DEGREE OF POLLUTION RESULTING FROM U OPERATIONS. THE ACTIVITY IN GROUNDWATER SAMPLES IS REPORTED FOR SEVERAL AREAS SUCH AS UHAPAN, CO AND GRANIS, NM, AND ANALYSIS OF RIVER WATER SAMPLES FROM THE COLORADO RIVER BASIN AND THE RIVERS ARE DESCRIBED. RIVER SEDIMENT IS POLLUTED WITH RADIOACTIVITY FROM THE U INDUSTRY BY THE DIRECT DISCHARGE OF SOLID WASTE TAILINGS, BY SMALLER AMOUNTS OF SUSPENDED FINES IN THE DISCHARGED EFFLUENT, AND BY CHEMICAL PRECIPITATION OF DISSOLVED RADIOACTIVE SUBSTANCES BY SULFATES IN THE WATER. LEVELS OF RA-226 ARE REPORTED FOR VARIOUS RIVER AND RESERVOIR SEDIMENTS. SELECTED BENTHIC INVERTEBRATES AND ATTACHED ALGAE SERVE AS USEFUL CUMULATIVE INDICATORS OF RADIOACTIVITY, SINCE THEY CONCENTRATE RA-226 FROM THE SURROUNDING AQUEOUS ENVIRONMENT TO APPROX THE SAME DEGREE. SOME CONCENTRATION FACTORS ARE GIVEN.

521

SOME IMPLICATIONS OF IN SITU URANIUM MINING TECHNOLOGY DEVELOPMENT

PNL-3439

COWAN, C.E.; PARKHURST, M.A.; COLE, R.J.; KELLER, D.; MELLINGER, P.J.; WALLACE, R.W.

800901

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 14 P.

PACIFIC NORTHWEST LABORATORY

D,1

THIS REPORT IS INTENDED TO BE A SOURCE DOCUMENT FOR THE DOE TECHNOLOGY ASSESSMENT. THE PURPOSE OF THE STUDY REPORTED HERE IS TO EXPLORE THE IMPEDIMENTS TO DEVELOPMENT AND DEPLOYMENT OF THE IN SITU URANIUM MINING TECHNOLOGY AND TO EVALUATE THE ENVIRONMENTAL IMPACTS FOR A REFERENCE FACILITY. THE SPECIFIC OBJECTIVES ARE: TO DESCRIBE THE CURRENT IN SITU U MINING TECHNOLOGY; TO DESCRIBE THE PHYSICAL, ECOLOGICAL, INSTITUTIONAL AND SOCIOECONOMIC ENVIRONMENT; TO EVALUATE, BASED ON AVAILABLE DATA, THE ENVIRONMENTAL IMPACTS AND, IN A LIMITED MANNER, HEALTH EFFECTS; TO DISCUSS IMPEDIMENTS TO FURTHER DEVELOPMENT OF THE IN SITU MINING TECHNOLOGY.

522

SUMMARY OF THE RISK ASSESSMENT MODE OF THE TRANSPORT OF PLUTONIUM NITRATE

CONF-801115

CHICKEN, J.C.

801101

K.O. STORCK & CO., HAMBURG

UKAEA, ABINGDON

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROC. 6TH INT. SYM. PP. 914-920.

0,1;0,2;0,3;0,5,8;0,9;0,0

THIS PAPER PRESENTS AN OVERALL VIEW OF THE ASSESSMENT OF

THE SIGNIFICANCE OF THE RISKS INVOLVED IN TRANSPORTING PLUTONIUM NITRATE FROM DOUNREAY TO WINDSCALE. THE ASSESSMENT WAS MADE AT THE SPECIAL REQUEST OF THE SECRETARY OF STATE FOR ENERGY AND WAS IN ADDITION TO THE EVIDENCE SUBMITTED TO THE COMPETENT AUTHORITY TO DEMONSTRATE THAT ALL THE RELEVANT REGULATIONS HAD BEEN SATISFIED. THE DISCUSSION IN THIS PAPER IS DIVIDED INTO SEVEN DISTINCT PARTS WHICH ARE MOVEMENT, CRITERIA, PROBABILITY OF RUPTURE, CONSEQUENCES OF RELEASE, MONITORING, DECONTAMINATION AND CONCLUSIONS.

523

URANIUM HAZARDS STRESSED BY HAM

ANONYMOUS

761001

SOUTHAM COMMUNICATIONS LTD., DON MILLS, ONTARIO

CANADIAN MINING JOURNAL

CAN. MIN. J. 97(10):28-29, 30.

D,1;D,4,C;D,4,E;D,4,G;D,5

THE HAM REPORT, FROM THE ONTARIO ROYAL COMMISSION ON THE HEALTH AND SAFETY OF WORKERS IN MINES, IS SUMMARIZED. AN UNPRECEDENTED POSTWAR U MINING BOOM STRAINED REGULATORY RESOURCES, CAUSING A DISPROPORTIONATE NUMBER OF U MINERS TO SUCCEED TO SILICOSIS. VENTILATION, NOT JOB ROTATION, IS THE ANSWER TO RADIATION PROTECTION IN U MINING.

524

BACKGROUND REPORT: CONSIDERATIONS OF ENVIRONMENTAL PROTECTION CRITERIA FOR RADIOACTIVE WASTE

NONE

U.S. EPA

780201

U.S. EPA, WASHINGTON, DC. 61 P.

U.S. EPA

K,1;L,1;N,1

THIS BACKGROUND REPORT DEVELOPS CONSIDERATIONS FOR AND INITIAL FORMULATIONS OF ENVIRONMENTAL PROTECTION CRITERIA FOR RADWASTES; AND AS SUCH, WILL PROVIDE THE BASIS FOR ADDITIONAL PUBLIC PARTICIPATION IN DEVELOPING THE CRITERIA. IN THIS REGARD, PUBLIC INPUT WAS RECEIVED FROM TWO PUBLIC WORKSHOPS HELD BY EPA IN FEBRUARY AND APRIL 1977 TO ADDRESS RELEVANT POLICY AND TECHNICAL ISSUES. A THIRD PUBLIC FORUM OF SIMILAR FORMAT IS PLANNED IN THE SPRING OF 1978 TO DISCUSS THIS BACKGROUND REPORT AND ITS INITIAL FORMULATIONS.

526

PROBABILISTIC SAFETY ANALYSIS IV

EPRI NP-1039

ERDMANN, R.C.; FULLWOOD, R.R.; GARCIA, A.A.; HARRIS, D.O.;

KELLEY, J.E.; KIRCH, H.; LEVERENZ, F.L.; MENDOZA, Z.T.;
RITZMAN, R.; STEVENS, C.A.

790101

ELECTRIC POWER RESEARCH INSTITUTE, PALO ALTO, CA. 78 P.
SCIENCE APPLICATIONS, INC.

C,3;C,4;C,5;C,7;C,9;D,0;E,0;I,0;J,0;L,0;N,0;O,0

THIS REPORT SUMMARIZES WORK ACCOMPLISHED DURING 1977-78 ON
EPRI CONTRACT RP767-1. THE PRIMARY GOAL OF THIS STUDY HAS BEEN
TO CONTINUE DEVELOPMENT OF PROBABILISTIC RISK ASSESSMENT
METHODOLOGY AND ITS APPLICABILITY TO UTILITY REQUIREMENTS.
IMPROVEMENTS HAVE BEEN DEVELOPED FOR METHODS OF FAULT TREE
ANALYSIS, CONSEQUENCE ANALYSIS, AND ATWS DATA COLLECTION AND
RETRIEVAL. PROGRESS HAS BEEN DOCUMENTED FOR AN ANALYSIS OF
EXTERNAL FUEL CYCLE RISKS. A TECHNIQUE HAS BEEN DEVELOPED FOR
APPLYING REGIONAL SEISMIC HISTORIES TO ANALYSES OF RISK FROM
EARTHQUAKES.

527

MONITORING PROGRAM DESIGN RECOMMENDATIONS FOR URANIUM
MINING AND MILLING

EPS-3-EC-78-10

ENVIRONMENT CANADA, ENVIRONMENTAL PROTECTION SERVICE

781001

ENVIRONMENT CANADA, ENVIRONMENTAL PROTECTION SERVICE, OTTAWA,
ONTARIO. 99 P.

ENVIRONMENT CANADA, ENVIRONMENTAL PROTECTION SERVICE

D,1;D,2;D,5;D,8;D,9;D,0;E,1;E,2;E,5;E,8;E,9;E,0;D

ENVIRONMENTAL RADIOLOGICAL MONITORING REQUIREMENTS AND
THEIR RATIONALE HAVE BEEN DEVELOPED FOR OPERATING U MINE/MILL
SITES INCLUDING THE PRE-OPERATIONAL PHASE AND FOR NON-OPERATING
TAILINGS AREAS, IN ORDER TO ASSESS THE RADIOLOGICAL IMPACT ON
THE ENVIRONMENT AND FOLLOW LONG-TERM TRENDS. THESE
RECOMMENDATIONS HAVE BEEN BASED ON A REVIEW OF REGULATORY
STANDARDS, SOURCES AND NATURE OF RELEASES FROM MINES, MILLS AND
TAILINGS, AND ENVIRONMENTAL PATHWAY ANALYSIS. MEDIA AND
MEASUREMENTS CONSIDERED IN THE ROUTINE ON-GOING PROGRAMS INCLUDE
AIRBORNE RADON, AIRBORNE PARTICULATES, EXTERNAL RADIATION,
TERRESTRIAL BIOTA, SURFACE WATER, DRINKING WATER, GROUND WATER,
FISH AND SEDIMENT. PROGRAM IMPLEMENTATION GUIDES ARE PROVIDED.
AN OVERVIEW OF SAMPLING AND FIELD TECHNIQUE AND SPECIFIC
RECOMMENDATIONS HAVE BEEN MADE.

528

ON THE RELATIONSHIP OF VARIOUS RELIABILITY MEASURES TO EACH
OTHER AND TO GAME THEORETICAL VALUES

NUREG/CR-1860; SAND80-2624

ENGELBRECHT-WIGGANS, R.; STRIP, D.R.

810101

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM. 33 P.

SANDIA NATIONAL LABORATORIES

C,3

A VARIETY OF MEASURES HAVE RECENTLY BEEN PROPOSED FOR MEASURING THE RELATIVE IMPORTANCE OF INDIVIDUAL COMPONENTS IN THE OVERALL RELIABILITY OF A SYSTEM. SEVERAL OF THESE SEEMINGLY DIFFERENT MEASURES ARE VERY CLOSELY RELATED UNDER THE CONDITIONS TYPICALLY ASSUMED IN THE RELIABILITY LITERATURE. THE MEASURES ARE ALSO CLOSELY RELATED TO THE PROBABILISTIC VALUES OF GAME THEORY.

529

ASSESSMENT OF INSTITUTIONAL AND TECHNICAL MEASURES TO REDUCE THE RISK OF POTENTIAL ACCIDENTS AND SABOTAGE OF NUCLEAR SPENT FUEL DURING TRANSPORT

CONF-801115

ELLIOT, J.M.; LESLIE-ROSS, K.E.

801101

K.O. STORCK & CO., HAMBURG

INTERNATIONAL ENERGY ASSOCIATES, WASHINGTON, DC.

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS, PROC. 6TH INT. SYMP. PP. 334-343.

P,1

THE TRANSPORTATION OF SPENT FUEL WITHIN THE UNITED STATES (AS WITHIN OTHER COUNTRIES) IS AN ACTIVITY WHICH IS PRESENTLY UNDER CONSIDERABLE SCRUTINY BY POLICY MAKERS AND THE PUBLIC. A MAJOR CAUSE FOR SUCH CLOSE EXAMINATION IS THE POSSIBLE CONSEQUENCES TO PUBLIC HEALTH AND SAFETY AND TO THE ENVIRONMENT RESULTING FROM A SERIOUS ACCIDENT OR SOPHISTICATED SABOTAGE ATTEMPT, HOWEVER SMALL THE RISK. FURTHER, LACK OF FAITH BY THE PUBLIC IN THE ABILITY OF LOCAL AUTHORITIES TO EFFECTIVELY RESPOND TO NUCLEAR SPENT FUEL TRANSPORTATION EMERGENCIES HAS GAINED CONSIDERABLE ATTENTION. THE PURPOSE OF THIS PAPER IS THREEFOLD. THE FIRST IS TO EXAMINE THE POTENTIAL RISKS ASSOCIATED WITH SPENT FUEL IN TRANSIT. THE SECOND IS TO DISCUSS INSTITUTIONAL AND TECHNICAL MEASURES IN THE U.S. TO REDUCE TRANSPORTATION RISKS DUE TO SERIOUS ACCIDENTS OR MALEVOLENT ACTIVITIES. THE THIRD IS TO PROVIDE AN ASSESSMENT OF THESE MEASURES BY DISCUSSING THEIR EFFECTS ON SPENT FUEL TRANSPORTATION ACTIVITIES IN THE U.S.

530

THE RISK OF TRANSPORTING SPENT NUCLEAR FUEL BY TRUCK

CONF-780506

ELDER, H.K.; ANDREAS, W.B.; RHOADS, R.E.

780501

SANDIA LABORATORIES, ALBUQUERQUE, NM

PACIFIC NORTHWEST LABORATORY

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS, PROC. 5TH INT. SYMP. PP. 893-901.

C,1;C,2;C,3,B;C,4,B;C,5,B;C,9;O,1;O,2;O,3,B;C,4,B;O,5,B;O,6;O,8,
B;C,9;O,0,B

THE REPORT FORM OF THIS PAPER IS PNL-SA-6520. THE RISK METHODOLOGY USED TO EVALUATE THE RISK IN SHIPPING SPENT FUEL INCLUDES (1) A DESCRIPTION OF THE SPENT FUEL TRANSPORT SYSTEM, (2) IDENTIFICATION OF POTENTIAL RELEASE SEQUENCES, (3) EVALUATION OF THE PROBABILITIES AND CONSEQUENCES OF THE RELEASES, AND 4) CALCULATION AND ASSESSMENT OF THE RISK. SEE ALSO PNL-2588 (ACN=10).

531

MONITORING INSTRUMENTATION SPENT FUEL MANAGEMENT PROGRAM
UCRL-15060 (ADD.1)
E.A. AND T. CO., INC.
790101
LAWRENCE LIVERMORE LABORATORY, LIVERMORE, CA. 159 P.
E.A. AND T. CO., INT., MARINA DEL RAY, CA
L,1

PRELIMINARY MONITORING SYSTEM METHODOLOGIES ARE IDENTIFIED AS AN INPUT TO THE RA OF SPENT FUEL MANAGEMENT. CONCEPTUAL APPROACHES TO INSTRUMENTATION FOR SURVEILLANCE OF CANISTER POSITION AND ORIENTATION VAULT DEFORMATION, SPENT FUEL DISSOLUTION, TEMPERATURE, AND HEALTH PHYSICS CONDITIONS ARE PRESENTED. IN FUTURE STUDIES, THE RESOLUTION, RELIABILITY, AND UNCERTAINTY ASSOCIATED WITH THESE MONITORING SYSTEM METHODOLOGIES WILL BE EVALUATED.

532

ENERGY MATERIAL TRANSPORT, NOW THROUGH 2000, SYSTEM CHARACTERISTICS AND POTENTIAL PROBLEMS TASK 3- FINAL REPORT - PETROLEUM TRANSPORTATION.

PNL-2421
DESIESE, J.G.; DAWSON, G.W.; AHLSTROM, S.W.; PAUMGART, K.A.; CAMPBELL, A.C.; GEFFEN, C.A.; HENDRICKSON, P.L.; LIPPEN, H.E.; WAKAMIYA, W.A.

790301
PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 275 P.
PACIFIC NORTHWEST LABORATORY
C,170,1;0,5

THIS REPORT PROVIDES A SUMMARY CHARACTERIZATION OF THE EXISTING DOMESTIC PETROLEUM TRANSPORTATION SYSTEM AND IDENTIFIES AND JUDGES PRIORITIES OF POTENTIAL FUTURE TRANSPORTATION PROBLEMS. PROBLEMS ARE VIEWED AS EITHER POTENTIAL OR LATENT CONCERNS. POTENTIAL CONCERNS APPEAR TO REQUIRE NEW PROGRAMMATIC ACTION, IN ADDITION TO EFFORT ALREADY UNDER WAY, TO MINIMIZE THE POSSIBLE FUTURE IMPACT OF THESE CONCERNS. RECOMMENDATIONS FOR SPECIFIC ACTIONS TO ADDRESS THESE CONCERNS ARE EMPHASIZED IN THIS REPORT. LATENT CONCERNS ARE THOSE ISSUES OR POTENTIAL PROBLEMS THAT ARE CURRENTLY BEING ADEQUATELY ADDRESSED OR RESOLVED BY ONGOING INDUSTRY AND GOVERNMENT PROGRAMS. IT IS RECOMMENDED THAT NO NEW PROGRAM EFFORT BE COMMITTED TO ADDRESS LATENT CONCERNS.

533

LONG RANGE MANAGEMENT OF TRANSURANIUM-CONTAMINATED SOLID
WASTES AT SAVANNAH RIVER

CONF-741026

ALBENESIUS, E.L.; REINIG, W.C.

750101

OECD, PARIS

SAVANNAH RIVER LABORATORY

MANAGEMENT OF PLUTONIUM-CONTAMINATED SOLID WASTES, PP. 124-132.
K,1

THE SAVANNAH RIVER PLANT, AN 80,000 HECTARE U.S. AEC
PRODUCTION SITE IN THE SOUTHEASTERN U.S., HAS GENERATED SOLID
WASTES CONTAMINATED WITH 60,000 CI OF TRANSURANIUM NUCLIDES,
CHIEFLY PU-239, PU-238, AND CM-244. THESE WASTES, ALONG WITH 300,
000 CI OF TRANSURANIUM WASTES FROM OTHER AEC SITES, ARE STORED
IN AN 80 HECTARE AREA ON THE PLANTSITE. THIS REPORT DISCUSSES A
COMPREHENSIVE PLANNING PROGRAM TO RETRIEVE AND CONVERT THE
WASTES TO NONCOMBUSTIBLE AND NONDISPERSIVE FORMS IN PREPARATION
FOR CENTURIES-LONG STORAGE IN AN ENGINEERED REPOSITORY.

534

FALLOUT ON THE FREEWAY. THE HAZARDS OF TRANSPORTING
RADIOACTIVE WASTES IN MICHIGAN

NONE

ANDERSON, M.

740101

60 P.

PUBLIC INTEREST RESEARCH GROUP IN MICHIGAN

0,1;0,2;0,3;0,4,8;0,5,6;0,9;0,0,8

THIS PIRGIM REPORT HAS BEEN PREPARED TO HELP THE CITIZENS
OF MICHIGAN, AND OF THE OTHER STATES DECIDE WHETHER THE
TRANSPORTATION OF RADIOACTIVE MATERIALS OVER THEIR HIGHWAYS AND
RAILROADS, THROUGH THEIR COMMUNITIES, AND PAST THEIR HOSPITALS
AND SCHOOLS, POSES AN ACCEPTABLE OR AN UNACCEPTABLE RISK TO
THEIR HEALTH AND SAFETY.

535

IDENTIFICATION AND PRIORITIZATION OF POTENTIAL PROBLEMS IN
NUCLEAR MATERIAL TRANSPORTATION, NOW THROUGH 2000

CONF-780506

DESTEESE, J.G.; RHOADS, R.E.

780501

SANDIA LABORATORIES, ALBUQUERQUE, NM

PACIFIC NORTHWEST LABORATORY

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS, PROC. 5TH
INT. SYMP. PP. 783-789.

O,1

THIS REVIEW PRESENTS THE RESULTS OF ISSUE ANALYSIS USED TO

IDENTIFY POTENTIAL PROBLEMS WHICH MAY IMPACT THE TRANSPORTATION OF NUCLEAR FUEL CYCLE MATERIALS BETWEEN NOW AND 2000. AN OBJECTIVE OF THIS EFFORT IS TO PROVIDE ADVANCED WARNING OF POTENTIAL PROBLEMS WHICH MAY INHIBIT THE FUTURE DEVELOPMENT OF SAFE AND ENVIRONMENTALLY ACCEPTABLE NUCLEAR MATERIAL TRANSPORTATION SYSTEMS. ISSUE ANALYSIS WAS ALSO USED TO ESTABLISH THE PRIORITIES OF POTENTIAL PROBLEMS. THIS PROVIDES A BASIS FOR RECOMMENDING RESEARCH, DEVELOPMENT AND OTHER NECESSARY ACTION TO ADDRESS THE POTENTIALLY ADVERSE EFFECTS OF THESE PROBLEMS. OVER 100 PROBLEM ISSUES WERE IDENTIFIED IN WORKSHOP SESSIONS AND REPRESENT THE COMBINED OPINIONS OF TRANSPORTATION EXPERTS IN INDUSTRY, GOVERNMENT AND RESEARCH INSTITUTIONS. A PANEL RANKED POTENTIAL IMPACT AND IMMEDIACY OF THE PROBLEM ISSUES ON A SCALE OF 1 TO 5. THE PRODUCT OF THE IMPACT AND IMMEDIACY RANKING WAS TAKEN TO INDICATE RELATIVE IMPORTANCE. THE TYPE OF POTENTIAL PROBLEM IDENTIFIED AS MOST IMPORTANT HAS CONSEQUENCES WHICH MAY IMPOSE UNNECESSARILY SEVERE OR COSTLY RESTRICTIONS ON NUCLEAR MATERIAL TRANSPORTATION. TEN SPECIFIC HIGH PRIORITY POTENTIAL PROBLEMS ARE DISCUSSED WHICH COLLECTIVELY MAY RESULT IN FUTURE INADEQUACY OF TRANSPORTATION FOR SPENT FUEL AND WASTE MATERIALS. THESE PROBLEMS MAY BECOME CRITICAL IN THE NEXT DECADE. RECOMMENDATIONS ARE MADE FOR NEW EFFORT THAT ADDRESSES THE SOLUTION OF THESE PROBLEMS. A BRIEF REVIEW IS INCLUDED OF SOME POTENTIAL PROBLEMS JUDGED TO BE CURRENTLY OF LOW PRIORITY, BUT WHICH MAY BECOME MORE SIGNIFICANT TOWARD THE END OF THE CENTURY.

536

PRELIMINARY RISK ANALYSIS OF THE TRANSPORTATION OF NUCLEAR WASTE

SAI-032-76-PA

FULLWOOD, R.R.; STRAKER, E.A.; MOFFAT, D.; ARON, M.; LOBNER, P.
761201

SCIENCE APPLICATIONS, INC., PALO ALTO, CA. 173 P.

SCIENCE APPLICATIONS, INC.

0,1;0,2;0,3;0,4;0,6;0,9

THIS DRAFT REPORT ADDRESSES THE RADIOLOGICAL RISK ASSOCIATED WITH THE TRANSPORTATION OF SEVERAL MATERIALS ESSENTIAL TO THE NUCLEAR FUEL CYCLE AS PRESENTLY STRUCTURED. THESE ARE: (1) DRY SHIPMENT OF SPENT FUEL BY RAIL, (2) WET SHIPMENT OF SPENT FUEL BY TRUCK NOT REQUIRING WEIGHT WAIVERS, (3) TRUCK SHIPMENT OF PLUTONIUM DIOXIDE POWDER, (4) RAIL SHIPMENT OF HIGH-LEVEL CALCINED WASTE, (5) RAIL/TRUCK SHIPMENT OF CLADDING HULLS, AND (6) TRUCK SHIPMENT OF NON-HIGH-LEVEL WASTE. THIS ANALYSIS PROVIDES THE PROBABILITY OF OCCURRENCE OF A WIDE SPECTRUM OF ACCIDENT CONSEQUENCES. FAULT TREE ANALYSIS IS USED TO ASSIST IN PERFORMING THESE CALCULATIONS. THE CONSEQUENCE ANALYSIS IS ONLY EXTENDED TO THE ISOTOPIC RELEASE SOURCE TERMS. IT DOES NOT EXTEND TO HEALTH EFFECTS.

537

RADIOLOGICAL RISK ANALYSIS OF TRUCK AND RAIL TRANSPORTATION
OF NUCLEAR WASTE 2 S

CONF-780506

FULLWOOD, R.R.; MENDOZA, Z.; KITZMAN, R.L.; ARON, W.; STRAKER,
E.A.

780501

SANDIA LABORATORIES, ALBUQUERQUE, NM

SAL, PALO ALTO

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROC. 5TH
INT. SYMP. PP. 933-935.

O,1;O,2;O,3,A;O,3,B;O,4,A;O,4,B;O,5,B;O,0,A;O,0,B

A RADIOLOGICAL ACCIDENT RISK ANALYSIS OF THE TRANSPORTATION
OF NUCLEAR WASTE HAS BEEN PERFORMED FOR THE FOLLOWING WASTE
TRANSPORTATION MODES: SPENT FUEL (NL1 10/24, RAIL; NFS-4, TRUCK),
PLUTONIUM DIOXIDE (6M, TRUCK), VITRIFIED HIGH LEVEL WASTE
(CONCEPTUAL CASK, RAIL), CLADDING HULLS (CONCEPTUAL CASK, TRUCK,
AND RAIL) AND NON-HIGH LEVEL WASTE (SUPER-TIGER, TRUCK). IN
ORDER TO SIMPLIFY THE PROBLEM, ACCIDENT CATEGORIES WERE DEFINED
CORRESPONDING TO FAILURE AND DEGREE OF FAILURE OF VARIOUS
BARRIERS. FAULT TREES, FOR EACH CATEGORY WERE PREPARED AND
QUANTIFIED USING VARIOUS SOURCES OF FAILURE PROBABILITIES, THE
TRANSPORTATION ACCIDENT PROBABILITIES WERE TAKEN FROM SLA
74-0001. ALL ACCIDENTS OF PUBLIC CONCERN INVOLVE PENETRATION OF
THE PROTECTION BARRIERS. BASED ON RECENT FULL SCALE TESTING AND
ANALYSIS, THE ONLY MECHANISMS FOR THIS PENETRATION IS IMPALEMENT
ON ACCIDENT DEBRIS SUCH AS A RAIL OR AXLE. THIS PROBABILITY IS
TAKEN TO BE THE PROBABILITY OF A MISSILE (CONSERVATIVELY
ASSUMING ALL MISSILES ARE IMPALEMENT STUBS) TIMES THE
PROBABILITY OF PENETRATION OBTAINED FROM TWO MISSILE PENETRATION
FORMULAE. THE SOURCE TERMS FOR THE ACCIDENTS WERE OBTAINED FROM
SEVERAL PHYSIOCHEMICAL MODELS. CS RELEASE SOURCE TERMS WERE
CALCULATED USING THE WASH-1238 SUPPLEMENT 2 MODEL. THE
POPULATION DOSE WAS CALCULATED USING THE WASH-1400 DRAFT
COMPUTER PROGRAM WHICH USES MEAN DEMOGRAPHICS AND METEOROLOGIES
APPROPRIATE TO A NUCLEAR POWER PLANT. NO CANCER EFFECTS ARE
ESTIMATED. THE RELATIVE MIX OF TRANSPORTATION MODES WAS ADAPTED
FROM RECENT PROJECTIONS FOR THE U.S. IN 1990. THE FINDINGS ARE
THAT TRANSPORTATION OF PLUTONIUM EITHER AS A POWDER OR AS A TRU
CONTAINMENT OF NON-HIGH-LEVEL WASTE REPRESENTS THE TWO HIGHEST
RISK MODES. ELIMINATING PU02 TRANSPORT, THIS WORK FINDS TOTAL
NONOCCUPATIONAL RISKS TO BE LESS THAN PRESENTED IN GESMO EXCEPT
FOR LUNG RISKS WHICH ARE SLIGHTLY HIGHER.

538

RELATIVE CONSEQUENCES OF TRANSPORTING HAZARDOUS MATERIALS

CONF-801115

REESE, R.T.; FULLWOOD, R.R.; RHYNE, W.R.; SIMMONS, J.A.

801101

K.O. STORCK & CO., HAMBURG

SANDIA NATIONAL LABORATORIES

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS, PROC. 6TH
INT. SYMP. PP. 197-205.

C,1;D,2;D,5,A;D,5,B;D,9;D,0

THE REPORT FORM OF THIS PAPER IS SAND80-0901C. THE
OBJECTIVE OF THIS PAPER IS TO DISCUSS METHODS UNDER STUDY AT
TRANSPORTATION TECHNOLOGY CENTER TO DEVELOP A PERSPECTIVE ON HOW
TECHNICAL MEASURES OF HAZARD AND RISK RELATE TO PERCEPTION OF
HAZARDS, HARM, AND RISKS ASSOCIATED WITH TRANSPORTING HAZARDOUS
MATERIALS. THIS PAPER IS CONCERNED WITH TWO MAJOR ASPECTS OF THE
RELATIVE HAZARDS PROBLEM. THE FIRST ASPECT IS THE ANALYSES OF
THE POSSIBLE EFFECTS ASSOCIATED WITH EXPOSURE TO HAZARDOUS
MATERIALS AS CONTAINED IN THE FOLLOWING TWO PARTS: OUTLINES OF
POSSIBLE PROBLEMS AND CONTROVERSIES THAT COULD BE ENCOUNTERED IN
THE EVALUATION AND COMPARISONS OF HAZARDS AND RISKS; AND
DESCRIPTION OF THE VARIOUS MEASURES OF HARM (HAZARDS OR DANGERS)
AND SUBSEQUENT COMPARISONS THEREOF. THE SECOND ASPECT OF THIS
PAPER LEADS INTO A PRESENTATION OF THE RESULTS.

539

TRANSPORTATION OF SPENT FUEL BY BARGE AND BY RAIL: A
COMPARISON OF RISK

CONF-790602

FULLWOOD, R.R.; UNIONE, A.J.

790601

AMERICAN NUCLEAR SOCIETY, LA GRANGE, IL

SAI-PALO ALTO

TRANS. AM. NUCL. SOC. 32:418-419.

O,3,A;D,3,B;D,4,A;D,4,B;D,5,B;D,6

THE QUANTIFICATION OF RISK TO THE PUBLIC FOR A 1985 REACTOR
POPULATION FROM TRANSPORTING SPENT FUEL BY AN INTERMODAL SCHEME
IS ADDRESSED. RISK FROM RAIL TRANSPORT ALONE IS CALCULATED FOR
COMPARISON. AN ESTIMATE OF RISK TO THE PUBLIC ON A NATIONAL
BASIS WAS ASSESSED FOR VARIOUS LEVELS OF INTERMODAL TRANSPORT.
THE WORK PRESENTED HERE IS TAKEN FROM A BROADER STUDY, INCLUDING
TECHNICAL AND ECONOMIC ASSESSMENTS OF INTERMODAL TRANSPORT
FEASIBILITY.

540

WORKING PAPER FOR A PROBABILISTIC RADIOLOGICAL SAFETY
EVALUATION OF A NUCLEAR WASTE REPOSITORY

SAI/SR-220-79-PA

FULLWOOD, R.R.; MENDOZA, Z.T.; STEVENS, C.A.

800101

SCIENCE APPLICATIONS, INC., PALO ALTO, CA. 165 P.

SCIENCE APPLICATIONS, INC.

C,1;L,1;L,2;L,3;L,4,A;L,4,B;L,4,C;L,4,D;L,4,I;L,4,J;L,5,A;L,5,B;
L,5,C;L,5,D;L,5,I;L,5,J;L,6;L,7;L,8;L,9;L,0,A;L,0,B;L,0,C;L,
0,D;L,0,I;L,0,J

THIS DRAFT REPORT PRESENTS A RADIOLOGICAL ACCIDENTAL RISK
ANALYSIS OF A REPOSITORY USED FOR LONG-TERM STORAGE OF HIGH

LEVEL, CLADDING, AND TRANSURANIC-CONTAMINATED WASTES. THE CONCEPTUAL REPOSITORY IS SITED IN BEDDED SALI WHICH IS CAPABLE OF STORING THE WASTES FROM THE GENERATION OF 2400 GWE-YEARS OF ELECTRIC ENERGY. THIS ANALYSIS CALCULATES AN ANNUAL RISK OF 1×10^{-10} LATENT CANCERS/YR/GWE-YR OF ELECTRICITY GENERATED. THE LONG TERM RISK AFTER REPOSITORY SEALING IS 5×10^{-12} LATENT CANCERS/YR/GWE-YR. THESE RESULTS ARE PLACED IN PERSPECTIVE BY COMPARING THE RADIOLOGICAL RISK FRACTION FROM THIS FACILITY RELATIVE TO THAT OF NATURAL RADIOACTIVITY. THIS IS $5 \times 10^{-12}\%$ BEFORE THE REPOSITORY IS CLOSED AND $3 \times 10^{-13}\%$ AFTER CLOSURE. A PARAMETRIC SENSITIVITY ANALYSIS IS PROVIDED FOR BOTH OF THESE TIME PHASES WITH INCREASING UNCERTAINTY THE FARTHER INTO THE FUTURE THE PROJECTION IS MADE. CONCLUSIONS OF SAFETY ARE NOT BASED ON SINGLE ANALYSES. THE REPORT GATHERS AND CONDENSES RESULTS FROM MANY SOURCES. THERE ARE OTHER ANALYSES OF REPOSITORY FAILURE USING THE RADIONUCLIDE TRANSPORT EQUATION, AN INTEGRATED ANALYSIS BASED ON OTHER MEASUREMENTS, OBSERVATIONS FROM A PREHISTORICAL NATURAL WASTE REPOSITORY, AND PERSPECTIVES ON THE HAZARDS FROM ORE BODIES AND CHEMICAL WASTES. THIS REPORT PROVIDES DETAILS OF THE RESULTS PREVIOUSLY REPORTED IN THE REPORT EPRI NP-1128 (ACN=200).

541

WORKING PAPER FOR A RADIOLOGICAL ACCIDENT
PROBABILITY/CONSEQUENCE ANALYSIS OF A MIXED-OXIDE FUEL
FABRICATION PLANT
SAI/SR--224-80-PA
FULLWOOD, R.R.; GARCIA, A.A.; MENDOZA, Z.T.; RIIZMAN, R.L.;
SUGARMAN, A.A.

800101

SCIENCE APPLICATIONS, INC., PALO ALTO, CA. 95 P.
SCIENCE APPLICATIONS, INC.
C,1;1,1;1,2;1,3;1,4,B;1,4,D;1,5,B;1,5,D;1,7;1,8;1,9;1,0,B;1,0,D
THIS REPORT PRESENTS A RADIOLOGICAL ACCIDENT RISK ANALYSIS OF THE PLANT AND PROCESSES USED IN THE FABRICATION OF NUCLEAR FUEL FROM MIXED-OXIDE (MOX) FISSIONABLE MATERIAL AND PROVIDES SUPPORTING INFORMATION FOR EPRI NP-1128 (STATUS REPORT ON THE EPRI FUEL ACCIDENT RISK ASSESSMENT). THE TECHNIQUES USED INVOLVE DEFINING A MODEL PLANT AND PROCESS WITH AN EYE TO ACCIDENTS THAT COULD POSE A PUBLIC RISK. SUCH ACCIDENTS ARE MADE EXPLICIT IN A PRELIMINARY HAZARDS ANALYSIS FROM WHICH 9 ACCIDENTS WERE SELECTED AS DEFINING THE RISK ENVELOPE AND OF THESE, 7 WERE ANALYZED IN DETAIL -- 4 BY FAULT TREE ANALYSIS AND 3 BY OTHER MATHEMATICAL MODELS. THE DOMINANT ACCIDENTS, IN DECREASING ORDER OF RISK ARE: EARTHQUAKE IN EXCESS OF THE DESIGN BASIS, CRITICALITY, AND A LARGE JET-PLANT CRASH INTO THE PLANT. IT WILL BE NOTED THAT ALL THREE OF THESE ACCIDENTS VIOLATE THE BOUNDARIES THAT CONFINE MATERIAL WITHIN THE PLANT - THE CRITICALITY ACCIDENT BY GENERATING GASES THAT ARE UNAFFECTED BY THE EFFLUENT CONTROL SYSTEM. THE RESULT OF THESE ANALYSES IS THAT THIS PLANT PRESENTS A RISK OF 3×10^{-4} LATENT CANCERS/YR IN A

POPULATION OF 1.8 MILLION PEOPLE, OR AN INCREASE OF 0.001% OVER THAT DUE TO NATURAL BACKGROUND.

542

PRELIMINARY RISK ANALYSIS OF THE TRANSPORTATION OF NUCLEAR WASTE

FULLWOOD, R.R.; STRAKER, E.A.; ARON, W.
770601

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
SCIENCE APPLICATIONS, INC.

TRANS. AM. NUCL. SOC. 26:271-272.

O,2;O,3,A;O,3,B

A PRELIMINARY RADIOLOGICAL ACCIDENT RISK ANALYSIS OF THE TRANSPORTATION OF NUCLEAR WASTE HAS BEEN PERFORMED. ACCIDENT PROBABILITIES WERE ASSESSED USING FAULT TREE ANALYSIS. THE COMPONENT FAILURE RATE DATA WERE DRAWN FROM A VARIETY OF SOURCES, THE PRINCIPAL ONE BEING CLARKE ET AL. THE ISOTOPIC RELEASE FRACTIONS WERE DERIVED FROM SEVERAL SOURCES AND THE FRACTION FOR SEMIVOLATILES WAS CALCULATED AS THE GEOMETRIC MEAN OF THE TWO ASSESSMENTS.

543

THE SANDIA TRANSPORTATION TECHNICAL ENVIRONMENTAL INFORMATION CENTER AND ITS APPLICATION TO TRANSPORTATION RISK ANALYSES.

CONF-781109-6; SAND78-1593C

FULEY, J.T.; DAVIDSON, C.A.; MCCLURE, J.D.

781126

SANDIA LABORATORIES, ALBUQUERQUE, NM. 8 P.

SANDIA LABORATORIES

O,9

THIS PAPER WAS PRESENTED FOR PRESENTATION AT THE ENVIRONMENTAL CONTROL SYMPOSIUM. IT DESCRIBES AN APPLIED RESEARCH ACTIVITY WHICH IS FUNDAMENTAL TO THE CONDUCT OF TRANSPORTATION ANALYSES: THE COLLECTION, ANALYSIS, STORAGE, AND RETRIEVAL OF INFORMATION ON THE INTENSITIES OF TECHNICAL ENVIRONMENTS. THIS PAPER DESCRIBES THE COLLECTION SYSTEM WHICH PROVIDES SUCH A SERVICE TO OFFICIAL RESEARCHERS IN TRANSPORTATION ANALYSIS AND THE APPLICATIONS OF THIS INFORMATION IN THE AREA OF RISK ANALYSIS.

544

COMPUTERIZED METHODOLOGY FOR EVALUATING THE LONG-RANGE RADIOLOGICAL IMPACT OF SHALLOW-LAND BURIAL

CONF-810462-1

FIELDS, D.E.; LITTLE, C.A.; EMERSON, C.J.

810101

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN. 14 P.

OAK RIDGE NATIONAL LABORATORY
N,2;N,4;C,2;C,3

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE 2ND ENVIRONMENTAL PROTECTION SEMINAR. A COMPUTERIZED METHODOLOGY HAS BEEN IMPLEMENTED TO CALCULATE THE RISK TO LOCAL AND INTERMEDIATE-RANGE (UP TO 80 KM DISTANT) POPULATIONS RESULTING FROM WATER- AND AIR-BORNE TRANSPORT OF RADIONUCLIDES PRESENT IN LOW-LEVEL WASTES BURIED IN SHALLOW TRENCHES SUCH AS THOSE USED AT OAK RIDGE. THE COMPUTER CODE, PRESTO (PREDICTION OF RADIATION EFFECTS FROM SHALLOW TRENCH OPERATIONS), WAS DEVELOPED UNDER U.S. EPA FUNDING TO EVALUATE POSSIBLE HEALTH EFFECTS RESULTING FROM SHALLOW BURIAL OPERATIONS. SOURCES OF CONTAMINATION INCLUDE RADIONUCLIDE RELEASES FROM THE TRENCHES AND FROM AREAS CONTAMINATED WITH OPERATIONAL SPILLAGE. THE MODEL IS INTENDED TO PREDICT RADIONUCLIDE TRANSPORT AND THE ENSUING EXPOSURE AND HEALTH IMPACT TO AT-RISK POPULATIONS FOR A 1000-YR PERIOD FOLLOWING CESSATION OF BURIAL GROUND OPERATIONS. SEVERAL CLASSES OF SUBMODELS ARE USED IN PRESTO TO REPRESENT "SCHEDULED EVENT," "UNIT SYSTEM RESPONSE," AND RISK EVALUATION PROCESSES. EXAMPLES OF SCHEDULED EVENTS ARE TRENCH CAP FAILURE, STABILIZATION OF INSOLUBLE SURFACE CONTAMINANT, THE ONSET OF FARMING OR RECLAMATION PRACTICES, AND HUMAN INTRUSION. UNIT SYSTEM RESPONSE SUBMODELS SIMULATE PROCESSES SUCH AS INFILTRATION OF RAINWATER INTO THE TRENCH AND EROSION OF SOIL OVERBURDEN FROM THE TRENCH COVER. SYSTEM RESPONSE SUBMODELS GENERATE PARAMETERS USED REPEATEDLY IN THE 1000-YR SIMULATION LOOP.

545

RISKS ASSOCIATED WITH NUCLEAR POWER: A CRITICAL REVIEW OF
THE LITERATURE. SUMMARY AND SYNTHESIS CHAPTER

NATIONAL ACADEMY OF SCIENCES
790401

NATIONAL ACADEMY OF SCIENCES, WASHINGTON, DC. 156 P.
D,5,D;E,5,D;F,5,D;G,5,D;H,5,D;J,5,D;K,5,D;L,5,D;M,5,D;P,5,D;P,5,
H;P,5,N

THE REPORT WAS PREPARED BY THE COMMITTEE ON LITERATURE SURVEY OF RISKS ASSOCIATED WITH NUCLEAR POWER FOR THE COMMITTEE ON SCIENCE AND PUBLIC POLICY OF THE NAS. THE REPORT HAD ITS ORIGIN IN 1975 IN A REQUEST BY PHILIP HANDLER, THEN PRESIDENT OF THE NAS, TO ITS COMMITTEE ON SCIENCE AND PUBLIC POLICY (COSPOP), TO REVIEW THE DRAFT OF WASH-1400. THE COSPOP WELCOMED THIS CHARGE AND DECIDED TO UNDERTAKE A SURVEY OF ALL THE TYPES OF RISKS ASSOCIATED WITH THE NUCLEAR POWER PROGRAM THROUGH A CRITICAL REVIEW OF THE LITERATURE. AT THE SAME TIME THE NATIONAL RESEARCH COUNCIL WAS ORGANIZING A COMMITTEE ON NUCLEAR AND ALTERNATIVE ENERGY SYSTEMS (CONAES) FOR A BROAD STUDY REQUESTED BY ERDA. IT WAS AGREED THAT THE LITERATURE REVIEW PROPOSED BY COSPOP WOULD PROVIDE INFO THAT COULD CONTRIBUTE SIGNIFICANTLY TO THE CONAES STUDY. ACCORDINGLY, THE COSPOP STUDY WAS SUPPORTED LARGELY BY FUNDS MADE AVAILABLE BY ERDA AND DOE FOR THE CONAES

EFFORT. THE REPORT DESCRIBES FINDINGS ON PRINCIPAL RISKS AND RELEVANT ALTERNATIVES IN THE NUCLEAR FUEL CYCLE.

546

DESIGN CRITERIA TRANSURANIC DRY WASTE BURIAL CONTAINERS
STEEL AND REINFORCED CONCRETE

ARH-CD-353

HAMMOND, J.E.

750101

ATLANTIC RICHFIELD HANFORD CO., RICHLAND, WA. 7 P.

ATLANTIC RICHFIELD HANFORD CO.

K,1;L,1

THESE CRITERIA, WHICH ESTABLISH GUIDELINES FOR THE DESIGN, FABRICATION, INSPECTION, AND TESTING OF TRANSURANIC DRY WASTE BURIAL CONTAINERS MADE OF STEEL AND/OR REINFORCED CONCRETE ARE PARTIAL REVISIONS.

547

SAFETY ASSESSMENT DOCUMENT PWR CORE 2 PROJECT

RHO-CD-356

HANSON, G.L.; JACKSON, R.R.

780401

ROCKWELL HANFORD CO., RICHLAND, WA. 36 P.

ROCKWELL HANFORD CO.

M,1;M,2;M,5;B;M,7;M,9;N,0

PWR CORE 2 BLANKET FUEL ASSEMBLIES, WHICH WERE USED TO POWER THE SHIPPINGPORT REACTOR, HAVE BEEN STORED IN THE REACTOR BASIN SINCE DISCHARGE (APPROX. 4 YRS). SHIPMENT OF THESE BLANKET FUEL ASSEMBLIES IN M-160 CASKS TO ROCKWELL HANFORD OPERATIONS FOR STORAGE IN THE 221-T CANYON POOL CELL FOR A PERIOD OF UP TO 20 YRS IS PLANNED. THE IMPACT OF NATURAL PHENOMENA ON THE FUEL STORAGE SITE AND THAT OF NORMAL AND ACCIDENT CONDITIONS DURING RECEIPT, UNLOADING AND STORAGE OF THE PWR CORE 2 BLANKET FUEL ASSEMBLIES HAVE BEEN EXAMINED. IT IS BELIEVED THAT THESE OPERATIONS CAN BE CONDUCTED WITHOUT UNDUE RISK TO THE HEALTH AND SAFETY OF EMPLOYEES, THE GENERAL PUBLIC, AND THE ENVIRONMENT.

549

MEASUREMENTS OF RADON DAUGHTER CONCENTRATIONS IN STRUCTURES
BUILT ON OR NEAR URANIUM MINE TAILINGS

CONF-761071-1

HAYWOOD, F.F.; KERR, G.D.; GOLDSMITH, W.A.; PERDUE, P.T.;

THORNGATE, J.H.

760101

NTIS. 18 P.

OAK RIDGE NATIONAL LABORATORY

D,9;E,9

THIS PAPER WAS PREPARED FOR PRESENTATION AT A SPECIALIST MEETING ON PERSONAL DOSIMETRY AND AREA MONITORING FOR RADON AND

DAUGHTER PRODUCTS. A TECHNIQUE IS DISCUSSED THAT HAS BEEN USED TO MEASURE AIR CONCENTRATIONS OF SHORT-LIVED DAUGHTERS OF Rn-222 IN RESIDENTIAL AND COMMERCIAL STRUCTURES BUILT ON OR NEAR U MILL TAILINGS IN THE WESTERN PART OF THE U.S.. IN THIS TECHNIQUE, THE CONCENTRATIONS OF RAA, RAB, AND RAC ARE CALCULATED FROM ONE INTEGRAL COUNT OF THE RAA AND TWO INTEGRAL COUNTS OF THE RAC' ALPHA-PARTICLE ACTIVITY COLLECTED ON A FILTER WITH AN AIR SAMPLING DEVICE. A COMPUTER PROGRAM IS AVAILABLE TO CALCULATE THE CONCENTRATIONS OF RAA, RAB, AND RAC IN AIR AND TO ESTIMATE THE ACCURACY IN THESE CALCULATED CONCENTRATIONS. THIS PROGRAM IS WRITTEN IN THE BASIC LANGUAGE. ALSO DISCUSSED IN THIS PAPER ARE THE ALPHA-PARTICLE SPECTROMETER USED TO COUNT ACTIVITY ON THE AIR FILTERS AND THE RESULTS OF THE RADON DAUGHTER MEASUREMENTS IN COLORADO, UTAH, AND NEW MEXICO. THESE RESULTS AND RESULTS OF OTHER MEASUREMENTS DISCUSSED IN A COMPANION PAPER ARE NOW BEING USED IN A COMPREHENSIVE STUDY OF POTENTIAL RADIATION EXPOSURES TO THE PUBLIC FROM U MILL TAILING PILES.

550

APPLICATION OF ALARA PRINCIPLES TO SHIPMENT OF SPENT
NUCLEAR FUEL

CONF-801115

GREENBERG, J.; BRACKENBUSH, L.W.; MURPHY, D.W.; BARNETT, R.A.;
LEWIS, J.R.

801101

K.O. STERCK & CO., HAMBURG

PACIFIC NORTHWEST LABORATORY

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS, PROC. 6TH
INT. SYMP. PP. 206-210.

M,9;0,1;0,2;0,3;0,4,C;0,5,D;0,9;0,0,C;0,0,D;F,9

THIS REPORT PRESENTS THE RESULTS OF A STUDY (PNL-3261,
ACN-46) PERFORMED BY PNL TO IDENTIFY AND EVALUATE ALTERNATIVES
IN POLICY, OPERATING PRACTICES AND EQUIPMENT DESIGN WITH
POTENTIAL TO REDUCE DOSE LEVELS WITHIN AN AS LOW AS REASONABLE
ACHIEVABLE (ALARA) PHILOSOPHY.

551

RISKS OF SHIPPING URANIUM HEXAFLUORIDE BY TRUCK AND TRAIN

CONF-781109

GEFFEN, C.A.; RHOADS, R.E.; JOHNSON, J.R.

781101

AMERICAN NUCLEAR SOCIETY, LA GRANGE, IL

PACIFIC NORTHWEST LABORATORY

TRANS. AM. NUCL. SOC. 30:321-322.

C,1;C,2;C,3,B;C,4,B;C,5,B;C,9;0,1;0,2;0,3,B;0,4,B;0,5,B;0,6;0,8,
B;0,9,B;U,0,B

THE SHIPMENT OF URANIUM HEXAFLUORIDE IS AN IMPORTANT
TRANSPORTATION LINK BETWEEN MANY COMPONENTS OF THE NUCLEAR FUEL
CYCLE. THIS PAPER PRESENTS THE RESULTS OF AN ANALYSIS OF THE
RISKS OF TRANSPORTING UF₆ BY TRUCK AND RAIL. THE RA METHODOLOGY

CONSISTS OF 4 BASIC STEPS: (1) A DESCRIPTION OF THE SYSTEM BEING ANALYZED, (2) IDENTIFICATION OF SEQUENCES OF EVENTS THAT COULD LEAD TO A RELEASE OF MATERIAL DURING TRANSPORTATION, (3) EVALUATION OF THE PROBABILITY AND CONSEQUENCES OF EACH RELEASE SEQUENCE, AND (4) ASSESSMENT OF THE RISK AND EVALUATION OF THE RESULTS. SEE ALSO PNL-2211, ACN=28.

552

DESCRIPTION OF GE SHIPPING CASKS #DOT-SP-5309 AND
DOT-SP-5169

NAME

GENERAL ELECTRIC

000101

GENERAL ELECTRIC. 5 P.

GENERAL ELECTRIC

O,1

THIS REPORT PROVIDES A DESCRIPTION OF THE TWO GENERAL ELECTRIC SHIPPING CASKS.

553

RISK ASSESSMENT REVIEW GROUP REPORT TO THE U.S. NUCLEAR
REGULATORY COMMISSION

NUREG/CR-0400

LEWIS, H.W., CHAIR.; BUDNITZ, R.J.; KOUTS, H.J.C.; LOWENSTEIN,
W.B.; ROWE, W.D.; VON HIPPEL, F.; ZACHARIASEN, F.

780101

NTIS. 75 P.

RISK ASSESSMENT REVIEW GROUP, AN AD HOC ADVISORY COMMITTEE
ADMINISTERED FOR THE COMMISSION THROUGH THE OFFICE OF
POLICY EVALUATION

C,1;C,3

THE RISK ASSESSMENT REVIEW GROUP WAS ORGANIZED BY NRC IN 1977 TO (1) CLARIFY THE ACHIEVEMENTS AND LIMITATIONS OF WASH-1400, (2) ASSESS THE PEEK COMMENTS AND RESPONSES TO WASH-1400, (3) STUDY THE PRESENT STATE OF SUCH RA METHODOLOGY, AND (4) RECOMMEND TO NRC HOW OR WHETHER SUCH METHODOLOGY CAN BE USED IN THE REGULATORY AND LICENSING PROCESS. IT WAS DETERMINED THAT THE FAULT-TREE/EVENT-TREE METHODOLOGY IS SOUND AND BOTH CAN AND SHOULD BE MORE WIDELY USED BY THE NRC. THE IMPLEMENTATION OF THIS METHODOLOGY IN WASH-1400 WAS A PIONEERING STEP, BUT LEAVES MUCH TO BE DESIRED.

554

A RISK-BASED FAULT TREE ANALYSIS METHOD FOR IDENTIFICATION,
PRELIMINARY EVALUATION, AND SCREENING OF POTENTIAL
ACCIDENTAL RELEASE SEQUENCES IN NUCLEAR FUEL CYCLE
OPERATIONS

BNWL-1959

SMITH, T.H.; PELLO, P.J.; STEVENS, D.L.; SEYBOLD, G.D.; PURCELL,

W.L.; KIMMEL, L.V.

760101

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 200 P.
BATTELLE, PACIFIC NORTHWEST LABORATORIES
C,1;C,2;C,3;C,4;C,5

A METHOD IS DESCRIBED FOR IDENTIFICATION, PRELIMINARY EVALUATION, AND SCREENING OF POTENTIAL ACCIDENT SEQUENCES LEADING TO UNCONTROLLED RELEASE OF RADIOACTIVE MATERIALS. INCLUDED IS A PROCEDURE FOR ESTIMATING THE RISK SUM OF ALL IDENTIFIED SEQUENCES. PORTIONS OF THE PROCEDURES HAVE BEEN DEVELOPED FOR DETAILED ANALYSIS OF THE DOMINANT (HIGHEST RISK) SEQUENCES SO SCREENED. THIS METHOD WAS DEVELOPED FOR THE ERDA-SPONSORED RA OF SYSTEMS FOR MANAGING HLW, PART OF THE WASTE FIXATION PROGRAM (WFP). A TYPE OF FAULT TREE CONSTRUCTION, THE "IO/THROUGH" APPROACH, WAS CHOSEN FOR THE WFP WASTE MANAGEMENT SYSTEM. THE SCREENING PROCESS WAS SUCCESSFULLY DEMONSTRATED ON A CONCEPTUAL WASTE MANAGEMENT SYSTEM FOR THE WFP. FAULT TREES WERE CONSTRUCTED AND EVALUATED FOR PROCESSING, HANDLING, TRANSPORTING, AND SICRING HLW. TREES OF UP TO 14,000,000 RELEASE SEQUENCES (BICS-BOOLEAN-INDICATED CUT SETS) WERE SCREENED AND THE TOP FEW HUNDRED OR THOUSAND SEQUENCES PRELIMINARILY RANKED. AN ESTIMATE OF THE TOTAL RISK REPRESENTED IN THE FAULT TREE ALSO WAS OBTAINED.

555

ENVIRONMENTAL ANALYSIS OF THE URANIUM FUEL CYCLE. PT. 1.

FUEL SUPPLY

EPA-520/9-73-003-B; PB-2235 804

U.S. EPA, OFFICE OF RADIATION PROGRAMS

730101

NTIS. 201 P.

E,1;E,2;E,4,D;E,5,C;E,9,D;E,9,C;E,0,C;E,0,D;F,1;F,2; F,5,D;F,5,C;
F,9,C;F,9,D;F,0,C;F,0,D;G,1;G,2;G,4,D;G,5,C;G,9,C;G,9,D;G,0,
C;G,0,D;H,1;H,2;H,4,D;H,5,D;H,9,C;H,9,D;H,0,C;H,0,D;O,1;O,2;
O,5,C;O,9,C;O,0,C

BECAUSE OF THE RAPID INCREASE IN THE USE OF LW-COOLED NUCLEAR REACTORS TO GENERATE ELECTRICITY, THERE IS A PARALLEL GROWTH IN THE BASIC INDUSTRY THAT PROVIDES ENRICHED U FUEL FOR THESE OPERATIONS. THIS INDUSTRY INCLUDES VARIOUS OPERATIONS BROADLY CLASSIFIED AS: MILLING, CONVERSION OF URANIUM OXIDE TO URANIUM HEXAFLUORIDE, ENRICHMENT, FUEL FABRICATION, AND RADIOACTIVE MATERIAL TRANSPORTATION BETWEEN THESE FACILITIES. RADWASTE PRODUCTS ARE ASSOCIATED WITH EACH OF THESE ACTIVITIES. PT. 1 OF THIS SET OF REPORTS EXAMINES THE PREDOMINANT FACILITIES AND OPERATIONS WITHIN THESE CATEGORIES WHICH HAVE THE HIGHEST POTENTIAL FOR ENVIRONMENTAL IMPACT. THE PRINCIPAL PURPOSE OF THIS FUEL CYCLE MAY HAVE ON PUBLIC HEALTH AND TO INDICATE WHERE, WHEN, AND HOW STANDARDS LIMITING ENVIRONMENTAL RELEASES COULD BE EFFECTIVELY APPLIED TO MITIGATE THESE EFFECTS.

556

ENVIRONMENTAL ANALYSIS OF THE URANIUM FUEL CYCLE. PT. 2.

NUCLEAR POWER REACTORS

EPA-520/9-73-003-C; PB-2235 805

U.S. EPA, OFFICE OF RADIATION PROGRAMS

730101

NTIS, 175 P.

P,1;P,2;P,4,C;P,5,D

PT. 2 OF THIS REPORT DEALS WITH HAZARDS AND POLLUTION IN THE NUCLEAR REACTOR PROCESS FOR ELECTRIC POWER GENERATION. TOPICS DISCUSSED ARE PROCESS DESCRIPTIONS, SOURCES OF RADIOACTIVE DISCHARGES INTO THE ENVIRONMENT, DISCHARGE CONTROL OPTIONS, NOBLE GASES, RADIOIODINE, POPULATION RADIATION EXPOSURE, REACTOR EFFLUENTS AND WASTE TREATMENT COSTS.

557

ENVIRONMENTAL ANALYSIS OF THE URANIUM FUEL CYCLE. PT. 3.

NUCLEAR FUEL REPROCESSING

EPA-520/9/73-003-D; PB-235 805 (SET OF 4 VOLS.)

U.S. EPA, OFFICE OF RADIATION PROGRAMS

730101

NTIS, 150 P.

J,1;J,5,D;J,9

PT. 3 CONCERNS EFFLUENT CONTROL, RADIOLOGICAL IMPACT OF A REPRESENTATIVE PLANT, IMPACT OF THE INDUSTRY, ECONOMICS OF FUEL REPROCESSING AND HEALTH HAZARD REDUCTION.

558

GUIDELINES TO RELATIVE HAZARDS OF RADIOACTIVE SHIPMENTS

NONE

INDUSI, J.P.; CUSACK, J.H.; HIGINBOTHAM, W.A.

750101

BROOKHAVEN NATIONAL LABORATORY, UPTON, NY, 30 P.

BROOKHAVEN NATIONAL LABORATORY

C,3;C,5;C,9;D,2;D,3,A;D,3,B;D,4,A;D,5,B;D,9

THE ACCIDENTAL OR PURPOSEFUL DISPERSAL OF AN ISOTOPE SHIPMENT WILL PRESENT PUBLIC HAZARDS OF VARYING DEGREES. THE SEVERITY OF THE HAZARD WILL DEPEND UPON SHIPMENT PARAMETERS (THE NATURE, INCLUDING CHEMICAL NATURE, FORM, INCLUDING PARTICLE SIZE, AND QUANTITY OF THE ISOTOPE), DISPERSAL PARAMETERS (THE FRACTION AIRBORNE, THE HEIGHT OF THE DISPERSION, AND LOCATIONAL FACTORS INCLUDING POPULATION DENSITY) AND METEOROLOGICAL PARAMETERS (WIND SPEED AND DIRECTION AND WEATHER STABILITY). THE DISPERSAL PATTERN RESULTING FROM A RELEASE IS ILLUSTRATED. IN ORDER TO DETERMINE THE RELATIVE HAZARD OF A PARTICULAR SHIPMENT, A REASONABLE SET OF PARAMETER ASSUMPTIONS HAVE BEEN ESTABLISHED AND APPLIED TO EACH ISOTOPE OF INTEREST.

559

AVERAGE ANNUAL DOSES, LIFETIME DOSES AND ASSOCIATED RISK OF
CANCER DEATH FOR RADIATION WORKERS IN VARIOUS FUEL
FABRICATION FACILITIES IN INDIA

STU/PUB/527; IAEA-SM-242/05

IYER, P.S.; DHOND, R.V.

790101

IAEA, VIENNA

BHABHA ATOMIC RESEARCH CENTRE, BOMBAY

OCCUPATIONAL EXPOSURE IN THE NUCLEAR FUEL CYCLE. PP. 113-120.

C,3;H,3,C;H,4,C;H,9;H,0,C

LIFETIME DOSES BASED ON AVERAGE ANNUAL DOSES ARE ESTIMATED FOR RADIATION WORKERS IN VARIOUS FUEL FABRICATION FACILITIES IN INDIA. FOR SUCH CUMULATIVE DOSES, THE RISK OF RADIATION-INDUCED CANCER DEATH IS COMPUTED. THE METHODOLOGY FOR ARRIVING AT THESE ESTIMATES AND THE ASSUMPTIONS MADE ARE DISCUSSED. BASED ON PERSONNEL MONITORING RECORDS FROM 1966 TO 1978, THE AVERAGE ANNUAL DOSE EQUIVALENT FOR RADIATION WORKERS IS ESTIMATED AS 0.9 MSV (90 MREM) AND THE MAXIMUM RISK OF CANCER DEATH ASSOCIATED WITH THIS OCCUPATIONAL DOSE AS 1.35×10^{-5} PER ANNUM AS COMPARED WITH THE RISK OF DEATH DUE TO NATURAL CAUSES OF 7×10^{-4} PER ANNUM AND THE RISK OF DEATH DUE TO BACKGROUND RADIATION ALONE OF 1.5×10^{-5} PER ANNUM.

560

AN INTERNATIONAL VIEW OF SPENT FUEL STORAGE AS ONE ASPECT
OF FUEL CYCLE SAFETY

CONF-780658

ILARI, C.; JOUANNAUD, C.

780601

OECD, PARIS

OECD, PARIS

STORAGE OF SPENT FUEL ELEMENTS. PP. 85-96.

M,1;M,2;M,9

THE REPORT FORM OF THIS PAPER IS INIS-MF-4476. THE CURRENT INTERNATIONAL COOPERATION CONNECTED WITH THE SAFETY OF FUEL CYCLE FACILITIES, WITH PARTICULAR REFERENCE TO THE SAFETY OF FACILITIES FOR THE STORAGE OF SPENT FUEL IS OUTLINED. THE VIEW OF THE OECD NEA/CSNI WORKING GROUP ON THE SAFETY OF THE FUEL CYCLE ARE REPORTED AND THE PRINCIPAL PROBLEMS OF THE SAFETY OF FUEL STORAGE ARE REVIEWED IN THE PERSPECTIVE OF THE SAFETY OF THE ENTIRE FUEL CYCLE. IT IS CONCLUDED THAT THE PROBLEMS ASSOCIATED WITH SHORT-TERM STORAGE ARE WELL UNDERSTOOD AND MANAGED, AND THAT THE ADDITIONAL PROBLEM OF MAINTAINING THE INTEGRITY OF FUEL ASSEMBLIES DURING LONG-TERM STORAGE REQUIRES FURTHER RESEARCH.

561

RISKS OF SHIPPING URANIUM HEXAFLUORIDE BY TRUCK AND TRAIN

CONF-780506

JOHNSON, J.F.; ANDREWS, W.B.

780501

SANDIA LABORATORIES, ALBUQUERQUE, NM
PACIFIC NORTHWEST LABORATORY
PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROC. 5TH
INT. SYMP. PP. 917-925.

C,1;C,2;C,3,B;C,4,B;C,5,B;C,9;O,1;O,2;O,3,B;O,4,B;O,5,B;O,6;O,8,
B;O,9;O,0,B

THE REPORT FORM OF THIS PAPER IS PNL-SA-6528. RISK IS
DEFINED AS THE PRODUCT OF THE PROBABILITY OF A RELEASE OF
MATERIAL TO THE ENVIRONMENT AND THE CONSEQUENCES RESULTING FROM
THE RELEASE. ALTHOUGH A FEW ACCIDENTS INVOLVING UF6 CONTAINERS
HAVE OCCURRED DURING TRANSPORTATION, THEY ARE INSUFFICIENT IN
NUMBER AND CONSEQUENCES TO PROVIDE DATA FOR A RISK ASSESSMENT OF
UF6 TRANSPORT. FOR THIS REASON, THIS STUDY USED THE PREDICTIVE
RISK ASSESSMENT METHODOLOGY DEVELOPED IN THE TRANSPORTATION
SAFETY STUDIES PROJECT. THE METHODOLOGY IS COMPOSED OF FOUR
BASIC STEPS: DETAILED DESCRIPTION OF THE TRANSPORTATION SYSTEM,
IDENTIFICATION OF POSSIBLE MATERIAL RELEASE SEQUENCES,
EVALUATION OF THE PROBABILITIES AND THE CONSEQUENCES OF THE
RELEASES, AND CALCULATION AND ASSESSMENT OF THE RISK. SEE ALSO
PNL-2211 (ACN=28).

562

ACCIDENT SEVERITIES EXPERIENCED BY RADIOACTIVE MATERIAL
PACKAGES TRANSPORTED BY WATER. DRAFT REPORT

TIC-0286

KIRKLAND, J.; BARANANO, T.

810101

ORI, SILVER SPRING, MD. 105 P.

ORI, INC.

O,1;O,2;O,3;O,9;O,0

THIS STUDY OF THE ABNORMAL ENVIRONMENTS EXPERIENCED BY
RADIOACTIVE MATERIAL (RAM) PACKAGES WHEN TRANSPORTED BY WATER
EXTENDS AND REFINES A PREVIOUS ANALYSIS CONDUCTED BY ORI, INC.
FOR THE SANDIA FOR SANDIA. THIS STUDY, AS WELL AS THE PREVIOUS
ORI STUDY, IS BASED ON THE CONCEPTS DEVELOPED BY SANDIA IN A
SERIES OF REPORTS ANALYZING THE TRANSPORTATION ACCIDENTS THAT
MAY OCCUR IN THE AIR, TRUCK AND RAIL TRANSPORTATION MODES. THE
PRINCIPAL CONCEPT OF SIGNIFICANCE IN THESE REPORTS IS THAT OF
"ACCIDENT ENVIRONMENT." FIVE SUCH ENVIRONMENTS WERE DEFINED --
IMMERSION, CRUSH, IMPACTS, PUNCTURE, AND FIRE. THE MAIN THRUST
OF THE SANDIA TRANSPORTATION STUDIES IS CONCERNED WITH
DETERMINING THE PROBABILITY OF A RAM PACKAGE ENCOUNTERING THESE
ENVIRONMENTS AND ESTIMATING THEIR SEVERITY. SINCE BOTH THE
PREVIOUS AND THE SUBJECT ORI STUDIES ARE NOT CONCERNED WITH
LOADING/UNLOADING ACCIDENTS, ONLY THREE OF THESE ENVIRONMENTS
HAVE BEEN CONSIDERED IN THESE STUDIES, I.E., IMMERSION, CRUSH,
AND FIRE. RIGOROUS DEFINITIONS OF THESE TERMS ARE GIVEN.

563

SPASM, A COMPUTER CODE FOR MONTE CARLO SYSTEM EVALUATION
EPRI NP-1685
LEVERENZ, F.L.
810101
ELECTRIC POWER RESEARCH INSTITUTE, PALO ALTO, CA. 32 P.
SCIENCE APPLICATIONS, INC.
C,3

SPASM IS A COMPUTER CODE IN THE WAM FAMILY WHICH EVALUATES THE DISTRIBUTION OF SYSTEM SUCCESS OR FAILURE FREQUENCY VIA MONTE CARLO SIMULATION. IT CAN BE USED INDEPENDENTLY OR IN CONJUNCTION WITH WAMCUT.

564
REALISTIC ESTIMATES OF THE CONSEQUENCES OF NUCLEAR ACCIDENTS

LEVENSON, M.; RAHN, F.
810501
AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
ELECTRIC POWER RESEARCH INSTITUTE
NUCL. TECHNOL. 53(2):99-110.
P,4,A;P,4,B;P,5,A;P,5,B

RADIATION EXPOSURE ESTIMATES FORM THE BASIS FOR EMERGENCY RESPONSE PLANNING IN THE EVENT OF AN ACCIDENT AT A NUCLEAR REACTOR. A REEXAMINATION OF THE CURRENT ESTIMATES SHOWS THAT THEY MAY BE HIGH BY A FACTOR OF 10 OR MORE. IF THIS IS SO, PUBLIC CONCERNS ABOUT NUCLEAR SAFETY MAY BE EXAGGERATED AND OUR STRATEGY FOR DEALING WITH SUCH AN ACCIDENT MAY BE INCORRECTLY BIASED, PARTICULARLY IN THE CASE OF EVACUATION POLICY, FOR THE REACTOR ACCIDENTS AND THE RESULTING RELEASES OF RADIOACTIVITY THAT COULD ACTUALLY OCCUR, FOR INSTANCE, MASS EVACUATION DOES NOT APPEAR TO BE THE SAFEST STRATEGY. SHELTERING (SOMETIMES WITH THE EVACUATION OF THE FEW INDIVIDUALS AT CLOSE-IN LOCATIONS) APPEARS TO BE SUPERIOR, IN THAT IT MAY RESULT IN A LOWER OVERALL RISK TO THE GENERAL POPULATION. IN A REACTOR ACCIDENT, THE PRINCIPAL CONCERN IS THAT THE ENGINEERED SAFETY FEATURES WILL FAIL, RESULTING IN A LARGE RELEASE OF RADIOACTIVITY. THE RADIOACTIVE FISSION PRODUCTS IN THE CORE WILL THEN BE REDISTRIBUTED BY VARIOUS NATURAL PROCESSES (CHEMICAL REACTIONS, AEROSOL BEHAVIOR, CONDENSATION, EFFECTS OF MOISTURE, ETC.). THE FAILURE OF EACH ENGINEERED BARRIER TO FUNCTION PROPERLY, HOWEVER, STILL DOES NOT MEAN THAT A SIGNIFICANT AMOUNT OF RADIOACTIVITY WILL ESCAPE. EXPERIMENTS AND EXPERIENCE DEMONSTRATE QUITE THE OPPOSITE. THIS RAISES THE QUESTION OF WHY CURRENT ESTIMATES ARE TO HIGH AND HOW MUCH RADIOACTIVITY COULD REALLY ESCAPE.

565
SAFETY ANALYSIS REPORT: HANDLING AND STORAGE OF IRRADIATED
N REACTOR FUEL IN 105 KW FUEL STORAGE FACILITY
UNI-1072
MOFFITT, R.L.

780601

UNITED NUCLEAR INDUSTRIES, INC., RICHLAND, WA. 103 P.

UNITED NUCLEAR INDUSTRIES, INC.

M,1;M,2;M,5,B;M,7;M,0,B;O,1;O,2

IRRADIATED N REACTOR FUEL, WHICH HAS BEEN COOLED FOR AT LEAST 150 DAYS, MAY BE SAFELY STORED AT THE FACILITY IN 4.9 M (16 FT) OF WATER USING THE STORAGE CONFIGURATION AND WILL PRESENT NO UNDUE RISK TO THE HEALTH AND SAFETY OF PLANT PERSONNEL OR THE GENERAL PUBLIC. THE ACCEPTED SAFE STORAGE CONFIGURATION WILL PREVENT AN ACCIDENTAL CRITICALITY AND THE WATER WILL PREVENT ANY SIGNIFICANT RELEASE OF RADIOACTIVE MATERIALS TO THE ENVIRONS AND LIMIT THE RADIATION EXPOSURE IN THE WORK AREA, FROM THE STORED FUEL, TO LESS THAN 1 MR/H. THE STORAGE CONFIGURATION CONSISTS OF FULL DENSITY STORAGE FOR THE LOWER ENRICHED FUEL AND HALF DENSITY STORAGE OF THE SPIKE FUEL. THE FULL DENSITY STORAGE ARRAY WILL ALLOW FOR STORAGE OF UP TO 1700 METRIC TONS (1900 TONS) OF IRRADIATED MK IV FUEL WHILE THE HALF DENSITY STORAGE ARRAY WILL ALLOW FOR STORAGE OF UP TO 611 METRIC TONS (660 TONS) OF IRRADIATED MK IA FUEL. SEE ACN=623 FOR REVISED ED. OF THIS REPORT.

566

STATISTICS AND RISK ANALYSIS--GETTING THE ACTS TOGETHER

CONF-791016

MOORE, R.H.

800101

NTIS

U.S. NRC

1979 DOE STATISTICAL SYMP. PROC. PP. 171-176.

P,1

THIS PAPER PROVIDES A METAPHORICAL FRESNEL LENS/PRISM THROUGH WHICH FOCUSING CAN, EXAMINE, AND JUXTAPOSE THE VARIOUS ISSUES AND INTERFACES AND INTERFERENCES BETWEEN THE TWO DISCIPLINES THAT ARE THE SUBJECTS OF THIS WORKSHOP: STATISTICS AND RISK ANALYSIS.

567

THE EFFECTS ON POPULATIONS OF EXPOSURE TO LOW LEVELS OF IONIZING RADIATION: 1980

COMMITTEE ON THE BIOLOGICAL EFFECTS OF IONIZING RADIATION

800101

NATIONAL ACADEMY PRESS, WASHINGTON, DC. 524 P.

C,1;C,5,D

THERE ARE SUFFICIENT DATA CONCERNING THE EFFECTS OF EXPOSURE TO HIGH DOSES OF IONIZING RADIATION, BUT LITTLE RELIABLE INFO CONCERNING THE CONSEQUENCES OF EXPOSURE TO LOWER DOSES, ESPECIALLY THOSE LOW DOSES TO WHICH A HUMAN POPULATION MIGHT BE EXPOSED. UPON THE ISSUE OF HOW ONE MAY EXTRAPOLATE FROM THE HIGH DOSES TO LOW, SCIENTIFIC ARGUMENT TURNED ON THE

QUESTION OF HOW ONE MAY VALIDLY EXTRAPOLATE FROM THE MEASURED EFFECTS OF HIGH DOSES TO THE MOST PROBABLE EFFECTS OF LOW DOSES. THIS BIER III REPORT EXHIBITS THE RANGE OF OPINION CONCERNING HOW THIS EXTRAPOLATION MAY BE PERFORMED. MANY COMMITTEE MEMBERS BELIEVE THAT THE DATA BEST SUPPORT A LINEAR OR PURE QUADRATIC MODELS PROVIDED BETTER ESTIMATES. THE REPORT PRESENTS ALL OF THESE VIEWS, IN BALANCED FASHION.

569

SOME HEALTH ASPECTS OF CANADIAN URANIUM MINING

AECL-5970

MYERS, D.K.; STEWART, C.G.

790301

AECL, CHALK RIVER NUCLEAR LABORATORIES, CHALK RIVER, ONTARIO. 21 P.

AECL, CHALK RIVER NUCLEAR LABORATORIES

D,4,C;D,5,D;D,8;D,9;D,0,C;D,0,D

THE RADIOLOGICAL HEALTH HAZARDS ASSOCIATED WITH URANIUM MINING IN CANADA ARE REVIEWED. RADIATION HAZARDS TO INDIVIDUAL MEMBERS OF THE GENERAL POPULATION CURRENTLY LIVING IN THE VICINITY OF THE MINES APPEAR TO BE EXTREMELY LOW. THE MAJOR HEALTH HAZARDS ARE THOSE ASSOCIATED WITH UNDERGROUND MINING. HAZARDS ASSOCIATED WITH THE INHALATION OF RADON DAUGHTERS IN THE MINES WERE ESTIMATED FROM ANALYSES OF AVAILABLE DATA FROM THE U.S. AND CZECHOSLOVAKIA. THESE DATA CAN BE FITTED BY VARIOUS MATHEMATICAL MODELS INCLUDING QUASI-THRESHOLD MODELS. ON THE REASONABLE ASSUMPTION OF A LINEAR RELATIONSHIP BETWEEN DOSE AND EFFECT, THE RISK WOULD APPEAR TO BE ABOUT 6.1 INDUCED LUNG CANCERS PER MILLION WLM PER YR, WHICH AVERAGED OVER A PERIOD OF INCIDENCE OF 15 YRS, WOULD BE EQUIVALENT TO A TOTAL OF ABOUT 100 INDUCED CANCERS PER MILLION WLM. THIS VALUE MAY BE TOO HIGH FOR ESTIMATION OF THE MOST PROBABLE RISK OF RADON DAUGHTERS TO THE GENERAL PUBLIC.

570

AN APPROACH TO SOCIETAL RISK ACCEPTANCE CRITERIA AND RISK MANAGEMENT

UCLA-ENG-7746

OKRENT, D.; WHIPPLE, C.

770101

UNIV. OF CALIFORNIA, LOS ANGELES, CA. 34 P.

UNIV. OF CALIFORNIA, LOS ANGELES

C,1

A QUANTITATIVE APPROACH TO RISK ACCEPTANCE CRITERIA AND RISK MANAGEMENT IS PROPOSED FOR ACTIVITIES INVOLVING RISK TO INDIVIDUALS NOT RECEIVING DIRECT BENEFITS, SUCH AS EMPLOYMENT, FROM THE ACTIVITY. SOCIETAL ACTIVITIES ARE DIVIDED INTO MAJOR FACILITIES OR TECHNOLOGIES, ALL OR PART OF WHICH ARE CATEGORIZED AS ESSENTIAL, BENEFICIAL, OR PERIPHERAL, AND A DECREASING LEVEL OF ACCEPTABLE RISK TO THE MOST EXPOSED INDIVIDUAL IS PROPOSED.

THE RISK WOULD BE ASSESSED AT A HIGH CONFIDENCE LEVEL, THEREBY PROVIDING AN INCENTIVE TO THE GAINING OF BETTER KNOWLEDGE. EACH RISK-PRODUCING FACILITY, TECHNOLOGY, ETC., WOULD HAVE TO UNDERGO ASSESSMENT BOTH OF RISK TO THE INDIVIDUAL AND TO SOCIETY. THE COST OF THE LATTER WOULD HAVE TO BE INTERNALIZED, PROBABLY VIA A TAX PAID TO THE FEDERAL GOVERNMENT, WHICH IN TURN WOULD REDISTRIBUTE THE BENEFIT AS NATIONAL HEALTH INSURANCE OR REDUCED TAXES TO THE INDIVIDUAL. RISK AVERSION TO LARGE EVENTS WOULD BE BUILT INTO THE INTERNALIZATION OF THE COST OF RISK.

571

INDEX OF RISK EXPOSURE AND RISK ACCEPTANCE CRITERIA

NUREG/CR-1930; BNL-NUREG-51339

MILLER, B.; HALL, R.E.

610101

BROOKHAVEN NATIONAL LABORATORY, UPTON, NY. 102 F.

BROOKHAVEN NATIONAL LABORATORY

C,1;C,2;C,3;C,4;C,5;C,6;C,7;C,8;C,9;C,0;P,1;P,2;P,3;P,4;P,5;P,6;
P,7;P,8;P,9;P,0

THIS REPORT CONTAINS ABSTRACTS OF ARTICLES WHICH ADDRESS VARIOUS ASPECTS OF QUANTITATIVE RISK ANALYSIS, COVERING THE SUBJECTS OF NUMERICAL RISK CRITERIA, METHODOLOGY AND DATA. THE ARTICLES WERE PUBLISHED PRIMARILY FROM 1976 TO DATE IN TECHNICAL JOURNALS, REPORTS, PAPERS, ETC. THE ARTICLES SELECTED FOR THIS REPORT WERE JUDGED TO HAVE RELEVANCE TO NUCLEAR POWER PLANT RISK EVALUATIONS AND TO THE POSSIBLE ESTABLISHMENT OR THE ACCEPTABILITY (OF UNACCEPTABILITY) OF CALCULATED NUCLEAR POWER PLANT RISKS. A MATRIX OF THE VARIOUS RISK CRITERIA PROPOSED IS PRESENTED.

572

PROCEEDINGS OF QUANTITATIVE ENVIRONMENTAL COMPARISON OF

COAL AND NUCLEAR ELECTRIC GENERATION AND THEIR

ASSOCIATED FUEL CYCLES WORKSHOP, VOL. 2

MTR-7010, VOL. 2; PB-246 650

MITRE CORP.

750101

MITRE CORPORATION, MCLEAN, VA.; NTIS. 195 P.

C,1;C,2;C,3;C,4;C,5;P,1;P,2;P,3;P,4;P,5

THE PURPOSE OF THE WORKSHOP, SPONSORED BY THE NATIONAL SCIENCE FOUNDATION, WAS TO COMPILE THE AVAILABLE INFO AND EXPERT OPINIONS TO QUANTIFY THE RISKS ARISING FROM THE VARIOUS ELEMENTS OF COAL AND NUCLEAR FUEL CYCLES AND TO ASSESS THE ECONOMIC COSTS AND ENVIRONMENTAL CONSEQUENCES ASSOCIATED WITH ELECTRIC GENERATION.

573

ANALYSIS AND MODEL TESTING OF A SUPER TIGER (TM) TYPE B

WASTE TRANSPORT SYSTEM IN ACCIDENT ENVIRONMENTS

CONF-801107-10; SAND60-1633C
MAY, R.A.; YOSHIMURA, H.R.; ROMESBERG, L.E.; JOSEPH, B.J.
801101
SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM. 4 P.
SANDIA NATIONAL LABORATORIES
0,1;0,2;0,4;0,0

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE ANS INT. CONF. SANDIA IS INVESTIGATING THE RESPONSE OF A TYPE B PACKAGING CONTAINING DRUMS OF CONTACT-HANDLED TRANSURANIC WASTE (CH-TRU) AS A PART OF A PROGRAM TO EVALUATE THE ADEQUACY OF EXPERIMENTAL AND ANALYTICAL METHODS FOR ASSESSING THE SAFETY OF WASTE TRANSPORT SYSTEMS IN ACCIDENT ENVIRONMENTS. AN NRC CERTIFIED TYPE B PACKAGE KNOWN AS THE SUPER TIGER WAS SELECTED FOR THE STUDY. THIS OVERPACK CONSISTS OF INNER AND OUTER STEEL SHELLS SEPARATED BY RIGID POLYURETHANE FOAM AND CAN BE USED FOR EITHER HIGHWAY OR RAIL TRANSPORTATION. TESTS USING SCALE MODELS OF THE VEHICULAR SYSTEM ARE BEING CONDUCTED IN CONJUNCTION WITH COMPUTER ANALYSES.

574

A MODEL TO ESTIMATE RADIATION DOSE COMMITMENTS TO THE WORLD POPULATION FROM THE ATMOSPHERIC RELEASE OF RADIONUCLIDES. (LABOR DEVELOPMENT PROGRAM)

WAPD-TM-1274

RIDER, J.L.; BEAL, S.K.

780101

N11S. 39 P.

BETTIS ATOMIC POWER LABORATORY, WEST MIFFLIN, PA

C,1;C,2;C,5,D;

A MODEL HAS BEEN DEVELOPED TO ESTIMATE THE RADIATION DOSE COMMITMENTS TO THE POPULATION OF THE WORLD BEYOND THE IMMEDIATE VICINITY OF THE POINT OF RELEASE OF THE RADIONUCLIDES INTO THE ATMOSPHERE. THIS MODEL IS AMENABLE TO SOLUTION VIA A COMPUTER PROGRAM AND CONTAINS A NUMBER OF FEATURES WHICH NOT KNOWN TO BE AVAILABLE ELSEWHERE. THE MOST SIGNIFICANT OF THESE FEATURES IS THE ABILITY TO CALCULATE AUTOMATICALLY THE DOSE COMMITMENTS ARISING FROM THE DAUGHTERS OF THE RELEASED RADIONUCLIDES WHICH FORM SUBSEQUENT TO THE RELEASE VIA RADIOACTIVE DECAY. THE MODEL IS BASED PRIMARILY UPON THE LAW OF THE CONSERVATION OF MASS AND UPON THE RELATIONSHIP THAT RADIATION DOSE RATES AND DOSE COMMITMENTS ARE DIRECTLY PROPORTIONAL TO THE CONCENTRATIONS OF THE RADIONUCLIDES.

575

TRANSPORT, HANDLING, AND INTERIM STORAGE OF INTERMEDIATE-LEVEL TRANSURANIC WASTE AT THE INEL

TRNE-1172

METZGER, J.C.; SNYDER, A.M.

771001

IDAHO NATIONAL ENGINEERING LABORATORY, IDAHO FALLS, ID. 44 P.

IDAHO NATIONAL ENGINEERING LABORATORY
K,1;N,1;O,1

THE TRANSPORT, HANDLING AND INTERIM STORAGE OF INTERMEDIATE-LEVEL TRANSURANIC (TRU) WASTE AT THE INEL IS DISCUSSED. TRANSURANIC-CONTAMINATED SOLID WASTE IS CONSIDERED AS SUCH WHEN THE ALPHA-EMITTING RADIONUCLIDES OF LONG HALF-LIFE AND HIGH SPECIFIC RADIOTOXICITY IS GREATER THAN 10 N CI/G. WASTE FORM CRITERIA AND PACKAGING CRITERIA ARE OUTLINED FOR THE WASTE ISOLATION PILOT PLANT AND RADIOACTIVE WASTE MANAGEMENT COMPLEX. THE CURRENT INTERMEDIATE-LEVEL TRU STORAGE FACILITY CONTAINS 26 STORAGE VAULTS. TWELVE OF THESE VAULTS HAVE AN INSIDE DIAMETER OF 0.59 M AND THE REMAINING HAVE AN INSIDE DIAMETER OF 0.39 M. THE STORAGE VAULTS ARE CARBON STEEL PIPE IMPLANTED VERTICALLY IN A LONG, NARROW BERM WITH A CRUSHED GRAVEL BASE COURSE AND A SUBBASE OF PIT RUN GRAVEL. EACH VAULT CONSISTS OF A LONG, STRAIGHT-WALLED LEAD-IN SECTION, A LID ATTACHED TO THE VAULT BODY SEALS THE VAULT AND ANY MOISTURE IS PREVENTED BY A BAG OF DESICCANT BETWEEN THE LID AND THE SHIELD PLUG. ADDITIONAL STORAGE VAULTS CAN BE ACCOMMODATED AT THE FACILITY. THESE NEWER VAULTS HAVE BEEN REDESIGNED TO BETTER MEET THE WASTE ISOLATION PILOT PLANT CRITERIA. ENVIRONMENTAL MONITORING IS ALSO DONE. THE TOTAL COST OF STORAGE AT THE FACILITY IS \$6921/CU M OR \$196/CU FT. WASTE GENERATORS AS WELL AS TRANSPORTATION AND HANDLING ARE INCLUDED IN THE PRESENTATION.

576

WORKING PAPER FOR A PROBABILISTIC SAFETY EVALUATION FOR A RADIOACTIVE WASTE REPOSITORY. DRAFT

SAL/SK-1-77-PA

STEVENS, C.A.; MENDOZA, Z.T.

770101

SCIENCE APPLICATIONS, INC., PALO ALTO, CA, 182 P.

L,1;L,2;L,3;L,5,B;L,7;L,9;N,1;N,2;N,3;N,5,B;N,7;N,9

RESULTS ARE PRESENTED OF A FIRST ATTEMPT AT PROBABILISTIC SAFETY ANALYSIS FOR A RADWASTE REPOSITORY. THIS DRAFT DOES NOT INCLUDE ROUTINE RELEASE IMPACT NOR THE IMPACT TO PLANT PERSONNEL. THE FINAL REPORT WILL INCLUDE THE FORMER AND MAY INCLUDE THE LATTER. ACCIDENT IMPACT IS DEFINED FOR EACH ACCIDENT AS THE PRODUCT OF THE PROBABILITY OF RELEASE OF A GIVEN QUANTITY OF RADIOACTIVE MATERIAL AND THE CONSEQUENCES OF THAT RELEASE. TOTAL ACCIDENT RISK IS SIMPLY THE SUM OF INDIVIDUAL ACCIDENT IMPACTS. PRIOR TO BEGINNING THE PRELIMINARY ANALYSIS, THE OPEN LITERATURE WAS REVIEWED. THIS REVIEW FAILED TO DISCLOSE A DETAILED PROBABILISTIC CONSEQUENCE ASSESSMENT FOR A WASTE REPOSITORY.

577

THE ENVIRONMENTAL EFFECTS ASSOCIATED WITH THE TRANSPORTATION OF RADIOACTIVE MATERIAL

CONF-791112

MCCLURE, J.D.; POPE, R.B.; YOSHIMURA, H.R.
800101

PLENUM PRESS, NEW YORK

SANDIA LABORATORIES

SCIENTIFIC BASIS FOR NUCLEAR WASTE MANAGEMENT. VOL. 2, PP. 53-60.
0,1;0,2;0,3;0,4,8;0,9;0,0,8

THE REPORT FORM OF THIS PAPER IS SAND79-1929C. THE PRIMARY AIM OF THIS PAPER HAS BEEN TO DESCRIBE SOME OF THE BACKGROUND INFORMATION CONCERNING NUCLEAR MATERIALS TRANSPORTATION SYSTEMS, ACCIDENT STATISTICS, ACCIDENT SEVERITIES, AND TEST INFORMATION - ALL OF WHICH WHEN COMBINED, YIELD AN ENVIRONMENTAL STATEMENT OF THE RISKS ASSOCIATED WITH THE TRANSPORTATION OF RADIOACTIVE MATERIALS. THE RESULTS OF THE ULTIMATE RISK ANALYSIS ARE EXPRESSED IN TERMS OF NUMBERS OF FATALITIES AND, IN THAT SENSE AT LEAST, TEND TO BE AN ABSOLUTE MEASURE OF RISK. WHEN THESE RISKS ARE COMPARED WITH OTHER ACCEPTED SOCIETAL RISKS, THE RELATIVE RISKS ASSOCIATED WITH RADIOACTIVE MATERIAL TRANSPORTATION CAN BE ESTABLISHED. THIS INFORMATION CAN BE USED TO MAKE DECISIONS AT THE GOVERNMENTAL LEVEL AND TO INFORM AN INTERESTED PUBLIC ABOUT THESE RISKS. IT CAN BE CONCLUDED THAT THE RISKS ASSOCIATED WITH THE TRANSPORTATION OF RADIOACTIVE MATERIAL ARE LOW RELATIVE TO THE OTHER RISKS THAT SOCIETY HAS ALREADY ACCEPTED.

578

PRELIMINARY INVESTIGATION OF FIRE AS A CONTRIBUTOR TO CRBRP RISK. P1. 1

SAI-020-76-PA

BURNS, E.I.; FULLWOOD, R.K.; GILBERT, K.J.

760101

SCIENCE APPLICATIONS INC., PALO ALTO, CA. 64 P.

C,1;C,2;C,3;C,7;P,1;P,2;P,3;P,7

FIRES THAT HAVE OCCURRED AT LIGHT WATER REACTORS BY PROBABILITY OF OCCURRENCE ARE RANKED. BOTH METALLIC AND NON-METALLIC FIRES THAT HAVE OCCURRED IN THE NUCLEAR INDUSTRY ARE DISCUSSED. NO ATTEMPT IS MADE TO PRESENT THIS INFO ON A PROBABILISTIC BASIS BECAUSE OF THE PLANT DIFFERENCES BUT SEVEN METALLIC FIRES ARE SPECIFICALLY DISCUSSED. REGULATIONS GUIDES AND STANDARDS IN ORDER TO JUDGE THE RISK OF FIRES IN THE LIGHT OF THE NEW REQUIREMENTS AS WOULD BE APPLIED TO THE CRBR ARE PRESENTED. THE SYSTEM DESIGN DESCRIPTIONS FOR METALLIC AND NON-METALLIC FIRES AT CRBRP ARE SUMMARIZED. TWO FIRE ANALYSES USING EVENT TREE METHODOLOGY ARE PRESENTED. A SYSTEMATIC METHOD USING FAILURE MODES AND EFFECTS ANALYSIS AND/OR, FAULT TREE ANALYSIS TO MODEL THE FIRE POTENTIAL FOR EACH CELL OR CORRIDOR AND LINKING THESE AS A SYSTEM USING EVENT TREES TO DETERMINE THE PROPAGATION POTENTIAL IS PROPOSED.

579

THE PROBABILITY OF SPENT FUEL TRANSPORTATION ACCIDENTS

SAND80-1721; TTC-0139

MCCLURE, J.D.

810101

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM. 12 P.

SANDIA NATIONAL LABORATORIES

0,370,9

THE TRANSPORTED VOLUME OF SPENT FUEL, INCIDENT/ACCIDENT EXPERIENCE AND ACCIDENT ENVIRONMENT PROBABILITIES WERE REVIEWED IN ORDER TO PROVIDE AN ESTIMATE OF SPENT FUEL ACCIDENT PROBABILITIES. IN PARTICULAR, THE ACCIDENT REVIEW ASSESSED THE ACCIDENT EXPERIENCE FOR LARGE CASKS OF THE TYPE THAT COULD TRANSPORT SPENT (IRRADIATED) NUCLEAR FUEL. THIS REVIEW DETERMINED THAT SINCE 1971, THE BEGINNING OF OFFICIAL U.S. DOT RECORD KEEPING FOR ACCIDENTS/INCIDENTS, THERE HAS BEEN ONE SPENT FUEL TRANSPORTATION ACCIDENT. THIS INFORMATION COUPLED WITH ESTIMATED ANNUAL SHIPPING VOLUMES FOR SPENT FUEL, INDICATED AN ESTIMATED ANNUAL PROBABILITY OF A SPENT FUEL TRANSPORT ACCIDENT OF 5×10^{-7} SPENT FUEL ACCIDENTS PER MI. THIS IS CONSISTENT WITH ORDINARY TRUCK ACCIDENT RATES. A COMPARISON OF ACCIDENT ENVIRONMENTS AND REGULATORY TEST ENVIRONMENTS SUGGESTS THAT THE PROBABILITY OF TRUCK ACCIDENTS EXCEEDING REGULATORY TEST FOR IMPACT IS APPROX. $10^{-9}/\text{MI}$.

580

A REVIEW OF U.S. ACCIDENT/INCIDENT EXPERIENCE INVOLVING THE TRANSPORTATION OF RADIOACTIVE MATERIAL (RAM) 1971-1980

CONF-801115; SAND80-0899C

MCCLURE, J.D.; EMEKSON, E.L.

801101

K.O. STORCK & CO., HAMBURG

SANDIA NATIONAL LABORATORY

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROC. 6TH INT. SYMP. PP. 811-817.

0,9

THIS PAPER ANALYZES THE TRANSPORTATION ACCIDENTS AND INCIDENTS WHICH HAVE OCCURRED IN THE U.S. IN THE PERIOD 1971-1980 BASED UPON THE INFORMATION IN THE RADIOACTIVE MATERIAL TRANSPORTATION ACCIDENT/ INCIDENT DATA BASE DEVELOPED BY THE TRANSPORTATION TECHNOLOGY CENTER (TTC) AT SNL. THE ACCIDENT/INCIDENT DATA BASE INCORPORATES THE FILES OF THE HAZARDOUS MATERIAL INCIDENT REPORT (HMIR) SYSTEM OPERATED BY THE MATERIAL TRANSPORTATION BUREAU OF THE U.S. DOT WITH ADDITIONAL INFORMATION OBTAINED FROM THE FILES OF THE U.S. NRC. A PRINCIPAL OBJECTIVE OF THIS PAPER IS TO SUMMARIZE U.S. ACCIDENT/INCIDENT EXPERIENCE FOR THE PAST TEN YRS, PROVIDING A CONCISE STATEMENT OF RADIOACTIVE MATERIAL (RAM) PACKAGE FAILURE DESCRIPTION FOR THE TRANSPORT MODES OF TRUCK, RAIL AND AIR.

581

WORKING PAPER FOR EVALUATION OF RISK FROM THE FRONT END OF

THE FUEL CYCLE

SAI/SR-191-77-FA

GARCIA, A.A.; MENDOZA, Z.I.

780101

SCIENCE APPLICATIONS, INC., PALO ALTO, CA. 70 P.

D,1;D,5,D;D,9;E,1;E,5,D;E,9

THE RESULTS OF THE EVALUATION OF RISK FROM THE MINING AND MILLING OF U ORE ARE PRESENTED IN THE FORM OF DOSE COMMITMENTS TO THE PUBLIC. THESE RESULTS INCLUDE CONTRIBUTIONS FROM ACTIVE MINING AND FROM THE 3 PHASES IN THE LIFE CYCLE OF THE MILL: THE ACTIVE PRODUCTION PERIOD, THE INTERIM PERIOD DURING WHICH THE MILL TAILINGS ARE ALLOWED TO DRY OUT AND THE INACTIVE PERIOD FOLLOWING STABILIZATION OF THE DRY TAILINGS PILES. THE RESULTS ARE GENERALLY DOMINATED BY THE INTERIM PERIOD IN THE MILL LIFE AND THE ACTIVE MINING OPERATION. IT IS NOTED THAT THESE RESULTS ARE BASED, IN PART, ON A SET OF SIMPLIFYING ASSUMPTIONS REGARDING RADIOACTIVE EXPOSURES AND SUBSEQUENT DOSE COMMITMENTS SIMILAR TO THOSE USED IN GESMU AND ORNL-TM-4903. EXCEPT FOR THE INGESTION PATHWAY WHICH WAS NOT CONSIDERED IN THIS REPORT, THE RESULTS SHOULD BE DIRECTLY COMPARABLE TO THEIRS.

582

ANNUAL REPORT ON THE CHARACTERISTICS OF HIGH-LEVEL WASTE

GLASSES

BNWL-2252

MENDEL, J.E.; RUSS, W.A.; ROBERTS, F.P.; KATAYAMA, Y.B.; WESTSIK, J.H., JR; TURCOTTE, R.P.; WADD, J.W.; BRALLEY, D.J.

770601

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 99 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

K,1;K,9;L,1;L,9

A PROGRAM PLAN FOR COMPREHENSIVE CHARACTERIZATION OF SOLIDIFIED HIGH-LEVEL WASTES WAS ISSUED IN DECEMBER 1975. THIS PLAN WAS PREPARED AS PART OF THE LARGER COMMERCIAL WASTE FIXATION PROGRAM BEING CONDUCTED BY PNL FOR ERDA. THIS ANNUAL REPORT IS THE FIRST OF A SERIES OF YEARLY REPORTS DEALING WITH THE IMPLEMENTATION OF THIS CHARACTERIZATION PLAN. THE GOAL OF COMPREHENSIVE CHARACTERIZATION IS TO PROVIDE SUCH AN UNDERSTANDING OF THE BEHAVIOR AND PROPERTIES OF SOLIDIFIED WASTE FORMS THAT IT WILL BE POSSIBLE TO CONVERT WASTE REPRESENTATIVE OF ANY REPROCESSING PLANT FLOWSHEET INTO A FORM SAFE FOR BOTH INTERIM AND LONG-TERM STORAGE. AS PART OF ITS EFFORT TO ACHIEVE THIS DEGREE OF UNDERSTANDING, BNWL HAS BEEN CONDUCTING IN-DEPTH STUDIES OF LOW-MELTING (1000-1150 C) BOROSILICATE GLASSES USED TO IMMOBILIZE HIGH-LEVEL LIQUID WASTES (HLLW) FROM THE LWR FUEL CYCLE. THIS REPORT DEALS EXCLUSIVELY WITH THE COMPREHENSIVE CHARACTERIZATION OF THESE BOROSILICATE GLASSES. SOMEWHAT SIMILAR CHARACTERIZATIONS ARE BEING DONE, OR WILL BE DONE, AT PNL FOR GLASSES DESIGNED TO IMMOBILIZE DEFENSE WASTES, AND FOR "ADVANCED" FORMS FOR SOLIDIFYING LWR WASTES. THIS LATTER CATEGORY COMPRISES SOLID WASTE FORMS OTHER THAN THE GLASS TYPE.

584

PROPOSED FEDERAL RADIATION GUIDANCE FOR RADIOACTIVE WASTES
EPA-520/3/79-002; PB-296 947; CONF-790209

MARTIN, J.E.; PELIENGILL, H.J.; LICHTMAN, S.
790201

NTIS. 536 P.

U.S. EPA

LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT, PROC. HEALTH PHYS. SOC.
12TH MIDYR. TOP. SYMP. PP. 284-292.

K,1;L,1;N,1

THE U.S. EPA WILL SOON FORWARD RADIATION PROTECTION GUIDANCE FOR RADIATION WASTES TO THE PRESIDENT FOR APPROVAL. THE RECOMMENDED GUIDANCE ADDRESSES: (1) THE TYPES OF MATERIALS TO BE CATEGORIZED AS RADIOACTIVE WASTES AND CONSIDERED FOR CONTROL; (2) THE USE OF INSTITUTIONAL FUNCTIONS, ENGINEERED CONTROLS, AND NATURAL BARRIERS TO ISOLATE WASTES; (3) THE POTENTIAL HEALTH RISKS ASSOCIATED WITH WASTES, AND THE FACTORS INVOLVED IN DETERMINING THEM; (4) FACTORS WHICH DETERMINE THE UNACCEPTABILITY OF VARIOUS LEVELS OF RISK; AND (5) OTHER CONSIDERATIONS SUCH AS RETRIEVABILITY, SITE LOCATIONS, AND COMMUNICATION TO SUCCEEDING GENERATIONS TO ASSURE CONTINUED ISOLATION. WHEN APPROVED BY THE PRESIDENT, THE RECOMMENDATIONS WILL GUIDE FEDERAL AGENCIES IN MAKING POLICY, PROGRAMMATIC, OPERATIONAL, AND STANDARD-SETTING DECISIONS IN PROVIDING RADIATION PROTECTION FOR RADIOACTIVE WASTES.

585

MODELING AND ANALYSES TO SUPPORT EPA'S LOW-LEVEL
RADIOACTIVE WASTE STANDARDS

CONF-801217

MEYER, G.L.

801201

NTIS

U.S. EPA

MODELING AND LOW-LEVEL WASTE MANAGEMENT: AN INTERAGENCY
WORKSHOP. PP. 9-19.

N,1;N,4;N,5

EPA IS DEVELOPING A GENERALLY APPLICABLE STANDARD FOR THE MANAGEMENT AND DISPOSAL OF LLW AS PART OF THE US NATIONAL RADIOACTIVE WASTE MANAGEMENT PROGRAM. IT WILL ISSUE A PROPOSED STANDARD IN SEPTEMBER 1981 AND A FINAL STANDARD IN EARLY 1984. EPA WILL USE PREDETERMINED MODELS TO ESTIMATE THE HEALTH RISKS AND COSTS/BENEFITS FROM DISPOSING OF LLW BY A NUMBER OF LAND AND SEA DISPOSAL ALTERNATIVES. THESE ESTIMATES WILL BE USED TO SUPPORT EPA'S DECISION ON THE PROPOSED STANDARD AND FOR THE SUPPORTING EIS AND REGULATORY ANALYSIS. THIS PAPER DESCRIBES WHY EPA IS USING A GENERIC SYSTEMS APPROACH TO MODELING THE IMPACT OF LLW DISPOSAL, THE TYPES OF DISPOSAL ALTERNATIVES WHICH WILL BE EVALUATED, ITS APPROACH TO COST/BENEFIT ANALYSIS, THE CURRENT

STATUS OF MODEL DEVELOPMENT, GENERAL INPUT DATA REQUIREMENTS FOR THE MODEL, AND A GENERAL SCHEDULE FOR DEVELOPMENT OF THE MODELS AND THE STANDARD.

586

OVERVIEW OF EPA'S HEALTH RISK ASSESSMENT MODEL FOR THE SHALLOW LAND DISPOSAL OF LLW.

CONF-801217

MEYER, G.L.; HUNG, C.Y.

801201

NTIS

U.S. EPA

MODELING AND LOW-LEVEL WASTE MANAGEMENT: AN INTERAGENCY WORKSHOP. PP. 283-301.

C,4;C,5;N,4;N,5

EPA IS DEVELOPING A GENERALLY APPLICABLE ENVIRONMENTAL STANDARD FOR MANAGING AND DISPOSING OF LLW AS PART OF THE NATIONAL RADIOACTIVE WASTE MANAGEMENT PROGRAM. TO SUPPORT THE LLW STANDARD, EPA WILL ASSESS POTENTIAL IMPACTS FROM DISPOSING OF LLW BY A NUMBER OF ALTERNATIVES INCLUDING ESTIMATING POTENTIAL RELEASES TO THE ENVIRONMENT, DOSES, HEALTH RISKS AND COSTS FROM EIGHT LAND DISPOSAL METHODS. THIS PAPER PRESENTS AN OVERVIEW OF EPA'S ASSESSMENT MODEL FOR SHALLOW LAND DISPOSAL (SLD) OF LLW. IT DESCRIBES MODEL DESIGN CONSIDERATIONS, CONCEPTUAL DESIGN OF MODEL AND APPROACH TO DEVELOPING MODEL. THE SLD MODEL HAS DATA PREPARATION AND MAIN CALCULATIONAL SECTIONS. THE MAIN CALCULATIONAL SECTION HAS RELEASE, TRANSPORT AND DOSE/HEALTH SUBMODELS INCLUDING LEACHING, RELEASE, GROUNDWATER TRANSPORT, SURFACE WATER TRANSPORT, ATMOSPHERIC TRANSPORT, RESUSPENSION, IRRIGATION, OPERATIONAL SPILLAGE, HUMAN INTRUSION, BIOLOGICAL UPTAKE BY MAN, DOSE AND HEALTH RISK SUBMODELS. WHERE POSSIBLE, EXISTING MODELS/SUBMODELS WERE USED. HOWEVER, NEW SUBMODELS WERE DEVELOPED FOR INFILTRATION, LEACHING, RELEASE AND GROUNDWATER TRANSPORT. BASIC SYSTEM EQUATIONS AND BRIEF EXPLANATIONS OF THESE FOUR SUBMODELS ARE GIVEN.

587

DATA BASE FOR RADIOACTIVE WASTE MANAGEMENT. VOL. 3. IMPACTS ANALYSIS METHODOLOGY REPORT

NUREG/CR-1759, VOL. 3

OZTUNALI, U.I.; RE, G.C.; MUSKOWITZ, E.D.; PICAZO, E.D.; PIIT, C.J.

810101

U.S. NRC, WASHINGTON, DC. 500 P.

DAMES AND MOORE, INC., WHITE PLAINS, NY

C,1;N,2;N,5,B;N,5,C;N,5,D;N,9;N,0,B;N,0,C;N,0,DC,2;O,5,B;O,5,C;O,5,D;O,9;O,0,B;O,0,C;O,0,D

THE METHODOLOGIES UTILIZED TO CALCULATE POTENTIAL IMPACTS RESULTING FROM THE MANAGEMENT OF LOW LEVEL RADIOACTIVE WASTE (LLW) ARE PRESENTED. THREE PHASES OF WASTE MANAGEMENT THAT MAY

RESULT IN VARIOUS TYPES OF IMPACTS ARE: (1) PROCESSING OF THE WASTE AT THE GENERATION SOURCE OR AT A CENTRALIZED LOCATION PRIOR TO DISPOSAL, (2) TRANSPORTATION OF THE WASTE FROM THE GENERATION SOURCE TO THE DISPOSAL LOCATION, AND (3) DISPOSAL OF THE WASTE. POTENTIAL IMPACTS RESULTING FROM THE MANAGEMENT AND DISPOSAL OF LLW ARE EXPRESSED THROUGH "IMPACT MEASURES". FIVE QUANTIFIABLE IMPACT MEASURES HAVE BEEN SELECTED FOR TREATMENT IN THIS REPORT: DOSE TO THE MEMBERS OF THE PUBLIC, OCCUPATIONAL EXPOSURES, COSTS, ENERGY USE, AND LAND USE. OTHER IMPACT MEASURES MAY BE QUANTIFIED; HOWEVER, THE ABOVE FIVE MEASURES HAVE BEEN SELECTED SINCE THEY IMPLICITLY REFLECT MANY OF THE OTHER IMPACT MEASURES.

588

OCCUPATIONAL SAFETY DATA AND CASUALTY RATES FOR THE URANIUM FUEL CYCLE

ORNL-5797

O'DONNELL, F.R.; HOY, H.C.

810101

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN. 78 P.

OAK RIDGE NATIONAL LABORATORY

D,1;D,9,E;E,1;E,9,E;F,1;F,9,E;G,1;G,9,E;H,1;H,9,E;O,1;O,9,E;P,1;P,9,E

OCCUPATIONAL CASUALTY (INJURIES, ILLNESSES, FATALITIES, AND LOST WORKDAYS) AND PRODUCTION DATA ARE PRESENTED AND USED TO CALCULATE OCCUPATIONAL CASUALTY INCIDENCE RATES FOR TECHNOLOGIES THAT MAKE UP THE U FUEL CYCLE, INCLUDING: MINING, MILLING, CONVERSION, AND ENRICHMENT OF U; FABRICATION OF REACTOR FUEL; TRANSPORTATION OF U AND FUEL ELEMENTS; GENERATION OF ELECTRIC POWER; AND TRANSMISSION OF ELECTRIC POWER. EACH TECHNOLOGY IS TREATED IN A SEPARATE CHAPTER. ALL DATA SOURCES ARE REFERENCED. ALL STEPS USED TO CALCULATE NORMALIZED OCCUPATIONAL CASUALTY INCIDENCE RATES FROM THE DATA ARE PRESENTED. RATES GIVEN INCLUDE FATALITIES, SERIOUS CASES, AND LOST WORKDAYS PER 100 MAN-YRS WORKED, PER 1×10^{12} BTU OF ENERGY OUTPUT, AND PER OTHER APPROPRIATE UNITS OF OUTPUT.

589

SAFETY ANALYSIS ON TRANSPORTATION OF RADIOACTIVE MATERIALS BY TRUCK IN JAPAN

CONF-801115

NAGAKURA, T.; TAKANO, H.; TAKAGI, S.; MAKI, Y.; SHIKATA, H.; ICHIKAWA, Y.; FUKUDA, S.

801101

K.O. STORCK & CO., HAMBURG

CENTRAL RESEARCH INSTITUTE OF ELECTRIC POWER INDUSTRY, TOKYO

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROC. 6TH INT. SYMP. PP. 392-400.

C,1;O,1;O,2;O,3;O,5,A;O,5,B;O,5,C;O,5,D;O,9;C,0,A;O,0,B;O,0,C;O,0,D

IN JAPAN, 12 BWRs, 9 PWRs, 1 GCR AND ADVANCED THERMAL REACTOR ARE NOW IN OPERATION, AND 1 BWR AND 3 PWRs ARE UNDER CONSTRUCTION. NUCLEAR SOURCE MATERIALS ARE IMPORTED BY SEA-GOING VESSELS AND TRANSPORTED ON ROAD TO FUEL FABRICATION PLANTS. LWR'S FRESH FUEL ASSEMBLIES ARE MAINLY TRANSPORTED ON ROAD FROM FUEL FABRICATION PLANTS TO NUCLEAR POWER PLANTS, AND LWR'S SPENT FUELS ARE TRANSPORTED BY SEA-GOING VESSELS FROM REACTOR SITES TO THE PNC REPROCESSING PLANT AT TOKAI-MURA AND ALSO TO REPROCESSING PLANTS IN EUROPE. THE RISK ASSESSMENT OF NUCLEAR MATERIALS HAS BEEN PERFORMED FOR THE SEA TRANSPORTATION IN 1978. IN 1979 AND 1980, RA OF ROAD TRANSPORTATION OF NUCLEAR FUEL MATERIALS HAS BEEN PERFORMED. THE SAFETY ASSESSMENT OF ROAD TRANSPORTATION IS VERY IMPORTANT AS ONE OF VERSATILE SAFETY ASSESSMENTS CONCERNING PEACEFUL USES OF NUCLEAR POWER IN THE NARROW JAPAN BECAUSE THE ROAD TRANSPORT OF NUCLEAR FUEL MATERIALS IS PERFORMED IN THE AREA WHERE THE GENERAL PUBLIC LIVE. THIS SAFETY ASSESSMENT IS PERFORMED BY DOSE ASSESSMENT FOR THE NORMAL MOVING AND THE ACCIDENT CONSIDERING THE RESULTS OF A TRUCK CRASH TEST FOR SAFETY MARGIN OF PACKAGINGS ON BOARD AND THE COUNTERMEASURES FOR THE SAFETY OF TRANSPORTING NUCLEAR FUEL MATERIALS.

590

NEAR SURFACE SPENT FUEL STORAGE-ENVIRONMENTAL ISSUES
PNL-SA-7344

NELSON, I.C.; SHIPLER, D.B.; MCKEE, R.W.; GLENN, R.D.
791001

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 20 P.
PACIFIC NORTHWEST LABORATORY

M,1;M,2;M,3,A;M,3,B;M,4,A;M,4,B;M,4,C;M,5,B;M,7,A;M,7,B;M,9;M,0,
A;M,0,B;0,2;0,5

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE ASCEE NATIONAL MEETING (CONF-791004). THE RESULTS OF AN EXAMINATION OF THE ENVIRONMENTAL ISSUES POTENTIALLY ASSOCIATED WITH MANAGEMENT OF SPENT FUEL BEFORE DISPOSAL OR REPROCESSING ARE GIVEN. WHETHER FOR SHORT TERM OR EXTENDED TERM, THIS STORAGE IS REFERRED TO, IN GENERAL, AS INTERIM NEAR SURFACE STORAGE OF SPENT FUEL. INTERIM STORAGE OF SPENT FUEL APPEARS INEVITABLE BECAUSE OF THE LACK OF REPROCESSING PLANTS AND SPENT FUEL REPOSITORIES. THIS PAPER EXAMINES THE ENVIRONMENTAL ISSUES POTENTIALLY ASSOCIATED WITH MANAGEMENT OF SPENT FUEL BEFORE DISPOSAL OR REPROCESSING IN A REFERENCE SCENARIO. THE RADIOLOGICAL IMPACTS OF SPENT FUEL STORAGE ARE LIMITED TO LOW-LEVEL RELEASES OF NOBLE GASES AND IODINE. WATER NEEDED FOR WATER BASIN STORAGE OF SPENT FUEL AND TRANSPORTATION ACCIDENTS ARE CONSIDERED; THE NEED TO MINIMIZE THE DISTANCE TRAVELLED IS POINTED OUT. RESOURCE COMMITMENTS FOR CONSTRUCTION OF THE STORAGE FACILITIES ARE ANALYZED.

592

SAFETY INDICES AND THEIR APPLICATION TO NUCLEAR WASTE
MANAGEMENT SAFETY ASSESSMENT

PNL-2727

VCSS, J.W.

790401

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 73 F.

PACIFIC NORTHWEST LABORATORY

C,1;C,2;C,0;L,0

IN THIS STUDY 13 INDICES HAVE BEEN EXAMINED TO DETERMINE THEIR POTENTIAL APPLICABILITY TO OPERATIONAL WASTE MANAGEMENT SAFETY ASSESSMENT. TO PRESENT THE INDICES, EACH IS DISCUSSED AS THEIR AUTHORS PRESENTED THEM. EACH TOOL IS CRITIQUED FOLLOWING ITS PRESENTATION. TWO WASTE STREAMS ARE PRESENTED ON A NORMALIZED BASIS. THESE ARE PACKAGED SPENT FUEL FROM THE ONCE-THROUGH FUEL CYCLE AND SOLIDIFIED HIGH-LEVEL WASTE FROM UO2 - PUO2 FUEL CYCLE. SEVEN OF THE INDICES ARE THEN CALCULATED FOR A HYPOTHETICAL SURFACE STORAGE SCENARIO OF THE TWO WASTES. THE INDICES ARE EXAMINED ON A CONSISTENT BASIS TO IDENTIFY ANY BIASES BUILT INTO THEM, AND TO DETERMINE THE SENSITIVITIES OF EACH TO VARIOUS WASTE SITUATIONS. THE TWO WASTE STREAMS ARE THEN COMPARED ON THE BASIS OF THE INDICES TO EXTEND THE UNDERSTANDING OF THE ANALYSIS TECHNIQUES. THE RESULTS OF THE ANALYSIS FALL INTO TWO CATEGORIES, INDEX EVALUATION AND FUEL CYCLE WASTE COMPARISON.

593

RADIOACTIVE EMISSIONS FROM YELLOWCAKE PROCESSING STACKS AT
URANIUM MILLS

ORP/LV-80-3

FORT, C.W., JR.; DOUGLAS, R.L.; MOORE, W.E.

800101

NTIS, 39 P.

U.S. EPA, OFFICE OF RADIATION PROGRAMS, LAS VEGAS, NV

E,1

A SAMPLING PROGRAM WAS UNDERTAKEN TO EVALUATE THE RELEASE OF U CONCENTRATE FROM U MILLS. THIS CONCENTRATE, KNOWN AS YELLOWCAKE, IS THE FINAL PRODUCT OF THE MILL. IT IS ROUTINELY RELEASED TO THE ENVIRONMENT THROUGH STACKS WHICH EXHAUSE AIR FROM BOTH THE YELLOWCAKE DRYING AND PACKAGING OPERATIONS. DURING THIS STUDY, SAMPLES WERE TAKEN IN THESE STACKS AT SIX MILLS TO EVALUATE THE TOTAL YELLOWCAKE EMISSION RATES. THE SAMPLING AND ANALYTICAL METHODS USED AND RESULTS OF SAMPLING ARE GIVEN. THE IMPLICATIONS OF THE RESULTS OF THIS STUDY FOR MONITORING TO MEET STATE AND FEDERAL LICENSING REQUIREMENTS ARE DISCUSSED. THE VARIATIONS OBSERVED INDICATE THE NEED FOR RELATIVELY FREQUENT AND SITE-SPECIFIC MEASUREMENTS.

594

NONPROLIFERATION ALTERNATIVE SYSTEMS ASSESSMENT PROGRAM
(NASAP) - PRELIMINARY ENVIRONMENTAL ASSESSMENT OF

THORIUM/URANIUM FUEL CYCLE SYSTEMS

ORNL/TM-6069

MEYER, H.R.; TILL, J.E.; BONDIETTI, E.A.; DUNNING, D.E.; FORE, C.S.; GARTEN, C.T.; KAYE, S.V.; KIRKSCEY, K.A.; LITTLE, C.A.; MOORE, R.E.; ROHMER, P.S.; TRAVIS, C.C. WITHERSPOON, J.P.

780101

NTIS. 25 P.

OAK RIDGE NATIONAL LABORATORY

C,1;C,2

THE REPORT'S PURPOSE INCLUDES (1) ASSISTANCE IN THE DEVELOPMENT OF A HAZARD ASSESSMENT POLICY FOR THE NONPROLIFERATION ALTERNATIVE SYSTEMS ASSESSMENTS PROGRAM (NASAP) SPONSORED BY DOE, AND (2) IDENTIFICATION OF AREAS IN WHICH FURTHER RESEARCH IS NECESSARY TO ALLOW DETAILED EVALUATION OF THE ENVIRONMENTAL HAZARDS ASSOCIATED WITH THORIUM FUEL CYCLES IN GENERAL. BOTH THE HAZARD ASSESSMENT DATA BASE AND THE AVAILABLE ASSESSMENT METHODOLOGY ARE EVALUATED. WHILE THIS REPORT DOES NOT PRESENT COVERAGE OF ALL ISSUES PERTAINING TO PRACTICAL THORIUM FUEL CYCLES AND PERTINENT LITERATURE, IT IS AN ATTEMPT TO SPECIFY THOSE ISSUES LIKELY TO APPEAR TO BE SIGNIFICANT DURING AN EXHAUSTIVE HAZARD ANALYSIS.

595

COMPLIANCE DETERMINATION PROCEDURES FOR ENVIRONMENTAL RADIATION PROTECTION STANDARDS FOR URANIUM RECOVERY FACILITIES 40 CFR PART 190

NUREG-0859

U.S. NRC, OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS, OFFICE OF NUCLEAR REGULATORY RESEARCH

820101

NTIS; U.S. GPO, NRC. 25 P.

E,1;E,9

URANIUM MILLING OPERATIONS ARE LICENSED BY THE NRC AND BY SOME STATES IN AGREEMENT WITH THE COMMISSION. THE RADIATION DOSE TO ANY INDIVIDUAL FROM THE OPERATION OF FACILITIES WITHIN THE U FUEL CYCLE IS LIMITED TO LEVELS SET BY THE U.S. EPA. THESE LEVELS ARE CONTAINED IN THE EPA ENVIRONMENTAL RADIATION PROTECTION STANDARDS FOR NUCLEAR POWER OPERATIONS, IN 40 CFR 190. THIS REPORT DESCRIBES THE PROCEDURES USED WITHIN NRC'S U RECOVERY LICENSING BRANCH FOR EVALUATING COMPLIANCE WITH THESE REGULATIONS FOR U MILLING OPERATIONS. THE REPORT CONTAINS DESCRIPTIONS OF THESE PROCEDURES, DOSE FACTORS FOR EVALUATING ENVIRONMENTAL MEASUREMENT DATA, AND GUIDANCE TO THE NRC STAFF REVIEWER.

596

MANAGEMENT OF RADIOACTIVE WASTE GASES FROM THE NUCLEAR FUEL CYCLE. VOL. 2. EVALUATION OF STORAGE/DISPOSAL ALTERNATIVES

NUREG/CR-1546, VOL. 2; DPST-81-1
 PROUT, W.E.; DURANT, W.S.; EVANS, A.G.; BUCKNER, M.R.; WRIGHT,
 W.V.

820101

NTIS; U.S. GPO, NRC, 101 P.
 SAVANNAH RIVER LABORATORY
 C,1;C,2;C,3;L,1

THE SECOND PHASE OF THE STUDY (THE FIRST IS ENTERED AS ITEM 177 IN THE FCRA DATA BASE) FOCUSES PRIMARILY ON THE FINAL DISPOSITION OF WASTE FORMS AND DEVELOPMENT OF PERFORMANCE CRITERIA. THE MOST PROMISING WASTE FORMS AND REPOSITORY OPTIONS ARE DESCRIBED AND THEN COMPARED WITH GENERAL PERFORMANCE CRITERIA BEING CONSIDERED FOR INCLUSION IN AN EPA GUIDELINE RELATED TO STORAGE OF HLW. LONG-RANGE STORAGE SCHEMES FOR EACH OF THE WASTE GASES ARE THEN RECOMMENDED. WITH NO LONG-TERM STORAGE FACILITY AVAILABLE IN THE NEAR FUTURE, AN ABOVE-GROUND, INTERIM, ENGINEERED STORAGE FACILITY FOR KR-85, C-14, AND I-129 IS DESCRIBED IN DETAIL. A GENERAL METHODOLOGY IS SET FORTH FOR ASSESSING THE RISK OF LONG-TERM OPTIONS SUCH AS STORAGE IN A MINED REPOSITORY OR IN DEEP OCEAN SEDIMENTS. INFO REQUIRED FOR SUCH STUDIES AND FURTHER RESEARCH FOR ITS DEVELOPMENT IS DESCRIBED.

598

DECOMMISSIONING OF SURFACE FACILITIES ASSOCIATED WITH
 REPOSITORIES FOR THE DEEP GEOLOGICAL DISPOSAL OF
 HIGH-LEVEL NUCLEAR WASTE

STI/PUB/500

HECKMAN, R.A.

790101

IAEA, VIENNA

LAWRENCE LIVERMORE LABORATORY

DECOMMISSIONING OF NUCLEAR FACILITIES. PP. 105-119.

C,1;C,0;L,1;P,1

A METHODOLOGY IS PRESENTED TO EVALUATE THE DECOMMISSIONING OF THE SURFACE FACILITIES ASSOCIATED WITH REPOSITORIES FOR THE DEEP GEOLOGICAL DISPOSAL OF HLW. A COST/RISK INDEX (FIGURE OF MERIT), EXPRESSED AS \$/MAN X REM, IS PROPOSED AS AN EVALUATION CRITERION. ON THE BASIS OF THIS COST/RISK INDEX, AN INSIGHT INTO THE ADVISABILITY OF ADAPTING CERTAIN DECONTAMINATION DESIGN OPTIONS INTO THE ORIGINAL FACILITY IS GAINED. THREE MODES ARE CONSIDERED: PROTECTIVE STORAGE, ENTOMBMENT, AND DISMANTLEMENT. COST ESTIMATES ARE MADE FOR THE DIRECT LABOR INVOLVED IN EACH OF THE ALTERNATIVE MODES FOR A BASELINE DESIGN CASE. SIMILARLY, OCCUPATIONAL RADIATION EXPOSURES ARE ESTIMATED, WITH A LARGER DEGREE OF UNCERTAINTY, FOR EACH OF THE MODES. COMBINATION OF THESE ESTIMATES PRODUCES THE COST/RISK INDEX. TO ILLUSTRATE THE METHODOLOGY, AN EXAMPLE USING A PRELIMINARY BASELINE REPOSITORY DESIGN IS DISCUSSED.

599

A RELIABILITY-RISK MODELLING OF NUCLEAR RAD-WASTE FACILITIES
STI/PUB/403

LEHMANN, P.H.; EL-BASSIONI, A.A.
750101

IAEA, VIENNA

CARNEGIE-MELLON UNIV.

RELIABILITY OF NUCLEAR POWER PLANTS. PP. 373-390.

C,1;C,3;C,5;C,8;P,1;P,3;P,5;P,6

TO ASSIST THE DESIGNER IN ACHIEVING MINIMUM
RELEASE/EXPOSURE GOALS, A COMPUTERIZED RELIABILITY-RISK MODEL
HAS BEEN DEVELOPED TO SIMULATE THE RADWASTE SYSTEM. THE
OBJECTIVES OF THE MODEL ARE TO FURNISH A PRACTICAL TOOL FOR
QUANTIFYING THE EFFECTS OF CHANGES IN SYSTEM CONFIGURATION,
OPERATION, AND EQUIPMENT, AND FOR THE IDENTIFICATION OF WEAK
SEGMENTS IN THE SYSTEM DESIGN.

600

TRANSPORTATION OF NUCLEAR FUEL

AECL-6331

PROWSE, D.R.

790101

AECL, WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT, PINAWA,
MANITOBA. 10 P.

AECL, WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT

O,1;O,2;O,3;O,5,B;O,5,D;O,5,H;O,7;O,8;O,9;O,0,B;O,0,D;O,0,H

SHIPMENT OF USED FUEL FROM NUCLEAR REACTORS TO A CENTRAL
FUEL MANAGEMENT FACILITY IS DISCUSSED WITH PARTICULAR EMPHASIS
ON THE ASSESSMENT OF THE RISK TO THE PUBLIC DUE TO THESE
SHIPMENTS. THE METHODS OF TRANSPORTING USED FUEL IN LARGE
SHIPPING CONTAINERS IS REVIEWED. IN TERMS OF AN ACCIDENT
SCENARIO, IT IS DEMONSTRATED THAT THE PRIMARY RISK OF TRANSPORT
OF USED FUEL IS DUE TO INJURY AND DEATH IN COMMON ROAD
ACCIDENTS. THE RADIOLOGICAL NATURE OF THE USED FUEL CARGO IS,
FOR ALL PRACTICAL PURPOSES, AN INSIGNIFICANT FACTOR IN THE TOTAL
RISK TO THE PUBLIC.

601

ENVIRONMENTAL EFFECTS OF TRANSPORTING RADIOACTIVE MATERIALS
IN NUCLEAR WASTE MANAGEMENT SYSTEMS

SAND78-1211C

POPE, R.B.; YOSHIMURA, H.R.; MCCLUKE, J.D.; HUERTA, M.
781101

SANDIA LABORATORIES, ALBUQUERQUE, NM. 20 P.

SANDIA LABORATORIES

O,1;O,2;O,3;O,4,A;O,4,B;O,7;O,9,B;O,0

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE AICHE 71ST
ANNUAL MEETING. THE ENVIRONMENTAL EFFECTS OF RADIOACTIVE
MATERIALS TRANSPORTATION ARE DISCUSSED. THE SYSTEMS USED OR
BEING DESIGNED FOR USE IN SPENT FUEL AND WASTE TRANSPORTATION

ARE DESCRIBED. ACCIDENT RATE AND SEVERITY DATA ARE USED TO QUANTIFY RISK. A TEST PROGRAM IN WHICH SUBSCALE AND FULL SCALE TRANSPORTATION SYSTEMS WERE EXPOSED TO ACCIDENT ENVIRONMENTS FAR IN EXCESS OF THOSE USED IN PACKAGE DESIGN IS USED TO RELATE PACKAGE DAMAGE TO ACCIDENT SEVERITY LEVELS. ANALYTICAL RESULTS, AND SUBSCALE AND FULL SCALE TEST RESULTS ARE CORRELATED TO DEMONSTRATE THAT COMPUTATIONAL METHODS OR SCALE MODELING, OR BOTH, CAN BE USED TO PREDICT ACCIDENT BEHAVIOR OF TRANSPORTATION SYSTEMS. THIS WORK IS USED TO SHOW THAT THE RISKS TO THE PUBLIC FROM RADIOACTIVE MATERIAL TRANSPORTATION ARE LOW RELATIVE TO OTHER RISKS COMMONLY ACCEPTED BY THE PUBLIC.

602

GEOLOGICAL DISPOSAL OF RADIOACTIVE WASTE - HIGH-LEVEL WASTE IN DEEP GEOLOGIC FORMATIONS IS LESS OF A HAZARD THAN NEAR SURFACE URANIUM ORES OR URANIUM MILL TAILINGS

PIGFORD, T.H.

820301

AICHE

UNIV. OF CALIFORNIA, BERKELEY

CHEM. ENG. PROG. 78(3):18-26.

C,1;C,2;C,5,D;C,0;D,2;D,0;E,2;E,0;L,2;L,0

THE POTENTIAL HAZARDS OF HIGH-LEVEL WASTES ARE SUMMARIZED. THIS PROVIDES FOR A NEW MEASURE OF HAZARDS WHICH TAKES INTO ACCOUNT SOME OF THE ACTUAL PATHWAYS BY WHICH RADIONUCLIDES IN THE BURIED WASTES CAN REACH THE BIOSPHERE. THESE HAZARDS ESTIMATES ARE COMPARED WITH THOSE FROM OTHER WASTES AND FROM NATURALLY OCCURRING RADIOACTIVITY.

603

INTEGRATED ASSESSMENT OF THE IMPACTS ASSOCIATED WITH URANIUM MINING AND MILLING

ORNL/TM-6677

PARZYCK, D.C.; BAES, C.F., III; BERRY, L.G.

790701

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN. 166 P.

OAK RIDGE NATIONAL LABORATORY

D,1;D,4,C;D,4,E;D,5,D;D,9;D,0,C;D,0,D;D,0,E;E,1;E,4,C;E,4,E;E,5,D;E,9;E,0,C;E,0,D;E,0,E

THE OCCUPATIONAL HEALTH AND SAFETY IMPACTS ARE ASSESSED FOR DOMESTIC UNDERGROUND MINING, OPEN PIT MINING, AND MILLING. PUBLIC HEALTH IMPACTS ARE CALCULATED FOR A POPULATION OF 53,000 LOCATED WITHIN 88 KM (55 MI) OF A TYPICAL SOUTHWESTERN U MILL. THE COLLECTIVE ANNUAL DOSE WOULD BE 6.5 MAN-LUNG REM/YR, 89% OF WHICH IS FROM Rn-222 EMITTED FROM MILL TAILINGS. THE DOSE TO THE UNITED STATES POPULATION IS ESTIMATED TO BE 6 E+4 MAN-LUNG REM FROM COMBINED MINING AND MILLING OPERATIONS. THIS MAY BE COMPARED WITH 5.7 E+5 MAN-LUNG REM FROM DOMESTIC USE OF NATURAL GAS AND 4.4 E+7 MAN-LUNG REM FROM BUILDING INTERIORS.

UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS APPEAR TO BE SEVERE IN A 250 HA AREA SURROUNDING A MILL SITE BUT NEGLIGIBLE IN THE ENTIRE POTENTIALLY IMPACTED AREA (500,000 HA). THE CONTEMPORARY URANIUM RESOURCE AND SUPPLY INDUSTRY AND ITS INSTITUTIONAL SETTINGS ARE DESCRIBED IN RELATION TO THE SOCIO-ECONOMIC IMPACTS LIKELY TO EMERGE FROM HIGH LEVELS OF U MINING AND MILLING, RADON AND RADON DAUGHTER MONITORING TECHNIQUES ASSOCIATED WITH URANIUM MINING AND MILLING ARE DISCUSSED.

604

RA-226 COLLECTIVE DOSIMETRY FOR SURFACE WATERS IN THE
URANIUM MINING REGION OF POCOS DE CALDAS

CONF-800304

PASCHOA, A.S.; SIGAUD, G.M.; MONTENEGRO, E.C.; BAPTISTA, G.B.
800308

PERGAMON PRESS, OXFORD

PONTIFICIA UNIV. CATOLICA DO RIO DE JANEIRO

INTERNATIONAL RADIATION PROTECTION ASSOCIATION. INT. CONG. PP.
1127-1130.

D,5,D

DOSIMETRIC AND ENVIRONMENTAL MODELS WERE USED TO CALCULATE THE ANNUAL COLLECTIVE DOSE EQUIVALENT (ACDE) TO THE POPULATION POTENTIALLY EXPOSED TO RA-226 FROM RIVER WATERS IN THE VICINITY OF URANIUM MINING AND FUTURE FACILITIES IN THE POCOS DE CALDAS REGION. THE ACDE FOR THE WHOLE-BODY, BONE, LOWER LARGE INTESTINE, KIDNEYS AND LIVER VIA THE PATHWAYS OF DRINKING WATER AND FOOD GROWN IN IRRIGATED FIELDS ARE PRESENTED AS A FUNCTION OF THE RA-226 CONCENTRATIONS IN THE SURFACE WATERS OF THIS REGION. THE RESULTS CONTRIBUTE TO THE UNDERSTANDING OF THE SHORTCOMINGS INVOLVED IN CALCULATING COLLECTIVE DOSE EQUIVALENT DUE TO THE POTENTIAL ENHANCEMENT OF RA-226 CONCENTRATIONS IN THE SURFACE WATERS NEAR THIS U MINING REGION.

605

NUCLEAR WASTE MANAGEMENT: STORAGE AND DISPOSAL ASPECTS

UCRL-84918

PATTERSON, B.D.; DAVE, S.A.; O'CONNELL, W.J.

800901

NTIS. 14 P.

PATTERSON-CONSULTING ENGINEER, HILLSDALE, NJ

K,1;L,1;M,1

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE SPECIALTY CONFERENCE, CIVIL ENGINEERING AND NUCLEAR POWER (CONF-800904). LONG-TERM DISPOSAL OF NUCLEAR WASTES MUST RESOLVE DIFFICULTIES ARISING CHIEFLY FROM THE POTENTIAL FOR CONTAMINATION OF THE ENVIRONMENT AND THE RISK OF MISUSE. ALTERNATIVES AVAILABLE FOR STORAGE AND DISPOSAL OF WASTES ARE EXAMINED IN THIS OVERVIEW PAPER. GUIDELINES AND CRITERIA WHICH MAY GOVERN IN THE DEVELOPMENT OF METHODS OF DISPOSAL ARE DISCUSSED.

606

PORTER WITH NUCLEAR RESERVATIONS

PATTERSON, W.

781102

MAGAZINES, LTD., LONDON

NEW SCI. 80(1127):362-363.

D,1;E,1;K,1;L,1;M,1

THE ONTARIO ROYAL COMMISSION ON ELECTRIC POWER PLANNING, CHAIRED BY ARTHUR PORTER IS REVIEWED. THIS INTERIM REPORT ON NUCLEAR POWER IS RELEVANT TO NUCLEAR POWER PLANNING FAR BEYOND THE CONFINES OF ONTARIO AND DISCUSSES NUCLEAR ISSUES IN THE EXPLICIT CONTEXT OF ELECTRICITY GENERATION AND USE. PROBLEMS CONSIDERED IN THE REPORT INCLUDE SAFETY ASPECTS OF URANIUM MINING, MILLING, AND SPENT FUEL DISPOSAL, THE ECONOMIC ISSUES WHICH AFFECT NUCLEAR PLANNING AND NUCLEAR INDUSTRY, AND THE PROLIFERATION ISSUE.

607

AN ASSESSMENT OF THE RISKS ASSOCIATED WITH CONTINUED STORAGE OF HIGH-LEVEL WASTE IN SINGLE-SHELL TANKS AT HANFORD

RHQ-LD-55

QUINN, D.J.; MCNAMEE, P.C.; BACA, R.G.; WOOD, D.E.

800501

ROCKWELL HANFORD OPERATIONS, RICHLAND, WA. 123 P.

STANFORD RESEARCH INSTITUTE

K,1;K,2;K,3;K,5,H;K,7;K,8;K,0;L,1;L,2;L,3;L,5,B;L,7;L,8;L,0;N,1;N,2;N,3;N,5,B;N,7;N,8;N,0

THE RISKS ASSOCIATED WITH CONTINUED FUTURE STORAGE OF HIGH-LEVEL DEFENSE WASTE IN SINGLE-SHELL TANKS HAVE BEEN ANALYZED AS PART OF A CONTINUING PROGRAM OF SAFETY ASSESSMENT AT HANFORD. THE STUDY CONSIDERED THE POTENTIAL RISKS OVER THE NEXT FEW DECADES. THE DETAILED ANALYSIS COVERED THE FIRST DECADE (1980-1990) TO PROVIDE A SPECIFIC TIME FRAME FOR COMPUTATION. DECAY OF THE NUCLIDES REDUCES THE RISK AFTER THE FIRST DECADE, SO THE RESULTS REPRESENT AN UPPER LIMIT TO THE RISK DURING ANY ONE OF THE NEXT SEVERAL DECADES. THE RISK METHODOLOGY DEVELOPED AND DESCRIBED HERE INCLUDES IDENTIFYING THE INITIATING EVENTS THAT MAY CAUSE RADIOACTIVE MATERIAL TO LEAVE THE TANKS, TRACING THE POSSIBLE TRANSPORT OF RADIOACTIVE MATERIAL OFFSITE WITH A QUANTITATIVE SYSTEMS MODEL, AND CALCULATING THE POPULATION EXPOSURE AND RESULTING HEALTH EFFECTS (FATAL CANCERS AND GENETIC EFFECTS). A SENSITIVITY ANALYSIS IDENTIFIES THE KEY INITIATING EVENTS AND EXPOSURE PATHWAYS, AND SHOWS THE IMPLICATIONS OF UNCERTAINTIES IN THE INPUT AND MODEL PARAMETERS. THE RESULTS OF THE ANALYSIS SHOW THE POSSIBILITY OF ONE CHANCE IN 80,000 OF A FATAL CANCER AMONG THE REGIONAL POPULATION FROM A DECADE OF STORAGE. THE CONSEQUENCE DISTRIBUTION OF THE ACCIDENTS IS ALSO PRESENTED. INDIVIDUAL RISK IS ABOUT ONE CHANCE IN 20 BILLION OF

A FATAL CANCER FROM A DECADE OF STORAGE, COMPARED TO ONE CHANCE IN FOUR OF FATAL CANCER FROM OTHER CAUSES. GENETIC RISK IS ABOUT ONE CHANCE IN 50,000 OF ONE GENETIC DEFECT IN THE REGIONAL POPULATION OVER SEVERAL GENERATIONS. CONGENITAL ABNORMALITIES FROM OTHER CAUSES OCCUR IN ABOUT 6% OF LIVE BIRTHS. THE HIGHER CONSEQUENCE RANGE OF THE DISTRIBUTION SHOWS THAT THERE IS ABOUT ONE CHANCE IN 40 MILLION OF AN ACCIDENT RESULTING IN ONE OR MORE FATAL CANCERS. THE SENSITIVITY OF THE RESULTS TO VARIOUS ASSUMPTIONS IS SHOWN. OF THE ACCIDENT SEQUENCES EXAMINED HERE, THE EVENT WITH HIGHEST RISK IS STRUCTURAL FAILURE LEADING TO DOME COLLAPSE. THE CONTRIBUTION FROM TANK LEAKS IS MORE THAN 1000 TIMES SMALLER.

608

RISKS OF SHIPPING PLUTONIUM BY TRUCK, TRAIN AND CARGO

AIRCRAFT

CONF-780506

JOHNSON, J.F.; ANDREWS, W.B.

780501

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PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIAL. PROC. 5TH INT. SYMP. PP. 926-932.

C,1;C,2;C,3,B;C,4,B;C,5,B;C,6,B;C,9;O,1;O,2;C,3,B;O,4,B;O,5,B;O,6;C,6,B;O,9;O,6,B

THE REPORT FORM OF THIS PAPER IS PNL-SA-6530. THIS PAPER BRIEFLY REVIEWS THE RA METHODOLOGY AND PRESENTS THE RESULTS OF RISK ANALYSES OF SHIPPING PU VIA THREE MODES: TRUCK, TRAIN, AND CARGO AIRCRAFT. THE SYSTEM DESCRIPTION INCLUDES PROJECTED INDUSTRY CHARACTERISTICS, AMOUNTS TO BE SHIPPED AND THE NUMBER OF SHIPMENTS REQUIRED, MATERIAL CHARACTERISTICS, TRANSPORT MODE AND CARRIER, CONTAINER TYPES, ROUTES (AND ANY RESTRICTIONS), AND WEATHER AND POPULATION ZONES. RELEASE SEQUENCES ARE IDENTIFIED USING FAULT TREE ANALYSES. RELEASES ARE EVALUATED USING CONTAINER FAILURE DATA AND MATHEMATICAL MODELS FOR DISPERSION AND HEALTH EFFECTS. THE RISK IS THEN CALCULATED AND COMPARED TO OTHER KNOWN RISKS. SEE ALSO DOCUMENTS BNWL-1846 (ACN=32), BNWL-1966 (ACN=16), AND BNWL-2030 (ACN=34).

609

PROBABILISTIC SAFETY EVALUATION FOR A MIXED OXIDE FUEL FABRICATION PLANT. DRAFT

SAI/SR 165-77 PA

RITZMAN, R.L.; GARCIA, A.A.; MENDOZA, A.; FULLWOOD, R.R.; ERDMANN, R.C.

770501

SCIENCE APPLICATIONS, INC., PALO ALTO, CA. 70 P.

SCIENCE APPLICATIONS, INC.

1,1;1,2;1,3,B;1,3,D;1,4;1,5,B;1,5,D;1,7;1,9;1,0,B;1,0,D

A PRELIMINARY PROBABILISTIC SAFETY EVALUATION FOR POTENTIAL

ACCIDENTS IN A MOX FUEL FABRICATION PLANT HAS BEEN PERFORMED. THE WORK WAS DONE TO CLASSIFY THE MANY TYPES OF ACCIDENT SEQUENCES SO THAT FURTHER EFFORTS COULD BE CONCENTRATED ON MORE THOROUGH ANALYSIS OF THE IMPORTANT CONTRIBUTORS TO THE OVERALL PROBABILISTIC CONSEQUENCE ENVELOPE. THE RESULTS OF THE PRELIMINARY ANALYSIS INDICATE THAT THE MAIN RISK CONTRIBUTORS ARE ACCIDENTS CAUSED BY CATASTROPHIC EXTERNAL EVENTS. SUCH EVENTS COULD INCLUDE AN EARTHQUAKE OF SUCH SIZE THAT IT EXCEEDS THE DESIGN BASIS EVENT (DBE) FOR THE PLANT OR AN AIRCRAFT CRASH WHICH WOULD PRODUCE MAJOR STRUCTURAL DAMAGE IN A LOCALIZED AREA OF THE PLANT. BOTH THE PROBABILITY OF THESE EVENTS AND ASSOCIATED PUO2 RELEASES, WHICH WERE ESTIMATED IN THE STUDY, SHOULD BE EXAMINED IN GREATER DETAIL TO EVALUATE THE ACCURACY OF THE ESTIMATES. THE RELEASE VALUES ARE PARTICULARLY SIGNIFICANT BECAUSE THEY WERE ESTIMATED TO BE 100 TIMES THAT OF ANY OTHER ACCIDENT SEQUENCE. THE RESULTS ALSO INDICATE OTHER ACCIDENT SEQUENCES THAT CONTRIBUTE TO THE LOW CONSEQUENCE REGION OF THE RISK ENVELOPE FOR THE PLANT. THESE INCLUDE CRITICALITY ACCIDENTS IN THE PLANT AND ACCIDENTS INVOLVING THE PUO2 SHIPPING CONTAINERS IN THE FUEL RECEIVING AREA OF THE PLANT. THE ESTIMATED PROBABILITIES OF OCCURRENCE AND RADIOACTIVITY RELEASES FROM THE PLANT FOR THESE ACCIDENTS NEED TO BE EVALUATED FOR ACCURACY USING PLANT SPECIFIC DATA OR BETTER RELEASE MODELS. THE RESULTS OF THIS PRELIMINARY ANALYSIS INDICATE THAT RISK FROM MOX PLANT OPERATION IS SMALL. THE FACT THAT THESE RESULTS ARE ALSO BELIEVED TO BE CONSERVATIVE ADDS ADDITIONAL CREDENCE TO THE INDICATION OF SMALL RISK FROM MOX PLANT OPERATION.

610

DISTINCTIONS BETWEEN RISK ANALYSIS AND RISK ASSESSMENT

CONF-791016

ROWE, W.D.

800101

NTIS

AMERICAN UNIV., WASHINGTON, DC

1979 DOE STATISTICAL SYMP. PROC. P. 177.

P,1

THIS IS AN ABSTRACT ONLY. HISTORICALLY, SOCIETY HAS BEEN ABLE TO COPE WITH BOTH INDIVIDUAL AND SOCIETAL RISKS ON AN AD HOC BASIS. THE INCREASING COMPLEXITY OF SOCIETY, CAUSED, AT LEAST IN PART, BY DEPENDENCE ON SOPHISTICATED TECHNOLOGY, CHANGING INSTITUTIONS, AND REEVALUATION OF OLDER VALUES, REQUIRES A MORE FORMAL APPROACH TO ESTABLISH SOCIETAL RISKS THAN HERETOFORE. THE FORMAL PROCESS OF RA REQUIRES A BALANCING OF COSTS, RISKS, BENEFITS, AND POLITICAL FACTORS, INCLUDING ESTABLISHMENT OF ACCEPTABLE LEVELS OF SOCIETAL RISK. FEW THINGS ARE RISK FREE, AND THE EQUITABLE DISTRIBUTION OF RESIDUAL INVOLUNTARY RISKS IMPOSED UPON DIFFERENT PARTS OF SOCIETY IS A KEY ASPECT. A VARIETY OF APPROACHES AND PROCESSES HAVE BEEN PROPOSED. ALTHOUGH MANY OF THESE ARE ANALYTICAL APPROACHES, THE PROBLEM THAT INVOLVES HUMAN VALUES AND OPPOSING CONSTITUENCIES

CANNOT BE SOLVED BY RIGOROUS ANALYSIS ALONE. ALTHOUGH ANALYTICAL TECHNIQUES FOR RA ARE NUMEROUS AND OFFER SOME OPPORTUNITIES FOR ADDRESSING THE PROBLEM, THERE ARE BASIC UNDERLYING LIMITATIONS THAT MUST BE WELL UNDERSTOOD AT THE OUTSET. NO ANALYTICAL TECHNIQUE OR COMBINATION OF TECHNIQUES WILL SOLVE THE PROBLEM. THE BEST THAT CAN BE EXPECTED IS CLARIFICATION OF ISSUES AND IDENTIFICATION OF CRITICAL PARAMETERS, DECISIONS, AND JUDGMENTS. THE DECISIONS MUST BE MADE BY OTHER PROCESSES.

611

SAFETY ASPECTS OF THE DESIGN OF A SWEDISH SPENT FUEL
STORAGE FACILITY

CONF-780658

RULANDSON, S.; SANDSTROM, J-E.; TIREN, I.

780601

OECD, PARIS

AB ASEA-ATOM, VAESTERAAS, SWEDEN

STORAGE OF SPENT FUELL EELEMENTS. PP. 135-149.

M,1;M,2;M,4,B;M,4,C;M,0,8;M,0,C

THE REPORT FORM OF THIS PAPER IS INIS-MF-4489. THE DESIGN OF AN INDEPENDENT SPENT FUEL STORAGE FACILITY WITH A CAPACITY OF 3000 TONS OF FUEL IS CURRENTLY IN PROGRESS IN SWEDEN. THE FUEL WILL BE STORED IN A MINED ROCK CAVITY. IN ORDER TO PERFORM A PRELIMINARY SAFETY ANALYSIS, A NUMBER OF SAFETY ASPECTS ON THIS SPECIFIC SPENT FUEL STORAGE FACILITY HAS BEEN IDENTIFIED AND DESIGN CRITERIA HAVE BEEN PROPOSED. THE LOCATION OF THE FUEL STORAGE POOLS IN A ROCK CAVITY IS TO OUR KNOWLEDGE UNIQUE FOR THE SWEDISH FACILITY AND THIS SPECIFIC DESIGN FEATURE IS REFLECTED IN THE DESIGN CRITERIA. THE ACCIDENT ANALYSIS SHOW THAT DESIGN BASIS ACCIDENTS YIELD VERY LOW OFF-SITE RADIATION EXPOSURES. A LONG TERM TOTAL LOSS OF COOLING OF THE STORED FUEL WILL HAVE AN EXTREMELY LOW PROBABILITY. AN ESTIMATION OF THE MAXIMUM FUEL TEMPERATURE IN THIS CASE SHOWS THAT THE CONSEQUENCES ARE TOLERABLE.

612

TRANSPORTATION RISKS IN THE NUCLEAR FUEL CYCLE

CONF-801115

RHOADS, R.E.; ANDREWS, W.B.

801101

K.O.STORCK & CO., HAMBURG

PACIFIC NORTHWEST LABORATORY

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROC. 6TH
INT. SYMP. PP. 180-188.

C,1;O,1;O,9

THE WORK COMPLETED TO DATE FOR NUCLEAR MATERIAL TRANSPORTATION MAKES IT POSSIBLE TO ESTIMATE THE TRANSPORTATION RISKS FOR THE ENTIRE FUEL CYCLE IN THE U.S. RESULTS OF THIS ASSESSMENT ARE PRESENTED IN THIS PAPER. BECAUSE THE RISK ANALYSIS STUDIES FOR THE TRANSPORTATION OF GASOLINE, PROPANE,

AND CHLORINE HAVE BEEN PERFORMED USING A METHODOLOGY, BASIC ASSUMPTIONS AND DATA THAT ARE CONSISTENT WITH THE STUDIES THAT HAVE BEEN PERFORMED FOR NUCLEAR MATERIALS, COMPARISONS AMONG THE RISKS FOR NUCLEAR MATERIALS AND THESE MATERIALS CAN ALSO BE MADE. RESULTS OF THESE COMPARISONS ARE ALSO PRESENTED. IT SHOULD BE NOTED THAT IT IS NOT THE INTENTION OF THESE COMPARISONS TO JUDGE THE SAFETY OF ONE INDUSTRY IN COMPARISON TO ANOTHER. IN FACT, THE RISKS FROM TRANSPORTING ALL OF THESE MATERIALS IN THE U.S. ARE LOW WHEN COMPARED TO THE RISKS FROM OTHER ACTIVITIES. THESE COMPARISONS, CAN, HOWEVER, PROVIDE SOME INSIGHTS INTO THE REGULATORY PHILOSOPHY FOR HAZARDOUS MATERIALS TRANSPORTATION. THE REMAINING SECTIONS OF THE PAPER BRIEFLY REVIEW THE RISK ANALYSIS METHODOLOGY USED IN THESE STUDIES, PROVIDE AN OVERVIEW OF THE SYSTEMS ANALYZED, SUMMARIZE THE RESULTS AND PRESENT CONCLUSIONS.

613

STUDY ON SEPARATE SPENT FUEL STORAGE FACILITY
CONF-780656
HANELIUS, A.; RASTAS, A.; IVUNG, B.; TIREN, I.
780601

OECD, PARIS

TVO POWER COMPANY, FINLAND

STORAGE OF SPENT FUEL ELEMENTS. PP. 107-118.

M,1;M,2;M,4,A;M,4,B

THE REPORT FORM OF THIS PAPER IS INIS-MF-49911. THE TVO POWER COMPANY (TVO) HAS TWO 660 MWE BWR UNITS UNDER CONSTRUCTION ON THE SOUTHWEST COAST OF FINLAND. IN ORDER TO SUPPORT THE LICENSING OF THE POWER PLANT UNITS A STUDY ON A SEPARATE SPENT FUEL STORAGE FACILITY (SFSF) LOCATED ON THE POWER PLANT SITE WAS MADE BY TVO TOGETHER WITH AB ASEA-ATOM. THE STUDY REPORT CONTAINS A PRINCIPAL TECHNICAL DESIGN AND PRELIMINARY SAFETY ASSESSMENT OF THE SFSF. THE STUDY PROVES THAT THE INTERIM STORAGE OF SPENT FUEL, IF NEEDED CAN BE SAFELY ARRANGED ON THE POWER PLANT SITE BY TECHNICALLY FEASIBLE MEANS.

614

CONSIDERATIONS IN THE ASSESSMENT OF THE CONSEQUENCES OF
EFFLUENTS FROM MIXED OXIDE FUEL FABRICATION PLANTS
BNWL-1697 (REV. 1)

SELBY, J.M.; WATSON, E.C.; CORLEY, J.P.; WAITE, D.A.; CARTER,
L.A.; DROPPD, J.G.; CLARK, R.G.; BROWN, C.L.; WILLIAMS,
L.D.; HALL, R.J.; SCHWENDIMAN, L.C.; MISHINA, J.; WOODRUFF,
K.K.; MCSWEEENEY, T.I.; BURNHAM, J.B.

750601

U.S. NRC, WASHINGTON, DC. 200 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

1,1;1,2;1,3,B;1,3,D;1,4;1,5,B;1,5,D;1,7;1,9;1,0,B;1,0,D

THE PURPOSE OF THIS STUDY WAS TO PROVIDE INFORMATION AND IDENTIFY PARAMETERS RELEVANT TO ASSESSING THE CONSEQUENCES TO

MAN AND HIS ENVIRONMENT OF LARGE SCALE MIXED PU-U OXIDE FUEL FABRICATION PLANTS WHICH WILL BE NEEDED IN THE NEXT 10 TO 15 YRS. THE REPORT IDENTIFIES THE PERTINENT PARAMETERS, VALUES, FACTORS AND METHODS WHICH MAY BE USED IN EVALUATING THE ENVIRONMENTAL CONSEQUENCES OF ROUTINE PLANT OPERATION AS WELL AS POSTULATED ACCIDENTS. THIS STUDY PROVIDES A BASE FOR THE DEVELOPMENT OF SITING CRITERIA AND SAFETY ANALYSES FOR MIXED OXIDE FUEL FABRICATION FACILITIES.

615

A METHOD TO DEVELOP DATA SUPPORTING CONSEQUENCE ANALYSIS OF TRANSPORTING NUCLEAR MATERIALS IN THE UNITED STATES

CONF-801115

REESE, R.T.; SANDOVAL, R.P.

801101

K.O. STORCK & CO., HAMBURG

SANDIA NATIONAL LABORATORY

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROC. 6TH INT. SYMP. PP. 227-233.

C,1;U,2;O,9

THE REPORT FORM OF THIS PAPER IS SAND80-0903C. THE TRANSPORTATION SYSTEM SAFETY EVALUATION (TSSE) PROGRAM AT SANDIA'S TRANSPORTATION TECHNOLOGY CENTER WAS INITIATED TO PROVIDE THE NECESSARY INFORMATION ON SOURCE TERMS FOR NUCLEAR MATERIALS SUBJECTED TO EXTREME ENVIRONMENTS. THE TECHNIQUES FOR DERIVATION OF SOURCE TERM; FOR THE FUEL ALONE HAS BEEN DESCRIBED AS WELL AS THE OUTLINE FOR PACKAGE RESPONSE. AN ADDITIONAL FACET OF THIS PROBLEM IS THE DEVELOPMENT OF ANALYTICAL METHODS TO DESCRIBE THE TRANSPORT OF THE RELEASED RADIONUCLIDES FROM THE FUEL RODS TO POSSIBLE RELEASE POINTS. THIS WORK IS ALSO COVERED IN THE TSSE PROGRAM. NOT ALL THE WORK REQUIRED WILL BE PERFORMED OR FUNDED BY SANDIA RATHER EXISTING WORK WILL BE SOUGHT OUT AND ONGOING WORK WILL BE UTILIZED IN AN ATTEMPT TO UNIFY THE PRESENTATION OF DATA AND THUS INCREASE ITS USEFULNESS.

616

ISSUES AND PROBLEMS IN INFERRING A LEVEL OF ACCEPTABLE RISK

R-2561-DOE

SALEM, S.L.; SOLOMON, K.A.; VESELY, W.E.

800101

RAND CORP., SANTA MONICA, CA. 120 P.

RAND CORP.

P,1,A;P,1,B;P,1,C;P,1,D;P,1,E;P,1,F;P,1,G;P,1,H;P,1,I;P,1,J;P,1,K;P,1,L;P,1,M;P,1,N;P,1,O;P,1,P

THIS REPORT PRESENTS THE FINDINGS FROM A REVIEW, UNDERTAKEN FOR THE OFFICE OF NUCLEAR POLICY, U.S. DOE, OF HOW TECHNICAL AND NONTECHNICAL FACTORS INFLUENCE THE PERCEPTION AND REGULATION OF RISKS FROM TECHNOLOGICAL ACTIVITIES. THE STUDY CONSIDERS: HOW EXISTING LEVELS OF RISK VARY ACROSS DIFFERENT INDUSTRIES AND HAZARDS. HOW VIEWPOINTS AND DEFINITIONS OF ACCEPTABLE RISK

DIFFER. WHAT ONE CAN INFER ABOUT LEVELS OF ACCEPTABLE RISK FOR CURRENT AND EMERGING ENERGY TECHNOLOGIES. WHAT THE IMPLICATIONS ARE FOR THE REGULATION OF CURRENT AND FUTURE RISKS TO SOCIETY. THE REPORT IS ADDRESSED TO POLICY ANALYSTS, REGULATORS, LEGISLATORS, AND OTHERS CONCERNED WITH SAFETY AND RISK-REDUCTION PROGRAMS FOR EXISTING AND EMERGING TECHNOLOGIES.

617

EVOLUTION OF THE CONCEPT OF RISK IN RADIOACTIVE MATERIALS
TRANSPORT

CONF-801115

SOUSSELIER, Y.; COHENY, G.; HAMARD, J.

801101

K.O. STORCK & CO., HAMBURG

CEA, FRANCE

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROC. 6TH
INT. SYMP. PP. 9-14.

O,1;P,1;

THE CONCEPT OF RISK IN RADIOACTIVE MATERIAL TRANSPORT IS
APPLIED TO THE IAEA TRANSPORT REGULATIONS.

616

METHODOLOGICAL APPROACH TO SAFETY ANALYSIS IN
TRANSPORTATION OF RADIOACTIVE MATERIALS AND
APPLICATION TO ACTUAL CASES

CONF-780506

SOUSSELIER, Y.; COHENY, G.; PAGES, P.; MESLIN, I.

780501

SANDIA LABORATORIES, ALBUQUERQUE, NM

CEA, FRANCE

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROC. 5TH
INT. SYMP. PP. 946-953.

C,1;C,2;C,3,A;C,3,B;O,1;O,2;O,3,A;O,3,B

THE AIM OF THIS STUDY LIES IN WORKING OUT A METHODOLOGY FOR
ASSESSING THE RISK IN TRANSPORTING RADIOACTIVE MATERIALS WITH A
VIEW TO ENABLING ANALYSIS, FORECAST AND DECISION. SUCH A TOOL IS
NEEDED FIRST TO GET AS PRECISE A KNOWLEDGE AS POSSIBLE ABOUT THE
OCCURRENCE AND CONSEQUENCE OF A TRANSPORT ACCIDENT. THEN ONE
MUST BE ABLE TO ASSESS THE RISK ASSOCIATED WITH A GIVEN
TRANSPORTATION SYSTEM AND THE POTENTIAL RISK REDUCTION FROM ANY
POSSIBLE MODIFICATION SUCH AS CHANGES IN THE TRAFFIC, IN THE
PACKAGING REQUIREMENTS. SUCH MEASURES ARE SUGGESTED AND/OR
COMPARED ON THE BASIS OF THEIR COSTS AND EFFECTIVENESS. KEEPING
IN MIND THESE GOALS, A PHYSICAL MODEL IS SET UP, IN A
PRELIMINARY PHASE, THE ANALYSIS OF THE TRANSPORTATION SYSTEM
EXHIBITS THE RELEVANT VARIABLES: TRANSPORT MODE, TRAFFIC, ROUTE
PACKAGE CHARACTERISTICS. RISK IS OBTAINED BY SUMMING THE
CONSEQUENCES C/SUB I/ OF ALL POSSIBLE ACCIDENT SEQUENCES,
WEIGHTED WITH THE ASSOCIATED CONDITIONAL PROBABILITIES P/SUB I/.
THE MODEL ALLOWS TO ESTIMATE THE P /SUB I/ AND C/SUB I/ FROM THE

QUANTITATIVE ANALYSIS OF TRANSPORT ACCIDENT DATA, AS COLLECTED BY DIFFERENT INVOLVED ORGANIZATIONS. THE TECHNIQUES IN USE RANGE FROM MULTIDIMENSIONAL DATA ANALYSIS TO SAFETY ANALYSIS TECHNIQUES SUCH AS FAULT OR EVENT TREE ANALYSIS. THE APPLICATION BORE UPON TRUCK AND TRAIN SHIPMENTS OF UF6 IN FRANCE. WITHIN BOTH TRANSPORT MODES, THE FOLLOWING QUANTITATIVE ESTIMATES ARE ASSIGNED BY THE MODEL TO EACH ACCIDENT SCENARIO (E.G. COLLISION, FIRE): THE PROBABILITY OF OCCURRENCE, THE SEVERITY TO BE EXPECTED (EXPRESSED WITH INDICATORS RELATED TO OBSERVED VARIABLES SUCH AS SPEED, MASS, FIRE DURATION), AND FINALLY THE RISK ASSOCIATED EITHER TO A UNIT OF TRAFFIC OR TO A GIVEN LEVEL AND/OR PERIOD OF ACTIVITY.

619

RAIL ACCIDENT STATISTICS PERTINENT TO THE SHIPMENT OF
RADIOACTIVE MATERIALS

HW-76299

STEWART, K.B.

630101

HANFORD ATOMIC PRODUCTS OPERATION, RICHLAND, WA. 72 P.

HANFORD LABORATORIES

O,9;0,0

THIS REPORT HAD ITS INCEPTION IN THE NEED TO KNOW WHAT RELATIONSHIPS EXIST BETWEEN THE FREQUENCY AND SEVERITY OF RAILROAD ACCIDENTS. THE DATA INCLUDE MANY STATISTICS ON ACCIDENTS WHICH OCCURRED ON MAJOR CLASS I RAILROADS IN THE YRS 1959-60 AND WHICH HAD TOTAL DAMAGES IN EXCESS OF \$2,000. THESE STATISTICS INCLUDE THE DATE OF THE ACCIDENT, THE KIND OF TRAIN(S) INVOLVED, THE CAUSE, AND THE COST OF THE DAMAGE TO THE EQUIPMENT AND TO THE TRACK AND ROADBED. THE DATA WERE FURNISHED BY THE INTERSTATE COMMERCE COMMISSION WHOSE ASSISTANCE IS GREATLY APPRECIATED. THE RESULTS OF THE STUDY ARE TO BE USED AS AIDS IN DESIGNING ADEQUATE PACKAGING FOR SHIPPING RADIOACTIVE MATERIALS AND IN DETERMINING ROUTING AND TRAVEL PROCEDURES WHICH WOULD MINIMIZE THE PROBABILITY OF AN ACCIDENT BEYOND A CERTAIN SEVERITY. THE DATA COULD HAVE BEEN ANALYZED IN MUCH GREATER DETAIL THAN WAS DONE BUT THIS WOULD NOT HAVE SERVED OUR PURPOSES. THE TABLES ARE PRESENTED IN DETAIL IN THE HOPE THAT THEY WILL BE OF USE. THE EXTRACTION OF THESE MULTIPLE CLASSIFICATION TABLES REPRESENTED A RATHER SMALL AMOUNT OF WORK COMPARED TO THE TASK OF GETTING ALL THE DATA CORRECTLY KEYPUNCHED. FURTHER TABLES CAN BE OBTAINED FROM THE DATA, AT REQUEST, IF DEEMED DESIRABLE.

620

ANALYSIS OF THE RADIOLOGICAL RISKS OF TRANSPORTING SPENT
FUEL AND RADIOACTIVE WASTES BY TRUCK AND BY ORDINARY
AND SPECIAL TRAINS

SAND77-1257

SMITH, D.R.; TAYLOR, J.M.

780601

SANDIA LABORATORIES, ALBUQUERQUE, NM. 33 P.

SANDIA LABORATORIES

O,1;O,2;O,3,B;O,3,D;O,4,B;O,4,D;O,9;O,0,B;O,0,D

THE RADIOLOGICAL IMPACTS ASSOCIATED WITH THE TRANSPORTATION OF NUCLEAR FUEL CYCLE MATERIALS BY ORDINARY AND DEDICATED TRAINS ARE COMPARED. FOR A POPULATION OF 100 LRS, NO SIGNIFICANT RADIOLOGICAL DIFFERENCES BETWEEN ORDINARY AND SPECIAL TRAIN SERVICE WERE DETERMINED.

621

ANALYSIS OF ALTERNATIVE TRANSPORTATION METHODS FOR RADIOACTIVE MATERIALS SHIPMENTS INCLUDING THE USE OF SPECIAL TRAINS FOR SPENT FUEL AND WASTES

CONF-780506

SMITH, D.R.; LUNA, R.E.; TAYLOR, J.K.

780501

SANDIA LABORATORIES, ALBUQUERQUE, NM

SANDIA LABORATORIES

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROC. 5TH INT. SYMP. PP. 954-962.

O,1;O,2;O,3,A;O,3,B;O,4,A;O,4,B;O,4,C;O,4,D;O,5,B;O,5,D;O,9,A;O,9,B;O,9,C;O,9,D;O,0,A;O,0,B;O,0,C;O,0,D

A NUMBER OF ALTERNATIVE TRANSPORTATION METHODS FOR RADIOACTIVE MATERIALS SHIPMENTS HAVE BEEN INVESTIGATED, INCLUDING A DETAILED STUDY OF THE USE OF SPECIAL TRAINS FOR SHIPMENTS OF SPENT FUEL AND RADIOACTIVE WASTES. THE ALTERNATIVES WERE COMPARED ON THE BASIS OF THE ANNUAL EXPECTED LCF'S RESULTING FROM NORMAL, I.E., ACCIDENT-FREE, TRANSPORT AND FROM TRANSPORTATION ACCIDENTS. WHEN SHIPMENTS OF ALL RADIOACTIVE MATERIALS WERE CONSIDERED, NONE OF THE ALTERNATIVES PRODUCED AS MUCH AS A FACTOR OF 2 REDUCTION IN TOTAL ANNUAL LCF'S. THE SPECIAL TRAINS ALTERNATIVE HAS A SMALL EFFECT UPON THE TOTAL LCF EVEN WHEN ONLY WASTE AND SPENT FUEL SHIPMENTS ARE CONSIDERED. THE SAME HEALTH EFFECTS CALCULATION USED IN THIS ANALYSIS TO ESTIMATE 3 LCF'S RESULTING FROM ALL RADIOACTIVE MATERIAL SHIPMENTS WOULD PREDICT ABOUT 5000 LCF PER YEAR FROM NATURAL BACKGROUND RADIATION AND FROM MEDICAL AND DENTAL USES OF RADIATION. THIS FACT, TOGETHER WITH THE ANNUAL CANCER FATALITIES FROM ALL CAUSES OF APPROXIMATELY 300,000, INDICATES THE RELATIVE MAGNITUDE OF THE HAZARD IN SHIPPING RADIOACTIVE MATERIALS.

623

SAFETY ANALYSIS REPORT - HANDLING AND STORAGE OF IRRADIATED N REACTOR FUEL IN 105-KW FUEL STORAGE FACILITY

UNI-1072, (REV. 1)

SHULTZ, M.V.

800901

UNC NUCLEAR INDUSTRIES, RICHLAND, WA. 182 P.

UNC NUCLEAR INDUSTRIES

M,1;M,2;M,5,A;M,5,B;M,0,A;M,0,B

IRRADIATED N REACTOR FUEL, WHICH HAS BEEN COOLED FOR AT LEAST 150 DAYS, MAY BE SAFELY STORED AT THE FACILITY IN 4.9 METERS (16 FT) OF WATER USING THE STORAGE CONFIGURATION AND WILL PRESENT NO UNDUE RISK TO THE HEALTH AND SAFETY OF PLANT PERSONNEL OR THE GENERAL PUBLIC. THE ACCEPTED SAFE STORAGE CONFIGURATION WILL PREVENT AN ACCIDENTAL CRITICALITY AND THE WATER WILL PREVENT ANY SIGNIFICANT RELEASE OF RADIOACTIVE MATERIALS TO THE ENVIRONS AND LIMIT THE RADIATION EXPOSURE IN THE WORK AREA, FROM THE STORED FUEL, TO LESS THAN 1 MR/H. THE STORAGE CONFIGURATION CONSISTS OF FULL DENSITY STORAGE FOR THE LOWER ENRICHED FUEL AND HALF DENSITY STORAGE OF THE SPIKE FUEL. THE FULL DENSITY STORAGE ARRAY WILL ALLOW FOR STORAGE OF UP TO 1700 METRIC TONS (1900 TONS) OF IRRADIATED MK IV FUEL WHILE THE HALF DENSITY STORAGE ARRAY WILL ALLOW FOR STORAGE OF UP TO 611 METRIC TONS (660 TONS) OF IRRADIATED MK IA FUEL. SEE ACN-565 FOR 1ST ED. OF THIS REPORT.

624

NUCLEAR MATERIAL SHIPMENT STUDY

CONF-801115

SHEPHERD, E.W.

801101

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SANDIA NATIONAL LABORATORIES

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS, PROC. 6TH INT. SYMP. PP. 1041-1049.

O,9

THE REPORT FORM OF THIS PAPER IS SAND60-895C. THE RADIOACTIVE MATERIAL TRANSPORT ASSESSMENT STUDY IS EXPECTED TO PROVIDE A FLEXIBLE SET OF CAPABILITIES AND USEFUL INFORMATION TO THE PUBLIC, INDUSTRY AND GOVERNMENT USERS BY USING A SYSTEM DESIGN TO ASSURE OBTAINING HIGH QUALITY DATA FROM SELECTED INDUSTRY SOURCES AT ACCEPTABLE COST. IT IS EXPECTED THAT THE SHIPPING RECORD APPROACH COUPLED WITH AN EFFICIENT SAMPLING STRATEGY WILL ACCOMPLISH THIS. THE STUDY IS ALSO DESIGNED TO YIELD ANALYTICAL CAPABILITIES AND STATISTICAL OUTPUT TO SERVE PUBLIC, INDUSTRY AND GOVERNMENT USERS. THE INFORMATION PROVIDED BY THE STUDY WILL MAKE A VALUABLE CONTRIBUTION TO ENVIRONMENTAL AND ACCIDENT RA, POLICY DEVELOPMENT AND OPERATIONAL PLANNING AND MANAGEMENT ACTIVITIES.

625

SPENT AND FRESH FUEL SHIPPING CASK CONSIDERATIONS

SAND75-5658

SHAPPERT, L.B.; UNGER, W.E.; FREEDMAN, J.M.

750101

SANDIA LABORATORIES, ALBUQUERQUE, NM. 18 P.

SANDIA LABORATORIES

O,1;O,2;O,9;O,0

A PROGRAM TO PROVIDE BASIC INFORMATION FOR CASK DESIGN AND SAFETY HAS BEEN CONDUCTED FOR OVER TEN YRS AT ORNL. PRINCIPAL PROBLEM AREAS IN LIQUID METAL FAST BREEDER REACTOR (LMFBR) CASKS ARE IDENTIFIED AS HEAT TRANSFER, STRUCTURES AND CONTAINMENT, CRITICALITY AND SHIELDING. SOLUTIONS IN THE PROBLEM AREAS, AS WELL AS THE NEED FOR FUTURE WORK, ARE ADDRESSED BY DESCRIBING AN LMFBR CONCEPTUAL DESIGN CASK. A NEW PROGRAM WHICH IS UNDERWAY AT SANDIA IS AIMED AT PRODUCING TECHNOLOGY USEFUL TO INDUSTRY AND GOVERNMENT. TECHNOLOGIES ARE BEING DEVELOPED IN AREAS OF HAZARDS ANALYSIS, HEAT TRANSFER, SHIELDING, STRUCTURES AND CONTAINMENT, AND SPENT FUEL CHARACTERIZATION, SUBSTANTIATED BY HOT LABORATORY VERIFICATION. PARTICULAR EMPHASIS WILL BE PLACED ON ESTABLISHING QUALIFICATION TESTS BASED ON ACCIDENT EXPERIENCE. HANDLING REQUIREMENTS AND LIMITATIONS ARE NOTED THROUGHOUT THE PAPER.

626

PROBABILITY AND CONSEQUENCES OF TRANSPORTATION ACCIDENTS INVOLVING RADIOACTIVE MATERIAL SHIPMENTS IN THE NUCLEAR FUEL CYCLE

SHAPPERT, L.B.; BROBST, W.A.; LANGHAAR, J.W.; SISLER, J.A.
731101

U.S. DOE

OAK RIDGE NATIONAL LABORATORY

NUCL. SAF. 14(6):597-604.

O,1;O,2;O,3,A;O,3,B;O,4,A;O,4,B;O,5,B;O,9;O,0,A;O,0,B

FOR 1980 THE PROJECTED ELECTRICAL GENERATING CAPACITY OF NUCLEAR POWER PLANTS IN THE U.S. IS ABOUT 130 MW(E); THIS, IN TURN, WILL GENERATE THOUSANDS OF SHIPMENTS OF RADIOACTIVE MATERIALS ANNUALLY. THE PROBABILITY OF ACCIDENTS INVOLVING THESE SHIPMENTS WITHIN THE PUBLIC DOMAIN HAS BEEN ESTIMATED AND BROKEN DOWN INTO FIVE SEVERITY CATEGORIES. IT IS ESTIMATED THAT IN 1980 THE SHIPMENTS CONSIDERED WOULD BE INVOLVED IN LESS THAN 20 ACCIDENTS, MOST OF WHICH WOULD RESULT IN ONLY MODERATE DAMAGE TO THE SHIPPING SYSTEM AND NO SIGNIFICANT NUCLEAR-RELATED HAZARDS. AN ESTIMATE WAS MADE OF THE EFFECTS OF AN EXTREMELY SEVERE ACCIDENT INVOLVING LOSS OF CONTAMINATED COOLANT FROM A SPENT-FUEL SHIPPING CASK AND THE POSSIBLE EXPOSURE TO THE PUBLIC. AS A RESULT OF THE ESTIMATES, IT IS CONCLUDED THAT THE LIKELIHOOD OF ANY SERIOUS RADIOLOGICAL INJURY IS VERY SMALL AND THE TRANSPORTATION OF NUCLEAR MATERIALS IN THE FUEL CYCLE HAS A HIGH DEGREE OF SAFETY.

627

DESCRIPTIONS OF REFERENCE LWR FACILITIES FOR ANALYSIS OF NUCLEAR FUEL CYCLES

PNL-2286

SCHNEIDER, K.J.; KABELE, T.J.

790901

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 450 P.

PACIFIC NORTHWEST LABORATORY

D,1;E,1;F,1;G,1;H,1;I,1;J,1

TO CONTRIBUTE TO THE DOE'S IDENTIFICATION OF NEEDS FOR IMPROVED ENVIRONMENTAL CONTROLS IN NUCLEAR FUEL CYCLES, A STUDY WAS MADE OF A LIGHT WATER REACTOR SYSTEM. A REFERENCE LWR FUEL CYCLE WAS DEFINED, AND EACH STEP IN THIS CYCLE WAS CHARACTERIZED BY FACILITY DESCRIPTION AND MAINLINE AND EFFLUENT TREATMENT PROCESS PERFORMANCE. THE REFERENCE FUEL CYCLE USES FRESH U IN LIGHT WATER REACTORS. FINAL TREATMENT AND ULTIMATE DISPOSITION OF WASTE FROM THE FUEL CYCLE STEPS WERE NOT INCLUDED, AND THE WASTE IS ASSUMED TO BE DISPOSED OF BY APPROVED BUT CURRENTLY UNDEFINED MEANS. THE CHARACTERIZATION OF THE REFERENCE FUEL CYCLE SYSTEM IS INTENDED AS BASIC INFORMATION FOR FURTHER EVALUATION OF ALTERNATIVE EFFLUENT CONTROL SYSTEMS.

628

COMPARATIVE RISK ASSESSMENT OF ENERGY SYSTEMS

CONF-7904143

SCHNEIDER, S.H.

800101

U.S. DOE, WASHINGTON, DC. 470 P.

NSF, NATIONAL CENTER FOR ATMOSPHERIC RESEARCH, BOULDER, CO.

WORKSHOP ON ENVIRONMENTAL AND SOCIETAL CONSEQUENCES OF A

POSSIBLE CO₂ - INDUCED CLIMATE CHANGE. PP. 403-418.

P,2;P,4,A;P,4,B;P,4,E;P,4,F;P,5,B;P,5,F;P,0,A;P,0,B;P,0,E;P,0,F

NEARLY ALL ENERGY SYSTEMS ENTAIL SOME SIGNIFICANT FORMS OF HEALTH, ENVIRONMENTAL, OR SOCIOPOLITICAL RISKS. BUT THERE IS CONSIDERABLE DIFFERENCE AMONG VARIOUS ENERGY SYSTEMS IN THE MAGNITUDE, TIMING, AND NATURE OF THEIR ASSOCIATED RISKS. IT IS THIS DIFFERENCE THAT ALLOWS A DEGREE OF CHOICE, OR POLICY, WITH REGARD TO SELECTING ENERGY ALTERNATIVES. THE NATIONAL ACADEMY OF SCIENCES COMMITTEE ON NUCLEAR AND ALTERNATIVE ENERGY SYSTEMS COMPILED A DETAILED ANALYSIS OF RISKS ASSOCIATED WITH DIFFERENT TYPES OF ENERGY USE. A CONDENSED TABLE OF THAT ANALYSIS IS PRESENTED. THE ISSUE OF ASSESSING RISKS IS ALSO DISCUSSED, GIVING THE AN IDEA OF THE COMPLICATIONS INVOLVED IN MAKING VALID RA, AND THE WORTH OF RA AS A PUBLIC POLICY MAKING DEVICE.

629

TRANSPORTATION OF VITRIFIED HIGH-LEVEL RADIOACTIVE WASTE BY
RAIL - FAULT TREE ANALYSIS AND ACCIDENTAL RELEASE

SCHNEIDER, K.

770601

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

TRANSNUKLEAR GMBH, HANAU, GERMANY

TRANS. AM. NUC. SOC. 26:272-273.

O,1;O,2;O,3;O,4;O,5;O,7

WITHIN THE SCOPE OF A STUDY ON WASTE MANAGEMENT IN GERMANY, THE METHOD OF PROBABILISTIC RISK ANALYSIS WAS APPLIED TO THE

TRANSPORTATION OF RADWASTE. THE TASK WAS UNDERTAKEN ON THE SHIPPING OF VITRIFIED HIGH-LEVEL WASTE FROM INTERIM STORAGE TO THE ULTIMATE REPOSITORY BY RAIL. THE METHOD MAKES USE OF FAULT TREE ANALYSIS AND THE RISK CONCEPT DEVELOPED BY FARMER. THE RESULTS OF THIS APPROACH TO RISK ANALYSIS OF THE TRANSPORT OF SOLIDIFIED HIGH-LEVEL WASTE ARE: HIGH TRAIN SPEED IN CONNECTION WITH THE COLLISION OF THE CASK WITH AN UNYIELDING SURFACE OR OBSTACLE HAS THE HIGHEST RISK; FIRE AFTER MECHANICAL DAMAGE HAS LESS IMPORTANCE; AND THE RISK IS NOT CONSIDERABLY INCREASED BY DEFECTS IN MATERIALS.

630

FINAL SAFETY ANALYSIS REPORT FOR THE FOURTH CALCINED SOLIDS STORAGE FACILITY

ENICO-1031

SCHINDLER, R.E.

800101

EXXON NUCLEAR IDAHO COMPANY, INC., IDAHO FALLS, ID. 74 P.

EXXON NUCLEAR IDAHO COMPANY, INC.

K,1;K,2;K,3,B;K,4,B;K,5,B;K,7;K,8;K,9;K,0,B

RADIOACTIVE AQUEOUS WASTES GENERATED BY THE SOLVENT EXTRACTION OF U FROM EXPENDED NUCLEAR FUELS AT THE IDAHO CHEMICAL PROCESSING PLANT ARE CALCINED TO GRANULAR SOLIDS IN THE WASTE CALCINING FACILITY (WCF). THE CALCINED SOLIDS ARE TRANSFERRED FROM THE WCF TO STAINLESS STEEL BINS ENCLOSED IN A CONCRETE VAULT FOR INTERIM STORAGE OF UP TO 500 YRS (THE FACILITY DESIGN LIFE). THE STORAGE OF CALCINED MATERIAL IS ESSENTIALLY A PASSIVE OPERATION AND PRESENTS VERY LITTLE OPPORTUNITY FOR RADIONUCLIDE RELEASE. THERE IS ESSENTIALLY NO POSSIBILITY OF AN ACCIDENTAL EXPLOSION IN THE FACILITY. THERE WOULD BE A SLIGHT CHANCE OF RELEASE OF RADIOACTIVE PARTICULATES INTO THE ATMOSPHERE AS A RESULT OF A BIN LEAK. THE DESIGN BASIS ACCIDENT (DBA) WHICH HAS A VERY LOW PROBABILITY OF ACTUALLY OCCURRING, POSTULATES THE SPILL OF SOLIDS FROM AN ERODED FILL LINE INTO THE VAULT COUPLED WITH A FAILURE OF THE RADIATION MONITOR. THE MAXIMUM CALCULATED RADIATION DOSE AT THE NEAREST INEL BOUNDARY AS A RESULT OF THE POSTULATED DBA IS 80 MREM TO THE BONE (THIS REPRESENTS 0.053% OF 10 CFR 100 CRITERIA).

631

AN EXPERIMENTAL SOURCE TERM DATA BASE FOR ASSESSING THE SAFETY OF SPENI FUEL TRANSPORTATION

CONF-811103

SANDOVAL, R.P.; VIGIL, M.G.; NEWTON, G.J.

811101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

SANDIA NATIONAL LABORATORIES

TRANS. AM. NUCL. SOC. 39:186-187.

O,1;O,4;O,0;

THE REPORT FORMS OF THIS PAPER ARE SAND81-1188C AND

TTC-0211. A PROGRAM IS CURRENTLY UNDERWAY AT SANDIA TO CHARACTERIZE SOURCE TERM AEROSOLS PRODUCED FROM EXPOSING SPENT FUEL TRANSPORT SYSTEMS TO EXTRAORDINARY ENVIRONMENTS AND TO PRODUCE IMPROVED ESTIMATES OF ENVIRONMENTAL AND HEALTH CONSEQUENCES. THE EXTREME ENVIRONMENTS OF INTEREST HAVE BEEN DIVIDED INTO TWO CATEGORIES; THOSE RELATED TO EXPLOSIVE ATTACK AND THOSE RELATED TO EXTRA-SEVERE ACCIDENTS. EFFORTS IN THIS PROGRAM TO DATE HAVE CONCENTRATED ON THE DEVELOPMENT OF AN EXPERIMENTAL DATA BASE CHARACTERIZING THE RELEASE OF RADIOACTIVE MATERIAL (I.E., SOURCE TERMS) RESULTING FROM EXPLOSIVE ATTACKS ON SPENT FUEL CASKS. THIS EXPERIMENTAL DATA BASE IS THE PRIMARY INPUT TO AN ANALYSIS OF THE HUMAN HEALTH AND ECONOMIC CONSEQUENCES.

632

A PROGRAM TO ASSESS THE EFFECTS OF EXTRAORDINARY ENVIRONMENTS ON RADIOACTIVE MATERIAL SHIPPING SYSTEMS
SAND80-0037C; TTC-0059
SANDOVAL, R.P.; REESE, R.T.
600317
N11S. 13 P.
SANDIA NATIONAL LABORATORIES
O,2;U,5,B;O,7

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE DOE ENVIRONMENTAL CONTROL SYMPOSIUM, CONF-600334. THE HIGHLIGHTS OF THE TRANSPORTATION SYSTEM SAFETY EVALUATION (TSSE) PROGRAM AT SANDIA ARE REVIEWED AND THE ORIGINS OF THE PROGRAM AND THE RELATIONSHIPS TO OTHER PROGRAMS ADDRESSING SAFETY CONCERNS ARE OUTLINED. THE AREAS OF CURRENT ACTIVITY IN THE ASSESSMENT OF POSSIBLE EFFECTS AN INTENTIONAL ACT OR EXTREME ENVIRONMENT COULD HAVE ON NUCLEAR MATERIAL SHIPPING SYSTEMS ARE DESCRIBED. EARLY INFORMATION HAS BEEN OBTAINED ON THE FORMATION OF AEROSOLS, AND A SIGNIFICANT BODY OF EXPERIMENTALLY DETERMINED SOURCE TERM DATA WILL BE AVAILABLE FOR RADIOLOGICAL CONSEQUENCE EVALUATIONS.

633

ASPECTS OF NUCLEAR WASTE MANAGEMENT. VOL. 1.
PRE-EMPLACEMENT RISKS
UCRL-15167, VOL. 1
ENSMINGER, D.A.; OSTON, S.G.
790801
ANALYTIC SCIENCES CORP., READING, MA. 58 P.
ANALYTIC SCIENCES CORP.
K,1;K,4,A;K,4,B;K,5,A;K,5,B;K,8;N,1;N,4,A;N,4,B;N,5,A;N,5,B;N,8
RESULTS OF THE PREVIOUS ONE-DIMENSIONAL THERMAL ANALYSIS OF INTERIM STORAGE ACCIDENTS ARE CONFIRMED BY MORE DETAILED TWO-DIMENSIONAL CALCULATIONS. WASTE TEMPERATURES CALCULATED FOR INTERIM STORAGE ACCIDENTS ARE MODERATELY SENSITIVE TO ASSUMPTIONS CONCERNING CANISTER SPACING AND ARE MUCH LESS SENSITIVE TO BOUNDARY CONDITIONS AT THE CANISTER TOP. FOR AN

INDIVIDUAL 100 M FROM A TRANSPORTATION ACCIDENT INVOLVING SOLIDIFIED HIGH-LEVEL WASTE THE EXPECTED DOSE FROM GAMMA RADIATION IS ON THE ORDER OF OR SMALLER THAN THE OTHER POSSIBLE EXPOSURES IN THE SAME ACCIDENT. FOR THE CALCULATION OF EXPECTED DOSES TO THE WORST-SITUATED INDIVIDUAL IN ACCIDENTS: EXPECTED POPULATION DOSE SHOULD REMAIN THE PRIMARY MEASURE OF PRE-EMPLACEMENT RISK IN ORDER TO MAINTAIN COMPARABILITY OF CONSEQUENCES OF DIFFERENT TYPES OF ACCIDENTS.

634

ASPECTS OF NUCLEAR WASTE MANAGEMENT. VOL. 2.

POST-EMPLACEMENT HAZARDS

UCRL-15167, VOL. 2

ROSS, B.I.; BERMAN, L.E.; HOUGH, M.E.; POLLAK, G.C.

790401

ANALYTIC SCIENCES CORP., READING, MA. 159 P.

ANALYTIC SCIENCES CORP.

C,4;C,5;C,8;K,4;K,5,B;K,7;K,8;K,0,B;N,4;N,5,B;N,7;N,8;N,0,B

STUDIES OF TECHNICAL ISSUES RELATING TO NUCLEAR WASTE MANAGEMENT ARE DESCRIBED. THE SUBJECT ADDRESSED IS THE POSSIBLE RELEASE OF WASTE FROM A GEOLOGIC REPOSITORY. ASPECTS OF LONG-TERM REPOSITORY PERFORMANCE WHICH ARE DISCUSSED INCLUDE WATER FLOW AROUND SHAFTS AND BOREHOLES AND USE OF WATER FROM CONTAMINATED WELLS. NEW METHODS AND RESULTS PERTAINING TO THE ANALYSIS OF UNCERTAINTIES IN LONG-TERM RISK PREDICTIONS ARE ALSO PRESENTED.

635

PRELIMINARY SAFETY AND ENVIRONMENTAL INFORMATION DOCUMENT.

VOL. VII. FUEL-CYCLE FACILITIES

DOE/NE-0003/7

U.S. DEPARTMENT OF ENERGY, ASSISTANT SECRETARY FOR NUCLEAR ENERGY
800101

U.S. DOE, WASHINGTON, DC. 206 P.

U.S. DOE

D,1;D,2;E,1;E,2;F,1;F,2;G,1;G,2;H,1;H,2;I,1;I,2;J,1;J,2;K,1;K,2;
L,1;L,2;M,1;M,2;N,1;N,2;O,1;O,2;P,1;P,2

THE INFORMATION CONTAINED IN THIS PRELIMINARY SAFETY AND ENVIRONMENTAL INFORMATION DOCUMENT (PSEID) IS AN OVERLAY OF THE PRESENT SAFETY, ENVIRONMENTAL, AND LICENSING EFFORTS CURRENTLY BEING PREPARED AS PART OF THE NONPROLIFERATION ALTERNATIVE SYSTEMS ASSESSMENT PROGRAM (NASAP). IT IS BASED ON NEW MATERIAL GENERATED WITHIN THE NASAP AND OTHER REFERENCE MATERIAL TO THE EXTENT THAT IT EXISTS. THE INTENT OF THIS ASSESSMENT IS TO DISCERN AND HIGHLIGHT ON A CONSISTENT BASIS ANY SAFETY OR ENVIRONMENTAL ISSUES OF THE ALTERNATIVE SYSTEMS THAT ARE DIFFERENT FROM A REFERENCE LIGHT-WATER ONCE-THROUGH CASE AND MAY AFFECT THEIR LICENSING. WHEN ISSUES EXIST, THIS DOCUMENT BRIEFLY DESCRIBES RESEARCH, DEVELOPMENT, AND DEMONSTRATION REQUIREMENTS THAT WOULD HELP RESOLVE THEM WITHIN THE NORMAL ENGINEERING

DEVELOPMENT OF A REACTOR/FUEL-CYCLE SYSTEM.

636

A REVIEW OF THE DEPARTMENT OF TRANSPORTATION (DOT)
REGULATIONS FOR TRANSPORTATION OF RADIOACTIVE MATERIAL

NONE

U.S. DOT

770101

U.S. DOT, MATERIALS TRANSPORTATION BUREAU, WASHINGTON, DC. 41 P.

U.S. DOT

0,170,9

THE PURPOSE OF THIS REVIEW IS TO SUMMARIZE THE BASIC REQUIREMENTS OF THE DEPARTMENT OF TRANSPORTATION (DOT) REGULATIONS GOVERNING THE PACKAGING AND SHIPMENT OF RADIOACTIVE MATERIALS AND TO PROVIDE GUIDANCE TOWARD MORE CORRECTLY AND EASILY APPLYING THOSE REGULATIONS IN ACTUAL PRACTICE. THIS REVIEW IS A REFERENCE AND GUIDANCE TYPE DOCUMENT FOR TRAINING PURPOSES. IT IS NOT INTENDED TO BE AN OFFICIAL INTERPRETATION OR RESTATEMENT OF THE REGULATIONS. ANY MATERIAL HEREIN MAY BE REPRODUCED WITHOUT SPECIAL PERMISSION FROM THE DEPARTMENT. USERS OF THIS REVIEW ARE STRONGLY ENCOURAGED TO OBTAIN THE LATEST COPY OF THE DOT HAZARDOUS MATERIALS REGULATIONS IN 49 CFR PARTS 100-199, AND TO KEEP ABREAST OF LATEST REVISIONS THERETO AS THEY ARE PUBLISHED IN THE FEDERAL REGISTER.

637

TRANSPORTATION OF HIGH LEVEL NUCLEAR WASTES

ERDA-8

U.S. ERDA

740101

U.S. ERDA, WASHINGTON, DC. 4 P.

U.S. ERDA, DIVISION OF WASTE MANAGEMENT AND TRANSPORTATION

C,17C,3,A;C,3,B;C,3,C;C,3,D;C,4,A;C,4,B;C,4,C;C,4,D;0,2;0,9;0,0

THE COMMITTEE ON RADIOACTIVE WASTE MANAGEMENT (CRWM) OF THE NAS-NAE-NRC APPOINTED A PANEL ON TRANSPORTATION TO REVIEW THE TRANSPORTATION OF RADIOACTIVE WASTES. THE PURPOSE OF THE PANEL, AS AN ADVISORY GROUP TO CRWM WAS: (1) TO DETERMINE THE PROBABILITIES AND CONSEQUENCES OF TRANSPORTATION ACCIDENTS, (2) TO ESTIMATE THE POTENTIAL RISKS OF TRANSPORTING RADIOACTIVE WASTES (INCLUDING HANDLING AND PACKAGING), AND (3) TO ATTEMPT TO EVALUATE THESE RISKS EITHER ON AN ABSOLUTE BASIS OR BY COMPARING THEM TO OTHER RISKS INVOLVED IN THE MANAGEMENT OF RADIOACTIVE WASTES. THE RISKS HERE MAY BE DEFINED IN TERMS OF THE POTENTIAL FOR INJURY AND DAMAGE TO HUMAN BEINGS, THE ENVIRONMENT, AND PROPERTY FROM THE RELEASE OF, OR EXPOSURE TO RADIOACTIVE WASTE MATERIALS.

638

TRANSPORTATION ACCIDENT RISKS IN THE NUCLEAR POWER INDUSTRY

1975-2020
EPA-520/3-75-023
U.S. EPA
750101
U.S. EPA, WASHINGTON, DC. 130 P.
U.S. EPA
0,1;0,3;0,5,B;0,9;0,0,B

A QUANTITATIVE ASSESSMENT WAS MADE OF THE ACCIDENT RISKS ASSOCIATED WITH THE TRANSPORTATION OF RADIOACTIVE MATERIAL IN THE NUCLEAR POWER INDUSTRY TO THE YR 2020. A SCENARIO WAS DEVELOPED FOR THE PERIOD FROM 1975 TO 2020 FOR SHIPMENTS BETWEEN NUCLEAR REACTORS, CHEMICAL REPROCESSING PLANTS, FUEL FABRICATION FACILITIES AND WASTE REPOSITORIES. TECHNICAL DATA FROM NUMEROUS SOURCES WERE COLLECTED FOR SHIPMENTS OF SPENT FUEL, RECYCLED PLUTONIUM, HIGH-LEVEL RADIOACTIVE SOLID WASTE AND FISSION-PRODUCT GASES. ASSUMPTIONS WERE DEVELOPED REGARDING TRANSPORT MODES, SHIPPING CONTAINERS, TRANSPORT PATHWAYS FOR DISPERSION OF RELEASED RADIOACTIVITY, AND POPULATION DISTRIBUTION. FAULT TREE ANALYSIS WAS USED TO ESTIMATE THE PROBABILITY OF RELEASE FROM SHIPPING CONTAINERS TAKING INTO CONSIDERATION THE TRANSPORT MODE, SEVERITY OF THE ACCIDENT AND DAMAGE TO THE PACKAGE. ESTIMATES WERE MADE OF THE FRACTION OF THE RADIOACTIVE CONTENTS WHICH COULD BE RELEASED AS A RESULT OF EACH CLASS OF ACCIDENT. CALCULATIONS WERE MADE OF THE ANNUAL FREQUENCY OF ACCIDENTS AND THE FREQUENCY OF RADIOLOGICAL RELEASES. RISKS WERE CHARACTERIZED BY THE PROBABILITY OF RELEASE AND THE MAGNITUDE OF THE RESULTING EXPOSURE. BOTH INDIVIDUAL EXPOSURE AND POPULATION DOSES WERE CALCULATED. THE RESULTS OF THE STUDY INDICATE THAT BY 2020 THE NUMBER OF SHIPMENTS EXCEED 37,000 PER YR WITH A TOTAL SHIPPING DISTANCE OF MORE THAN 17 MILLION MILES. AS A RESULT, THE NUMBER OF ACCIDENTS IS IN EXCESS OF 20 PER YR. HOWEVER, THE FREQUENCY OF RELEASE IS SMALL, THE EXPECTED VALUE BEING LESS THAN ONE PER 13 YRS IN 2020. RELEASES FROM ACCIDENTS INVOLVING SPENT FUEL DOMINATE THE RELEASE FREQUENCY DURING THE ENTIRE PERIOD STUDIED. THE AVERAGE ANNUAL POPULATION DOSE FROM TRANSPORTATION ACCIDENTS OF THE NUCLEAR POWER INDUSTRY IS INSIGNIFICANT--LESS THAN ONE PERSON-REM PER YR FROM ALL SOURCES IN 2020. A RELEASE, IF IT SHOULD OCCUR, IS MOST LIKELY TO RESULT IN A RELATIVELY SMALL EXPOSURE TO INDIVIDUALS NEAR THE ACCIDENT, ON THE AVERAGE.

639
EFFECTS OF NATURAL PHENOMENA ON THE BABCOCK AND WILCOX CO.
PLUTONIUM FABRICATION PLANT AT THE PARKS TOWNSHIP SITE,
LEECHBURG, PENNSYLVANIA
NUREG-0547
U.S. NRC
790301
U.S. NRC, WASHINGTON, DC. 57 P.
U.S. NRC
C,1;1,1;1,2;1,3;1,5,B;1,7;1,8;1,9;1,0,B

THE PROPOSED ACTION IS TO ISSUE A RENEWAL TO THE FULL-TERM SPECIAL NUCLEAR MATERIAL LICENSE NO. SNM-414 (DOCKET NO. 70-364) AUTHORIZING THE NUCLEAR MATERIAL DIVISION OF THE BABCOCK AND WILCOX CO. (BANDW) TO OPERATE NUCLEAR-FUEL-FABRICATION FACILITIES LOCATED IN LEECHBURG, PA. THE PU FUEL FACILITY IS PRESENTLY BEING USED TO FABRICATE FUEL FOR THE FAST TEST REACTOR UNDER CONSTRUCTION AT THE HANFORD RESERVATION NEAR RICHLAND, WA. IMPLICIT IN SECTIONS 70.22 AND 70.23 OF 10CFR70 IS A REQUIREMENT THAT EXISTING PU FABRICATION PLANTS BE EXAMINED WITH THE OBJECTIVE OF IMPROVING, TO THE EXTENT PRACTICABLE, THEIR ABILITIES TO WITHSTAND ADVERSE NATURAL PHENOMENA WITHOUT LOSS OF CAPABILITY TO PROTECT THE PUBLIC. IN ACCORDANCE WITH THESE REGULATIONS, AN ANALYSIS WAS INITIAIED OF THE EFFECTS OF NATURAL PHENOMENA ON THE BANDW PU FABRICATION PLANT. FOLLOWING COMPLETION OF THE ANALYSIS, A CONDENSATION WAS PREPARED OF THE EFFECTS OF NATURAL PHENOMENA ON THE FACILITY.

640

EFFECTS OF NATURAL PHENOMENA ON THE WESTINGHOUSE ELECTRIC CORPORATION PLUTONIUM FUELS DEVELOPMENT LABORATORY AT CHESWICK, PENNSYLVANIA

NUREG-0621

U.S. NRC

791101

U.S. NRC, WASHINGTON, DC. 52 P.

U.S. NRC

C,1;1,1;1,2;1,3;1,5,B;1,7;1,8;1,9;1,0,B

ONE AIM OF THE ANALYSIS IS TO EXAMINE THE PLANT WITH THE OBJECTIVE OF IMPROVING ITS ABILITY TO WITHSTAND ADVERSE NATURAL PHENOMENA WITHOUT LOSS OF CAPABILITY TO PROTECT THE PUBLIC. THE RELATIVELY SMALL RISK TO THE PUBLIC FROM THE UNLIKELY EVENTS DISCUSSED (EARTHQUAKE, FLOOD, TORNADO) WOULD INDICATE THAT THE PUBLIC IS NOT SERIOUSLY THREATENED BY THE PRESENCE OF THE WESTINGHOUSE PFDL. THUS, IT IS THE JUDGMENT OF THE STAFF THAT THE BENEFITS TO BE GAINED BY SUBSTANTIAL PLANT IMPROVEMENTS TO FURTHER MITIGATE AGAINST ADVERSE NATURAL PHENOMENA ARE NOT COST EFFECTIVE.

641

BEAR CREEK PROJECT (CONVERSE COUNTY, WYOMING), DRAFT ENVIRONMENTAL STATEMENT

NUREG-0129

U.S. NRC; U.S. DOI; U.S.D.A.

770101

U.S. NRC, WASHINGTON, DC. 331 P.

U.S. NRC

D,1;D,2;D,3;D,4,A;D,4,C;D,4,E;D,5,B;D,5,D;D,7;D,9;D,0,A;D,0,B;D,0,C;D,0,D;D,0,E;E,1;E,2;E,3;E,4,A;E,4,C;E,4,E;E,5,B;E,5,D;E,7;E,9;E,0,A;E,0,B;E,0,C;E,0,D;E,0,E;O,1;O,2;O,3;O,5,B;O,5,F;O,9;O,0,B;O,0,F

A DES FOR THE ROCKY MOUNTAIN ENERGY COMPANY FOR THE THE OPERATION OF THE BEAR CREEK URANIUM MINING AND MILLING PROJECT IN NORTH-CENTRAL CONVERSE COUNTY, WYOMING, HAS BEEN PREPARED BY THE STAFFS OF THE U.S. FOREST SERVICE, USGS AND NRC AND WAS ISSUED BY THE OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS OF NRC, OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS OF THE NUCLEAR REGULATORY COMMISSION. THIS STATEMENT PROVIDES (1) AN EVALUATION OF ENVIRONMENTAL IMPACT AND ADVERSE EFFECTS OF THE PROPOSED MILL, AND (2) A CONSIDERATION OF THE PRINCIPAL ALTERNATIVES. ALSO INCLUDED ARE COMMENTS OF GOVERNMENTAL AGENCIES AND OTHER ORGANIZATIONS ON THE DRAFT ENVIRONMENTAL STATEMENT FOR THIS PROJECT, AND STAFF RESPONSES TO THESE COMMENTS. THE NUCLEAR REGULATORY COMMISSION HAS CONCLUDED THAT, AFTER WEIGHING THE ENVIRONMENTAL, ECONOMIC, TECHNICAL, AND OTHER BENEFITS OF THE BEAR CREEK PROJECT AGAINST ENVIRONMENTAL AND OTHER COSTS AND CONSIDERING AVAILABLE ALTERNATIVES, THE ACTION CALLED FOR IS ISSUANCE OF A SOURCE MATERIAL LICENSE TO THE APPLICANT, SUBJECT TO CONDITIONS STIPULATED IN THE SOURCE MATERIAL LICENSE.

642

PROCEDURES FOR PICKING UP AND RECEIVING PACKAGES OF
RADIOACTIVE MATERIAL

WASH-1313

U.S. AEC

740101

U.S. AEC, DIRECTORATE OF REGULATORY STANDARDS, WASHINGTON, DC.
15 P.

U.S. AEC

0,170,4

AMENDMENTS TO 20.205 OF 10 CFR PT. 20 HAVE BEEN ADOPTED THAT REQUIRE A LICENSEE WHO EXPECTS TO RECEIVE A PACKAGE CONTAINING RADIOACTIVE MATERIAL IN EXCESS OF TYPE A LIMITS ARRANGE TO RECEIVE THE PACKAGE WHEN IT IS OFFERED FOR DELIVERY AT THE FACILITY BY THE CARRIER, OR, IF THE PACKAGE IS TO BE PICKED UP BY THE CONSIGNEE AT THE CARRIER'S FACILITY, TO ARRANGE TO BE NOTIFIED BY THE CARRIER OF THE ARRIVAL OF THE PACKAGE AT THE TIME OF ITS ARRIVAL. A LICENSEE WHO PICKS UP A PACKAGE OF RADIOACTIVE MATERIAL FROM A CARRIER'S FACILITY IS REQUIRED TO DO SO EXPEDITIOUSLY. LICENSEES ARE FURTHER REQUIRED TO MONITOR, AS SOON AS PRACTICABLE AFTER RECEIPT AND WITHIN SPECIFIED TIME LIMITS, THE EXTERNAL SURFACES OF CERTAIN PACKAGES OF RADIOACTIVE MATERIAL FOR RADIOACTIVE CONTAMINATION AND FOR EXTERNAL RADIATION LEVELS. IF GREATER THAN A SPECIFIED AMOUNT OF CONTAMINATION OR ALLOWABLE RADIATION LEVELS IS DETECTED, THE LICENSEE IS REQUIRED TO IMMEDIATELY REPORT THAT FACT TO THE FINAL DELIVERING CARRIER AND TO THE AEC. THE REQUIREMENT THAT PACKAGES BE MONITORED ON RECEIPT PROVIDES A POSITIVE MEANS FOR DETECTING ANY SIGNIFICANT RADIATION LEVEL OR LEAKAGE FROM PACKAGES, SUBSTANTIATES THE RECORD OF NO LEAKAGE, AND PROVIDES DATA THAT CAN BE A BASIS FOR CHANGES IN SPECIFIC DESIGNS THAT WOULD FURTHER REDUCE THE CHANCE OF HIGH RADIATION LEVELS OR

LEAKAGE OCCURRING. THESE REQUIREMENTS ARE DIRECTED TOWARD THE CONTROL OF (1) RADIATION EXPOSURE AND (2) SPREAD OF RADIOACTIVE CONTAMINATION FROM PACKAGES OF RADIOACTIVE MATERIAL IN TRANSPORT.

643

RISK ANALYSIS AND RELIABILITY

CONF-791016

UPPULURI, V.R.R.

800101

NTIS

OAK RIDGE NATIONAL LABORATORY

1979 DOE STATISTICAL SYMP. PROC. PP. 187-191.

C,3;P,3

THERE IS AN URGENT NEED FOR THE MATHEMATICAL FOUNDATIONS OF RISK ANALYSIS. SEVERAL SCIENTISTS ARE ASKING FOR UNAMBIGUOUS DEFINITIONS OF RISK AND FOR SOUND TECHNIQUES TO ESTIMATE THESE MEASURES. THERE IS CONSIDERABLE INTEREST IN THE COMPARISON OF RISKS ASSOCIATED WITH ALTERNATE TECHNOLOGIES. WHAT CAN THE MATHEMATICS AND STATISTICS COMMUNITY OF DOE DO TO ALLEVIATE THIS SITUATION? ONE OF THE IMPORTANT FIRST STEPS SEEMS TO BE THE IDENTIFICATION OF MATHEMATICAL AND STATISTICAL PROBLEMS IN RISK ANALYSIS. IN THIS PAPER A FEW TOPICS OF INTEREST ARE IDENTIFIED WHICH REQUIRE FURTHER DEVELOPMENT. THESE TOPICS INCLUDE RARE EVENTS, SERIES-PARALLEL SYSTEMS, AND TREATMENT OF EXPERT OPINION TO OBTAIN CONSENSUS ESTIMATES.

644

CRITICALITY CONTROL AND LONG TERM STORAGE OF SPENT FUEL

IAEA-CN-36-33; CONF-770505-234

TOFFER, H.

770501

NTIS. 11 P.

UNC, INC.

M,1

THIS PAPER WAS PRESENTED AT THE INT. CONF. ON NUCLEAR POWER AND ITS FUEL CYCLE. DEVELOPMENT OF ADEQUATE FACILITIES FOR LONG TERM STORAGE OF SPENT NUCLEAR FUELS IS A CURRENT CONCERN IN THE NUCLEAR INDUSTRY. LACK OF CHEMICAL REPROCESSING IS FORCING REACTOR OPERATORS TO INCREASE THE CAPACITY OF THEIR EXISTING POOLS BY STRUCTURAL MODIFICATIONS OR BY COSTLY INVESTMENTS IN NEW FACILITIES. ONE OF THE MAIN CONSTRAINTS GOVERNING THE UTILIZATION OF SPACE IN A STORAGE POOL IS NUCLEAR CRITICALITY CONTROL. THE DEGREE OF SUBCRITICALITY OF STORED FUEL IS DEPENDENT ON THE FISSILE MATERIAL INVENTORY, THE ARRANGEMENT OF FUEL, AND THE PRESENCE OF MATERIALS PROVIDING PARASITIC CAPTURE OF NEUTRONS. LONG TERM STORAGE OF SPENT FUEL REQUIRES THAT NUCLEAR CRITICALITY CONSIDERATIONS INCLUDE TIME DEPENDENT VARIATIONS IN FISSILE ISOTOPIC INVENTORY, DISPERSION OF FISSILE MATERIALS, TRANSMUTATION OF FISSION PRODUCTS, AND THE DETERIORATION OF SPECIAL NEUTRON CONTROL MATERIALS. ACCORDING TO

CURRENT PRACTICES IN POWER REACTOR POOLS, SUBCRITICAL UNITS OF FUEL ARE STORED IN A LATTICE ARRANGEMENT WITH SUFFICIENT NEUTRONIC DECOUPLING BETWEEN INDIVIDUAL FUEL BUNDLES. SUCH DECOUPLING IS ACHIEVED BY ADEQUATE ISOLATION IN WATER OR BY THE INSERTION OF SPECIAL NEUTRON ABSORBING MATERIALS SUCH AS BORAL. POOL CAPACITY INCREASES BY A FACTOR OF TWO HAVE BEEN REALIZED USING BORAL INSERTS. AN ASSUMPTION IS MADE IN CRITICALITY SAFETY ANALYSES THAT SPENT FUEL HAS A FISSION ISOTOPIC COMPOSITION OF UNIRRADIATED FUEL. THE FACT THAT A LARGE FRACTION OF THE FISSION ISOTOPES HAVE BEEN CONVERTED TO FISSION PRODUCTS IS NOT CONSIDERED. CRITICALITY CONTROL CALCULATIONS AND EXPERIMENTS WITH SPENT FUEL INDICATE THAT USE OF GREEN FUEL ISOTOPIC COMPOSITIONS INTRODUCE SAFETY MARGINS IN FUEL STORAGE BASINS WHICH WOULD BE EQUIVALENT TO THE NEUTRON CONTROL PROVIDED BY MATERIALS SUCH AS BORAL INSERTS. THEREFORE, THE USE OF SPENT FUEL CRITICAL MASS PARAMETERS CAN SERVE AS AN ALTERNATE, OR AS A SUPPLEMENT TO SPECIAL POISON INSERTS FOR ACHIEVING MAXIMUM UTILIZATION OF BASIN CAPACITY FOR LONG TERM STORAGE OF FUEL.

645

A DOE PROGRAM FOR TRANSPORTATION R & D: A PROGRESS REPORT
CONF-780506

SISLER, J.A.

780501

SANDIA LABORATORIES, ALBUQUERQUE, NM

U.S. DOE

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROC. 5TH
INT. SYM. PP. 763-779.

0,0

THIS PAPER SUMMARIZES THE HISTORY OF THE PROGRAM, DESCRIBES THE ACCOMPLISHMENTS, INCLUDES REFERENCES TO PUBLISHED REPORTS, AND DISCUSSES THE CURRENT STATUS OF THE ENVIRONMENTAL AND SAFETY R & D PROGRAM AS RELATED TO TRANSPORTATION OF ENERGY MATERIAL IS SUMMARIZED. COMMENTS ARE ALSO INCLUDED REGARDING THE FUTURE DIRECTION OF THE PROGRAM. THE PROGRAM INCLUDES THE DEVELOPMENT OF DATA AND METHODOLOGY FOR ENVIRONMENT AND SAFETY ASSESSMENTS INCLUDING THE DEVELOPMENT OF TRANSPORTATION ENVIRONMENTAL DATA, SEVERE ACCIDENT ANALYSIS AND RISK ASSESSMENT; CONFIRMATORY FULL-SCALE TESTING OF PACKAGE AND VEHICULAR SYSTEMS TO IMPROVE SCALE MODELING AND ANALYTICAL TECHNIQUES FOR TRANSPORT SYSTEM ASSESSMENT; DEVELOPMENT OF AN IMPROVED CAPABILITY FOR ASSESSING THE DYNAMIC PERFORMANCE OF NUCLEAR PACKAGING UNDER SEVERE ACCIDENT CONDITIONS; EVALUATION AND VERIFICATION OF EXISTING TRANSPORTATION STANDARDS TO ASSURE ADEQUATE ENVIRONMENTAL CONTROLS; AND DEVELOPMENT OF NEEDED INFORMATION SYSTEM TOOLS SUCH AS FILMS, BOOKLETS, AND EXHIBITS TO PERMIT THE PUBLIC AND OTHER INTERESTED PARTIES TO HAVE ACCESS TO THE RESULTS OF THE R & D PROGRAM.

646

SUMMARY OF FY-1978 CONSULTATION INPUT FOR SCENARIO
METHODOLOGY DEVELOPMENT

PNL-2851

SCOTT, P.L.; BENSON, G.L.; CRAIG, R.A.; HARWELL, P.A., (EDS.)
790101

PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA. 180 P.
PACIFIC NORTHWEST LABORATORY
C,2;C,7 ;L,2;L,7;N,2;N,7

THE SCENARIO METHODOLOGY DEVELOPMENT TASK IS CONCERNED WITH
EVALUATING THE GEOLOGIC SYSTEM SURROUNDING AN UNDERGROUND
REPOSITORY AND DESCRIBING THE PHENOMENA (VOLCANIC, SEISMIC,
METEORITE, HYDROLOGIC, TECTONIC, CLIMATE, ETC.) WHICH COULD
PERTURB THE SYSTEM AND POSSIBLY CAUSE LOSS OF REPOSITORY
INTEGRITY. THIS DOCUMENT INCLUDES 14 INDIVIDUAL PAPERS, TWO OF
WHICH ARE INCLUDED IN THIS BIBLIOGRAPHY (ACN=647, 648).

647

DISRUPTIVE EVENT ANALYSIS: VOLCANISM AND IGNEOUS INTRUSION

PNL-2851

CROWE, B.M.
790101

NTIS

PACIFIC NORTHWEST LABORATORY

SUMMARY OF FY-1978 CONSULTATION INPUT FOR SCENARIO METHODOLOGY
DEVELOPMENT. PP. I.1-1.9.

C,2;C,3;C,5;C,7 ;L,2;L,3;L,5;L,7;N,2;N,3;N,5;N,7;

THREE BASIC TOPICS ARE ADDRESSED FOR THE DISRUPTIVE EVENT
ANALYSIS: (1) THE RANGE OF DISRUPTIVE CONSEQUENCES OF A RADWASTE
REPOSITORY BY VOLCANIC ACTIVITY, (2) THE POSSIBLE REDUCTION OF
THE RISK OF DISRUPTION BY VOLCANIC ACTIVITY THROUGH SELECTIVE
SITING OF A REPOSITORY, AND (3) THE QUANTIFICATION OF THE
PROBABILITY OF REPOSITORY DISRUPTION BY VOLCANIC ACTIVITY.

648

ANALYSIS OF THE SEISMIC HAZARD TO AN UNDERGROUND WASTE
REPOSITORY

PNL-2851

WRIGHT, L.H.
790101

NTIS

TERA CORP., BERKELEY, CA

SUMMARY OF FY-1978 CONSULTATION INPUT FOR SCENARIO METHODOLOGY
DEVELOPMENT. PP. III.1-III.21.

L,3;L,5;L,7;L,9;L,0;N,3;N,5;N,7;N,9;N,0

IT IS CONCLUDED THAT THE CONSEQUENCE ASSOCIATED WITH
INTENSE VIBRATORY SHAKING OF A WELL-DESIGNED REPOSITORY IS
ESSENTIALLY NEGLIGIBLE. THE SPECIFICATION OF AN APPROPRIATE
SEISMIC VIBRATORY DESIGN CRITERIA COULD BEST BE ACCOMPLISHED
WITH A BAYESIAN SEISMIC HAZARD ASSESSMENT, USING GEOLOGIC SLIP
RATES AS INPUT. THE CONSEQUENCE ASSOCIATED WITH FAULT

DISPLACEMENT IS VERY SITE SPECIFIC AND DEPENDENT ON THE HOST GEOLOGIC MEDIA AND ITS PERMEABILITY CHANGES IN RESPONSE TO FAULT DISPLACEMENT. THE PROBABILITY OF FAULTING THROUGH A REPOSITORY IN ITS MILLION YR DESIGN LIFE IS RATHER HIGH, PRINCIPALLY BECAUSE OF A HIGH PROBABILITY OF PRIMARY OR SECONDARY FAULTING ON UNDETECTED FAULTS. THE FAULTING PROBABILITY CAN BE MINIMIZED BY DEPLOYING SOPHISTICATED SITE CERTIFICATION PROGRAMS.

650

MINIMUM RISK BASED SELECTION OF WASTE FUEL DUMPING SITE
INIS-MF-5372; CONF-7903112
SHARMA, D.D.; CHATTERJEE, D.; SRI RAM, K.
790301

NTIS

INDIAN INSTITUTE OF TECHNOLOGY
SAFETY ASPECTS OF NUCLEAR FUEL CYCLE. 6TH IND. ASSN. RAD.
PROTECT. CONF. PP. 62-63.

L,1;L,9;O,1;O,3;O,9;P,1;P,9

INDIA HAS A 200 MWE UNIT OPERATING AND ANOTHER OF SAME CAPACITY AWAITING COMMISSIONING AT KOTA, TWO UNITS OF 200 MWE EACH AWAITING COMMISSIONING AT MADRAS, TWO UNITS OF 200 MWE UNDER CONSTRUCTION AT NARORA AND ANOTHER SIMILAR PAIR OF UNITS PROPOSED FOR SOMEWHERE IN GUJARAT. THERE IS ONLY ONE PROPOSED WASTE FUEL DUMPING SITE SOMEWHERE IN ANDHRAPRADESH. IN THIS VIEW AND ANTICIPATING THAT IN FUTURE INDIA MAY HAVE TO ALSO TACKLE WASTE FUEL FROM TAPS (INSTALLED CAPACITY 400 MWE), IT'S OBVIOUS THAT LARGE AMOUNT OF ACTIVITY WILL HAVE TO BE HANDLED IN FUTURE. THE PROBLEMS NOW FACED ARE: (1) IS IT SAFE ENOUGH TO HAVE ONLY ONE WASTE FUEL DUMPING SITE AND (2) DOES THE WASTE FUEL DUMPING SITE ENSURE MINIMUM RISK OVER THE ENTIRE WASTE FUEL HANDLING CYCLE? BOTH THE QUESTIONS COVER A WIDE SPECTRUM OF SAFETY RELATED CONSIDERATIONS IN RADIOACTIVE WASTE FUEL MANAGEMENT. THIS ABSTRACT DEALS WITH THE PROBLEM OF FINDING RADIOACTIVE WASTE FUEL DUMPING SITES AND A SCHEDULE OF TRANSPORTING WASTE FUEL FROM EACH OF THE FIVE NUCLEAR REACTORS SO THAT THE TOTAL RISK IN WASTE FUEL HANDLING IS MINIMIZED. THE BASIC INFORMATION REQUIRED IS GEOGRAPHICAL, GEOLOGICAL AND DEMOGRAPHIC DETAILS OF PROPOSED REGIONS, ACCIDENT DATA AT ALL STAGES OF HANDLING AND CONSEQUENT RISK. TO COMPUTE RISK IT IS NECESSARY TO KNOW PROBABILITY OF RADIOACTIVE MATERIAL LEAKAGES FOLLOWING AN ACCIDENT. SINCE ADEQUATE DATA IS NOT AVAILABLE TO PROVIDE THIS INFORMATION, FAULT TREE ANALYSIS IS ADOPTED TO OBTAIN THE DESIRED FAILURE PROBABILITY.

652

RADTRAN II - A COMPUTERIZED MODEL FOR RISK ANALYSIS OF
TRANSPORTATION OF RADIOACTIVE MATERIAL
CONF-801115; SAND80-1804C
TAYLOR, J.M.; DANIEL, S.L.; BIRINGER, B.E.
801101

K.O. STORCK & CO., HAMBURG
SANDIA NATIONAL LABORATORIES
PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS, PROCC. 6TH
INT. SYMP. PP. 161-167.

O,5,A;O,5,B;O,5,C;O,5,D

THE RADTRAN COMPUTER CODE, WHICH FORMED THE BASIS FOR THE 1977 U.S. GENERIC TRANSPORTATION RA, HAS BEEN EXTENSIVELY UPDATED. THE UPDATED VERSION OF THE CODE, DENOTED RADTRAN II, INCLUDES CHANGES BASED ON FINDINGS FROM OTHER TRANSPORTATION RISK STUDIES AS WELL AS CHANGES BASED ON REEVALUATION OF EARLIER ASSUMPTIONS, ANALYSES, AND COMPUTERIZATION TECHNIQUES. THE ENVIRONMENTAL IMPACT OF THE TRANSPORTATION OF RADIOACTIVE MATERIAL CAN BE ENVISIONED AS CONSISTING OF FIVE COMPONENTS, INCIDENT FREE TRANSPORT, NON-RADIOLOGICAL IMPACTS, VEHICULAR ACCIDENTS, BREACHES OF SECURITY/SAFEGUARDS, AND FAILURES OF QUALITY ASSURANCE. RADTRAN II IS DESIGNED TO EVALUATE BOTH THE INCIDENT-FREE AND THE ACCIDENT CONTRIBUTION DIRECTLY AND CAN BE USED TO EVALUATE THE CONTRIBUTIONS OF BREACHES OF SECURITY AND QUALITY ASSURANCES DEVIATION IF SOME ALTERATIONS IN CODING ARE MADE. NON-RADIOLOGICAL IMPACTS ARE NOT ADDRESSED.

653

DATA BASE FOR RADIOACTIVE WASTE MANAGEMENT. VOL. 2. WASTE
SOURCE OPTIONS REPORT

NUREG/CR-1759, VOL. 2

WILD, R.E.; OZONALI, O.I.; CLANCY, J.J.; PIIT, C.J.; PICAZO, E.D.
810101

U.S. NRC, WASHINGTON, DC. 500 P.

DAMES AND MOORE, INC, WHITE PLAINS, NY

N,17N,9

THIS REPORT PRESENTS A DATA BASE ON LLW SOURCES, AS WELL AS OPTIONS FOR PROCESSING THIS WASTE. THE DATA BASE INCLUDES ESTIMATES OF: THE PHYSICAL, CHEMICAL, AND RADIOLOGICAL CHARACTERISTICS OF LLW PROJECTED TO BE ROUTINELY GENERATED DURING THE PERIOD FROM 1980 TO THE YR 2000; THE CHANGES IN THESE CHARACTERISTICS UNDER A NUMBER OF VIABLE WASTE TREATMENT TECHNOLOGY OPTIONS; THE COSTS FOR THESE WASTE TREATMENT OPTIONS BASED UPON CURRENTLY AVAILABLE TECHNOLOGY; AND DATA ON OCCUPATIONAL EXPOSURES AND ENVIRONMENTAL RELEASES FROM THE WASTE TREATMENT OPTIONS. THESE CHARACTERISTICS MAY BE UTILIZED TO DETERMINE PERFORMANCE OBJECTIVES AND TECHNICAL REQUIREMENTS FOR ACCEPTABLE DISPOSAL OF THE WASTES, AND TO DETERMINE THE ENVIRONMENTAL IMPACTS OF SELECTED DISPOSAL ALTERNATIVES.

654

REPORT ON A WORKSHOP ON TRANSPORTATION ACCIDENT SCENARIOS
INVOLVING SPENT FUEL, MAY 6-8, 1980

CONF-8005151; SAND80-2012; TTC-0151

WILMOT, E.L.; MCCLURE, J.D.; LUNA, R.E.

810201

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM, 112 P.
SANDIA NATIONAL LABORATORIES
0,2;0,3,8;0,9,8;0,0,8

IN MAY OF 1980, THE TRANSPORTATION TECHNOLOGY CENTER (TTC) OF SANDIA CONDUCTED A THREE-DAY WORKSHOP TO DISCUSS TRANSPORTATION ACCIDENT SCENARIOS INVOLVING SPENT FUEL. PARTICIPANTS IN THE WORKSHOP WERE REPRESENTATIVES FROM THE U.S. DOE, NRC, SANDIA, ETC. (A COMPLETE LIST OF ATTENDEES IN IN APPENDIX 1). THE PURPOSE OF THE MEETING WAS TO EXPLORE THE BASES FOR ASSUMPTIONS USED TO CREATE TRANSPORTATION ACCIDENT SCENARIOS FOR SPENT FUEL. TWO SPECIFIC OBJECTIVES OF THE WORKSHOP WERE: TO DECIDE UPON A CONSENSUS SCENARIO TO BE USED AS A REFERENCE FOR ENVIRONMENTAL IMPACT STATEMENTS AND TO PROVIDE RECOMMENDATIONS TO THE DOE FOR AREAS IN NEED OF FURTHER STUDY. THE WORKSHOP CONSISTED OF FIVE TOPICAL SESSIONS: ACCIDENT ENVIRONMENTS, MECHANISMS FOR RELEASE FROM THE SPENT FUEL TO THE CASK CAVITY, BARRIERS TO RELEASE FROM THE CASK CAVITY TO THE ENVIRONMENT, ACCIDENT PROBABILITIES AND RECOMMENDATIONS. DURING EACH SESSION, CONSENSUS WAS ACHIEVED WITHIN EACH OF FOUR WORKING GROUPS, AND THEN THE WORKING GROUPS INTERACTED BY COMPARING THEIR CONCLUSIONS AND REACHED AGREEMENT ON EACH MAJOR ISSUE.

655

RISK OF TRANSPORTING PLUTONIUM DIOXIDE AND LIQUID PLUTONIUM NITRATE BY TRUCK AND RAIL
STU/PUB/437; IAEA-SR-10/13
WILLIAMS, L.D.; HALL, R.J.
760101

IAEA, VIENNA
BATTELLE, PACIFIC NORTHWEST LABORATORIES
TRANSPORT PACKAGING FOR RADIOACTIVE MATERIALS. FP. 57-67.
J,1;0,1;0,2;0,3;0,9;0,0

AN ANALYSIS METHOD IS DEVELOPED TO ASSESS THE RISK IN THE TRANSPORTATION OF RADIOACTIVE MATERIALS AND DEMONSTRATES ITS APPLICATION BY SUMMARIZING THE RESULTS OF RA OF THE SHIPMENT OF PUO2 POWDER AND LIQUID PLUTONIUM NITRATE BY TRUCK AND RAIL IN THE U.S. IN THE RA, POSTULATED RELEASE MODES (SERIES OF EVENTS THAT COULD RESULT IN A RELEASE OF RADIOACTIVE MATERIAL) ARE IDENTIFIED USING THE FAULT TREE ANALYSIS METHOD. TWO CATEGORIES OF EVENTS THAT COULD CONTRIBUTE TO A RELEASE DURING TRANSPORTATION ARE CONSIDERED: ACCIDENTS AND SUBSTANDARD PACKAGING CONDITIONS. THE LIKELIHOOD OF BASIC EVENTS IN THESE CATEGORIES ARE DETERMINED FROM GENERAL ACCIDENT EXPERIENCE, RADIOACTIVE MATERIAL SHIPPING EXPERIENCE, ENGINEERING ANALYSIS, ETC. USING THE LAWS OF COMBINING PROBABILITIES, THE LIKELIHOOD OF RADIOACTIVE MATERIAL RELEASE IS THEN EVALUATED. SINCE ACCIDENTS VARY GREATLY IN SEVERITY, THE RELEASES FROM THESE POSTULATED EVENTS ALSO VARY IN MAGNITUDE FROM THE NO RELEASE CONDITION UP THROUGH RELEASE OF THE ENTIRE PACKAGE CONTENTS. THE BASES FOR THE RELEASE QUANTITIES ASSIGNED TO THE POSTULATED ACCIDENTS SEQUENCES ARE DISCUSSED. THE CONSEQUENCES OF THESE

POSTULATED RELEASES ARE EVALUATED BASED ON THE AMOUNT OF PU ESTIMATED TO BE RELEASED TO THE ENVIRONS, THE PROBABLE WEATHER CONDITIONS AT THE TIME OF THE ACCIDENT, AND POPULATION DENSITY DOWNWIND FROM THE ACCIDENT SCENE. THE LIKELIHOOD AND CONSEQUENCE OF POSTULATED RELEASES ARE COUPLED AND EXPRESSED AS A RISK SPECTRA.

656

SAFETY PHILOSOPHY AND ACCEPTABLE RISK

CONF-801115

WEHNER, G.

801101

K.O. STORCK & CO., HAMBURG

BUNDESMINISTERIUM DES INNEREN, BONN

PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS. PROC. 6TH INT. SYMP. PP. 15-30.

O,2;O,9;O,0,A;O,0,B;O,0,C;O,0,D

THE SAFETY PHILOSOPHY BEHIND THE INTERNATIONAL ATOMIC ENERGY ORGANIZATION'S TRANSPORT REGULATIONS IS DESCRIBED. ACCEPTANCE CRITERIA FOR THE SOCIETY AND THE INDIVIDUAL AT RISK IN TRANSPORTING RADIONUCLIDES ARE DESCRIBED AND DISCUSSED.

657

THE LONG-TERM STORAGE OF IRRADIATED CANDU FUEL UNDER WATER

AECL-6313

WALKER, J.F.

790101

AECL, WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT, PINAWA, MANITOBA. 21 P.

AECL, WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT

M,1

IN THIS REPORT, THE VARIOUS FACTORS INFLUENCING THE LONG-TERM INTEGRITY OF STORED FUEL ARE CONSIDERED. THE DISCUSSION IS SPECIFICALLY LIMITED TO ZIRCONIUM-ALLOY-CLAD URANIUM DIOXIDE FUEL AND EVIDENCE FROM CANADA AND ELSEWHERE IS CONSIDERED. UNDER STORAGE CONDITIONS, CHANGES TAKE PLACE SO SLOWLY, IF AT ALL, THAT NO EVIDENCE HAS BEEN OBTAINED THAT INDICATES ANY DETERIORATION OF STORED FUEL AFTER 10 TO 15 YRS UNDER WATER. ALL THE INFORMATION NOW AVAILABLE INDICATES THAT IRRADIATED CANDU FUEL MAY BE SAFELY STORED BY THE PRESENT METHODS AS LONG AS IT IS TECHNICALLY AND ECONOMICALLY DESIRABLE TO DO SO. STORED FUEL SHOULD CONTINUE TO BE EXAMINED AFTER INCREASINGLY LONG STORAGE TIMES UNDER WATER TO CONFIRM THE STABILITY OF THE ZIRCALOY CLADDING CONTAINING THE FUEL PELLETS.

658

LETTER TO THE EDITORS - FIDUCIAL ESTIMATION OF

PROBABILITIES FOR RELIABILITY AND RISK ASSESSMENT

VAURIO, J.K.
800801
PERGAMON PRESS, NEW YORK
ARGONNE NATIONAL LABORATORY
ANN. NUCL. ENERGY 8:147-148.
C,3

THE USE OF THE FIDUCIAL ESTIMATION AS A VIABLE ALTERNATIVE FOR ESTIMATING RELIABILITY PARAMETERS AND PROBABILITIES FOR RISK ASSESSMENTS OF NUCLEAR REACTORS IS DISCUSSED. CASE STUDIES ARE PRESENTED TO DEMONSTRATE THAT THE CLASSICAL FIDUCIAL ESTIMATION IS A VIABLE ALTERNATIVE TO BAYESIAN METHODS, AND CAN YIELD MORE PRECISE OR LESS CONSERVATIVE ESTIMATES THAN BAYESIAN TECHNIQUES IF THE PRIOR INFORMATION IS SCARCE.

659
VOLUME IV, SAFETY ANALYSIS REPORT SUPPLEMENT FOR
CONSOLIDATED FUEL ROD STORAGE AT AN INDEPENDENT SPENT
FUEL STORAGE INSTALLATION
DOE/ET/47912-4; NAC-C-8130
VIEBROCK, J.M.; KING, R.A.
810901

NUCLEAR ASSURANCE CORP., ATLANTA, GA, 126 P.
NUCLEAR ASSURANCE CORP.

M,1;M,2;M,3,A;M,3,B;M,4,A;M,4,B;M,6;M,0,A;M,0,B

THIS REPORT SUPPLEMENTS A SAFETY ANALYSIS REPORT FOR AN INDEPENDENT SPENT FUEL STORAGE INSTALLATION TO ALLOW THE INCORPORATION OF CONSOLIDATED NUCLEAR FUEL INTO AN OTHERWISE LICENSED FACILITY. THIS REPORT PRESENTS ONLY INFORMATION REGARDING STORAGE OF CONSOLIDATED PRESSURIZED WATER REACTOR FUEL. THE DOCUMENT CONTAINS SUPPLEMENTAL CRITICALITY, RADIOLOGICAL, STRUCTURAL, AND THERMAL INFORMATION WHICH MUST BE ADDED TO AN EXISTING SAFETY ANALYSIS REPORT TO PERMIT UPGRADING THE METHOD OF FUEL STORAGE TO CONSOLIDATED FUEL ROD STORAGE.

660
RISK ANALYSIS OF THE ROAD TRANSPORT OF RADIOACTIVE WASTE IN
THE NETHERLANDS

VAN OTTERLOO, R.W.

770601

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

KEMA-NETHERLANDS

TRANS. AM. NUCL. SOC. 26:273-274.

N,2;N,3,A;N,3,B;N,4,A;N,4,B;N,5,B;O,2;O,3,A;O,3,B;O,4,A;O,4,B;O,5,B

TO OBTAIN A BETTER UNDERSTANDING OF THE POSSIBLE CONSEQUENCES OF A ROAD TRANSPORT OF LOW- AND INTERMEDIATE-LEVEL RADIOACTIVE SOLID WASTE, A RISK ANALYSIS OF THIS TRANSPORT WAS PERFORMED. IN THIS RISK ANALYSIS, THE ACCIDENTS INVOLVING CONTAMINATION OR IRRADIATION WERE EVALUATED AND THE RESULTING

COSTS WERE ESTIMATED. COSTS OF MATERIAL DAMAGE AND DEAD AND WOUNDED BECAUSE OF OTHER THAN RADIOLOGICAL REASONS WERE EXCLUDED.

661

INTRODUCTION: THE NATURE OF RISK ASSESSMENT

GRIFFITHS, R.F.

810101

MANCHESTER UNIV. PRESS, MANCHESTER

MANCHESTER UNIV.

DEALING WITH RISK. PP. 1-20.

C,1;C,0 ;P,1;P,0;

THE NATURE AND IMPLICATIONS OF TECHNOLOGICAL RISK AND DECISION TAKING ARE OUTLINED. THE SUBJECT IS CONTINUED UNDER THE HEADINGS: NECESSITY FOR PUBLIC REPRESENTATION ON RISK QUESTIONS, MILESTONES IN THE UK DEBATE ON RISK (NUCLEAR AND CHEMICAL ACCIDENTS AND SUBSEQUENT REGULATORY ACTION), LIMITATIONS ON THE VALIDITY OF QUANTITATIVE RISK ESTIMATES, PROBABILITY, DISCREPANCIES BETWEEN ESTIMATES OF DAMAGE AND THE HISTORICAL ACCIDENT RECORD, THE VALIDITY OF INTERCOMPARISONS, AND HINDRANCES TO RESOLUTION OF THE RISK QUESTION.

662

RISK, VALUE CONFLICT AND POLITICAL LEGITIMACY

COTGROVE, S.

810101

MANCHESTER UNIV. PRESS

BATH UNIV.

DEALING WITH RISK. PP. 122-140.

C,1;C,0 ;P,1;P,0;

THE DIFFERING VIEWS OF ENVIRONMENTALISTS, THE PUBLIC AND INDUSTRIALISTS ON THE PERCEPTION OF DANGERS TO THE ENVIRONMENT ARE ANALYZED. THE SUBJECT IS CONTINUED UNDER THE HEADINGS: COMPETING PARADIGMS, ACCEPTABLE RISK, VALUES FOR MONEY - HABITAT PROTECTION OR INDUSTRIAL DEVELOPMENT, AND CRISIS OF LEGITIMACY.

663

EXECUTIVE SEMINAR ON THE FUTURE ROLE OF RISK ASSESSMENT AND RELIABILITY ENGINEERING IN NUCLEAR REGULATION

NUREG/CP-0017; ANL-81-3

VAN ERP, J.B., (ED.)

800101

ARGONNE NATIONAL LABORATORY, ARGONNE, IL. 132 P.

ARGONNE NATIONAL LABORATORY

C,2;C,3;C,4;C,5;C,6;C,7;C,8

IN THE AFTERMATH OF THE THREE MILE ISLAND ACCIDENT THERE IS RENEWED INTEREST IN PROBABILISTIC RISK ASSESSMENT AS A TOOL IN NUCLEAR SAFETY REGULATION. THIS EXECUTIVE SEMINAR WAS HELD TO

HELP THE NRC STAFF TO UNDERSTAND THE STRENGTHS AND WEAKNESSES OF PROBABILISTIC RA AND TO UNDERSTAND CURRENT ATTITUDES ON ITS USE IN NUCLEAR SAFETY REGULATION.

664

STATE POLICIES AND REQUIREMENTS FOR MANAGEMENT OF URANIUM MINING AND MILLING IN NEW MEXICO. VOLUME III. ADVERSE EFFECTS OF URANIUM MINING AND MILLING ON THE PHYSICAL ENVIRONMENT

SAND78-1332

TIERNEY, M.S.; VANDEVENDER, S.G.

790101

SANDIA LABORATORIES, ALBUQUERQUE, NM, 173 P.

SANDIA LABORATORIES

D,1;D,2;D,9;E,1;E,2;E,9

THIS VOLUME CONTAINS TWO PARTS. THE FIRST PART IS A SUMMARY OF ISSUES. IT COMPLEMENTS THE SECOND PART WHICH IS A PROGRAM PLAN PROPOSED BY THE NEW MEXICO ENVIRONMENTAL IMPROVEMENT DIVISION (NMEID) FOR THE STUDY AND MITIGATION OF ENVIRONMENTAL EFFECTS OF U MINING AND MILLING. THE NMEID PROGRAM PLAN WAS BEGUN WHEN THE LACK OF AN ADEQUATE DATA BASE UPON WHICH THE NMEID COULD BASE RECOMMENDATIONS FOR NEW ENVIRONMENTAL LAWS AND REGULATIONS APPLYING TO THE U MINING AND MILLING INDUSTRY WAS PERCEIVED. THE NMEID PLANNING DOCUMENT NOTES THAT, IN THE ABSENCE OF ADEQUATE SCIENTIFIC DATA, STATE DECISIONS REGARDING THE REGULATION OF THE U INDUSTRY MAY PROVE TO BE OVERLY RESTRICTIVE OR NOT AS RESTRICTIVE AS IS NECESSARY TO ASSURE PROTECTION OF THE PUBLIC AND THE ENVIRONMENT. TO COUNTER THESE TENDENCIES, CERTAIN PLANS FOR COOPERATIVE STUDIES INVOLVING FEDERAL AND STATE AGENCIES ARE PROPOSED. IN PARTICULAR, THERE IS THE NEED TO IMPROVE THE DATA BASE FOR DETERMINING POPULATION RADIATION EXPOSURE IN AFFECTED AREAS AND TO EVALUATE THE DATA NEEDS FOR DEVELOPING AN AMBIENT RADON STANDARD. IT IS CONCLUDED THAT THE DOE'S MISSION OF ENERGY DEVELOPMENT WOULD BE ADVANCED BY THE PROVISION OF TECHNICAL ASSISTANCE AND, IN SOME CASES, FUNDS FOR CERTAIN STATE PROGRAMS THAT DEMONSTRABLY CONTRIBUTE TO THE STATE'S ABILITY TO DEAL WITH FEDERAL REGULATORY AGENCIES AS AN INFORMED, INDEPENDENT AGENT IN REGARD TO PROBLEMS OF U DEVELOPMENT.

665

RISKS, REGULATION RESPONSIBILITIES AND COSTS IN NUCLEAR WASTE MANAGEMENT: A PRELIMINARY SURVEY IN THE EUROPEAN COMMUNITY

EUR-6893

ORLOWSKI, W.

800101

COMMISSION OF THE EUROPEAN COMMUNITIES, BRUSSELS, 41 P.

COMMISSION OF THE EUROPEAN COMMUNITIES, BRUSSELS

K,0;L,0;N,0;P,0

AN ACCOUNT OF CURRENT TRENDS IN EUROPEAN COUNTRIES OF THE ADMINISTRATIVE, LEGAL AND FINANCIAL FRAMEWORK OF THE NUCLEAR INDUSTRY AND THE INSTITUTION OF STRUCTURES FOR THE MANAGEMENT OF RADIOACTIVE WASTE TO PROVIDE ACCEPTABLE PROTECTION FOR BOTH MANKIND AND THE ENVIRONMENT IS GIVEN. INDUSTRIALIZED COUNTRIES ARE AWARE OF THE NEED TO ESTABLISH SUITABLE CONTROLS TO PROTECT THE ENVIRONMENT AND THEIR CITIZENS FROM THE RISKS OF POLLUTION. CONTROLS MAY BE TECHNICAL OR INSTITUTIONAL. IDEALLY, THE DEVELOPMENT OF BOTH TYPES OF CONTROL SHOULD PROCEED IN PARALLEL SO THE TECHNICAL PROCESSES COMPLY WITH THE SAFETY CRITERIA LAID DOWN IN THE INSTITUTIONAL CONTROLS AND CONVERSELY, SO THAT THE ADMINISTRATIVE, LEGAL AND FINANCIAL MEASURES WHICH THE LATTER COMPRISE HAVE A VALID TECHNICAL BASIS.

666

RISK ASSESSMENT FOR RADIATION PROTECTION PURPOSES

POCHIA, E.E.

800101

IAEA, VIENNA

NATIONAL RADIOLOGICAL PROTECTION BOARD, HARWELL

AT. ENERGY REV. 18(3):779-802.

C,3;C,5;C,8;D,5,A;D,5,B;D,5,C;D,5,D;E,5,A;E,5,B;E,5,C;E,5,D;F,5,A;F,5,B;F,5,C;F,5,D;G,5,A;G,5,B;G,5,C;G,5,D;H,5,A;H,5,B;H,5,C;H,5,D;I,5,A;I,5,B;I,5,C;I,5,D;J,5,A;J,5,B;J,5,C;J,5,D;K,5,A;K,5,B;K,5,C;K,5,D;L,5,A;L,5,B;L,5,C;L,5,D;M,5,A;M,5,B;M,5,C;M,5,D;N,5,A;N,5,B;N,5,C;N,5,D;O,5,A;O,5,B;O,5,C;O,5,D

IN DEFINING CRITERIA FOR GOOD PROTECTION AGAINST IONIZING RADIATION, IT IS IMPORTANT TO ASSESS QUANTITATIVELY THE LIKELY RISK OF ANY RADIATION EXPOSURE. THE 'SOMATIC' RISKS TO THE INDIVIDUAL RESULT MAINLY FROM INDUCTION OF CANCER IN THE ORGANS IRRADIATED, AND THESE RISKS CAN NOW BE ESTIMATED ON THE BASIS OF NUMEROUS DETAILED EPIDEMIOLOGICAL SURVEYS OF EXPOSED HUMAN POPULATIONS. ESTIMATES OF THE RISK OF HEREDITARY EFFECTS, FROM GENETIC CHANGES INDUCED IN GERM CELLS, ARE BASED LARGELY ON THE FREQUENCY WITH WHICH SUCH EFFECTS ARE INDUCED IN OTHER SPECIES. IN BOTH CASES THE RISK AT VERY LOW DOSE CAN BE INFERRED USING KNOWLEDGE OF THE WAY IN WHICH RADIATION DAMAGE IS CAUSED IN TISSUES. COHERENT SYSTEMS OF RADIATION PROTECTION ARE BASED ON A RESTRICTION OF DOSES TO THE WHOLE BODY AND TO INDIVIDUAL ORGANS, SUCH THAT THE INDUCTION OF CANCER AND GENETIC HARM IS INFREQUENT, AND THE THRESHOLD DOSE FOR CAUSING OTHER, 'NON-STOCHASTIC', EFFECTS IS NOT EXCEEDED.

667

A SCOPING STUDY OF SPENT FUEL CASK TRANSPORTATION ACCIDENTS

NUREG/CR-0811; SAI-OR-79-140-04

RHYNE, W.R.; RITZMAN, R.L.; COTHMAN, H.E., JR.; ALLEGEIER, J.P.;

BARTON, C.J., SR.

790601

U.S. NRC, WASHINGTON, DC. 144 P.
SCIENCE APPLICATIONS, INC., OAK RIDGE, TN
0,1;0,2;0,3;0,5,8;0,8;0,9;0,0

A SCOPING STUDY OF SPENT FUEL CASK TRANSPORTATION ACCIDENTS WAS PERFORMED TO PROVIDE THE NRC WITH AN ASSESSMENT OF EXISTING INFORMATION AND TO RECOMMEND, ON A PRIORITY BASIS, THE ADDITIONAL INFORMATION THAT SHOULD BE OBTAINED TO ALLOW SPECIFICATION OF INCREASINGLY REALISTIC SOURCE TERMS. THE SCOPE WAS LIMITED TO THE ESCAPE OF RADIONUCLIDES FROM THE CASK TO THE ENVIRONMENT RESULTING FROM SEVERE ACCIDENTS. THE ACCIDENT ENVIRONMENT DEFINITION ASSOCIATED WITH A SEVERE ACCIDENT IS THE STARTING POINT AND WAS SELECTED NOT FOR ITS REALISM BUT TO ALLOW SENSITIVITY STUDIES ON THE REMAINING VARIABLES IN THE ACCIDENT SCENARIO. HOWEVER, GIVEN THIS ACCIDENT DEFINITION, THE REMAINDER OF THE EVALUATION OF THE ACCIDENT SCENARIOS IS TO BE AS REALISTIC AS POSSIBLE. INFORMATION WAS FOUND TO BE INADEQUATE TO MAKE CORRELATIONS BETWEEN ACCIDENT SEVERITY AND RADIONUCLIDE RELEASE. GENERALLY, CASK AND FUEL ROD THERMAL-HYDRAULIC DATA AND ANALYTICAL CAPABILITY WERE FOUND TO BE REASONABLY ADEQUATE; HOWEVER, DATA AND ANALYTICAL CAPABILITY FOR EVALUATING STRUCTURAL RESPONSE TO IMPACT ARE NOT. RADIONUCLIDE BEHAVIOR INFORMATION IS ADEQUATE FOR INERT GASES BUT GENERALLY INADEQUATE FOR MOST VOLATILE RADIONUCLIDES AND FOR FUEL PARTICULATES. A SERIES OF GAUGING CALCULATIONS WERE PERFORMED TO PERMIT PRIORITIZATION OF THE INFORMATION NEEDS, AND RESEARCH RECOMMENDATIONS WERE MADE IN EIGHT AREAS.

668

DEPLETED URANIUM DIOXIDE POWDER FLOW THROUGH VERY SMALL OPENINGS

SUTTER, S.L.; JOHNSTON, J.W.; OWZARSKI, P.C.; MISHIMA, J.; SCHWENDIMAN, L.C.

B10101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
PACIFIC NORTHWEST LABORATORY
NUCL. TECHNOL. 52:100-104.
F,5;F,9;1,5;1,9;J,5;J,9;0,5;0,9

RELEASE OF PUO₂ FROM A BREACHED SHIPPING CONTAINER WAS SIMULATED USING DEPLETED UO₂. MICROGRAM QUANTITIES OF THE POWDER WERE CARRIED BY PRESSURIZED AIR THROUGH VERY SMALL OPENINGS IN A VESSEL APPROXIMATELY THE SAME DIMENSIONS AS A SHIPPING CONTAINER. POWDER TRANSMISSION WAS MEASURED AS A FUNCTION OF UPSTREAM PRESSURE ABOVE AND BELOW THE STATIC POWDER LEVEL. CONTROLLING PARAMETERS FOR THE POWDER TRANSMISSION WERE THE CROSS-SECTIONAL AREA OF THE OPENING, OPENING CHARACTERISTICS, I.E., ORIFICE OR CAPILLARY, AND CHAMBER PRESSURE. AFTER A DECISION ON LEAK LOCATION AND CONFIGURATION, POWDER LEAKAGE CAN BE MATHEMATICALLY ESTIMATED. GIVEN A ONCE-A-MONTH EVENT RATE, EXPECTED MAXIMUM POWDER TRANSMITTED PER EVENT THROUGH A 38 MICROMETER OPENING BY 6895-KPA (1000-PSIG) PRESSURE WOULD BE 287

MICROGRAMS FOR A LEAK BELOW THE STATIC AND 46 MICROGRAMS ABOVE.
AVERAGE VALUES WOULD BE 11% OF THIS MAXIMUM.

669

SUMMARY OF THE DEVELOPMENT OF A COST/RISK/BENEFIT ANALYSIS
FOR THE DECONTAMINATION AND DECOMMISSIONING OF THE
HANFORD Z-PLANT

RHO-SA-103

SEXTON, R.A.; MELVIN, J.P.

790901

ROCKWELL HANFORD OPERATIONS, RICHLAND, WA, 15 P.

ROCKWELL HANFORD OPERATIONS

I,1,K;I,0,K;J,1,K;J,0,K;P,0,K

THIS PAPER WAS PREPARED FOR PRESENTATION AT THE TOPICAL
MEETING ON THE DECONTAMINATION AND DECOMMISSIONING OF NUCLEAR
FACILITIES, CONF-790923. IN THIS REPORT, VARIOUS POSSIBILITIES
ARE CONSIDERED FOR THE DECONTAMINATION AND DECOMMISSIONING OF
HANFORD'S Z-PLANT PU PROCESSING FACILITY IN A COST/RISK/BENEFIT
ANALYSIS. THE FOUR END POINTS OF UNRESTRICTED, CONDITIONAL,
RESTRICTED AREA WITH USE AND RESTRICTED AREA WITH NON USE ARE
DEFINED AND THE CRITERIA AND METHODS OF ANALYSIS ARE DESCRIBED.

670

SOME NOTABLE PROBABILITY AND STATISTICS PROBLEMS
ENCOUNTERED IN RISK ANALYSIS APPLICATIONS

CONF-791016

VESELY, W.E.

800101

NTIS

U.S. NRC

1979 DOE STATISTICAL SYMP. PROC. PP. 178-186.

C,3;P,3

A VARIETY OF PROBABILITY AND STATISTICS PROBLEMS ARISE WHEN
AN ATTEMPT IS MADE TO QUANTIFY NUCLEAR POWER PLANT RISKS AND TO
USE THE RISK RESULTS IN DECISION MAKING. SOME OF THE MORE
NOTABLE PROBLEMS INCLUDE (1) MEASURES OF UNCERTAINTY TO USE, (2)
THE WAY DEPENDENT FAILURE PROBABILITIES ARE TO BE QUANTIFIED,
(3) BELIEVABILITY OF FAULT TREE/EVENT TREE MODELING, (4) THE
HANDLING OF SUBJECTIVE DATA (5) WHETHER "ABSOLUTE" OR "RELATIVE"
PROBABILITY EVALUATIONS ARE MORE BELIEVABLE, (6) BAYESIAN VS
CLASSICAL APPROACHES, AND (7) THE WAY TO USE RISK RESULTS AND
THEIR UNCERTAINTIES IN DECISION MAKING. THESE SEVEN PROBLEMS ARE
ADDRESSED; RESEARCH PROJECTS BEING CONDUCTED ARE DESCRIBED; AND
SOME WORTHWHILE, ADDITIONAL STUDIES ARE PROPOSED.

671

PLAN FOR DEVELOPING A SAFETY GOAL

NUREG-0735

U.S. NRC

801001

U.S. NRC, WASHINGTON, DC. 32 P.

U.S. NRC, OFFICE OF POLICY EVALUATION AND OFFICE OF THE GENERAL COUNSEL

P,0

THIS REPORT PRESENTS A COMMISSION-APPROVED PLAN FOR DEVELOPMENT AND ARTICULATION OF NRC SAFETY OBJECTIVES, NOTABLY -- BUT NOT EXCLUSIVELY -- WITH RESPECT TO POWER REACTORS; WITH SPECIAL ATTENTION TO INTERIM OBJECTIVES ATTAINABLE IN THE NEAR TERM, BUT INCLUDING CONSIDERATION OF AN OVERALL PROGRAM AS WELL. THE PLAN PROVIDES FOR PREPARING, FOR COMMISSION CONSIDERATION AND PUBLIC COMMENT, A PRELIMINARY POLICY PAPER BY DECEMBER 29, 1980 AND A POLICY PAPER REFLECTING SUBSEQUENT WORK BY AUGUST 12, 1981. THE POLICY ARTICULATION TO BE DEVELOPED WILL INCLUDE SOME GENERAL APPROACH TO RISK ACCEPTABILITY AND SAFETY-COST TRADEOFFS, AND, TO THE EXTENT THAT THESE REASONABLY LEND THEMSELVES TO ARTICULATION, QUANTITATIVE SAFETY GOALS, SAFETY IMPROVEMENT GOALS, AND STANDARDS FOR REVIEW OF PAST ACTIONS IN LIGHT OF NEW RULES AND IMPROVED PRACTICES.

672

DEVELOPMENT AND APPLICATION OF A RISK ASSESSMENT METHOD FOR RADIOACTIVE WASTE MANAGEMENT. VOL 1. GENERIC

DESCRIPTION OF AMRAW-A MODEL

EPA 520/6-78-005 A; PB-288 339; PB-288 338 (SET)

LOGAN, S.E.; BERBANO, M.C.

780101

U.S. EPA, WASHINGTON, DC. 150 P.

UNIV. OF NEW MEXICO

C,1;C,2;C,3;C,4;C,5;C,6;C,7;C,8;C,9;L,3;L,4,B;L,5,B;L,6;L,9;L,0,B

SEE ACH=673, 674, AND 675. A RADIOACTIVE WASTE MANAGEMENT SYSTEMS MODEL, DEVELOPED AND IMPLEMENTED BY THE UNIV. OF NEW MEXICO UNDER CONTRACT WITH THE U.S. EPA, IS PRESENTED. THE SYSTEM MODEL AND ASSOCIATED COMPUTER CODE CALLED AMRAW (ASSESSMENT METHOD FOR RADIOACTIVE WASTE), HAS TWO PARTS. THE FIRST PART, AMRAW-A, CONSISTS OF THE SOURCE TERM (RADIOACTIVE INVENTORY VERSUS TIME), THE RELEASE MODEL, AND THE ENVIRONMENTAL MODEL. THE RELEASE MODEL CONSIDERS VARIOUS GEOLOGIC AND MAN-CAUSED EVENTS WHICH ARE POTENTIAL MECHANISMS FOR RELEASE OF RADIOACTIVE MATERIAL BEYOND THE IMMEDIATE ENVIRONS OF A REPOSITORY OR OTHER LOCATION; THE RISK ANALYSIS MODE USES EVENTS DISTRIBUTED PROBABILISTICALLY OVER TIME, AND THE CONSEQUENCE ANALYSIS MODE USES DISCRETE EVENTS OCCURRING AT SPECIFIED TIMES. THE ENVIRONMENTAL MODEL INCLUDES (1) THE TRANSPORT TO AND ACCUMULATIONS AT VARIOUS RECEPTORS IN THE BIOSPHERE, (2) PATHWAYS FROM THESE ENVIRONMENTAL CONCENTRATIONS, AND (3) RESULTING RADIATION DOSE TO MAN.

673

DEVELOPMENT AND APPLICATION OF A RISK ASSESSMENT METHOD FOR

RADIOACTIVE WASTE MANAGEMENT, VOL. II. IMPLEMENTATION
FOR TERMINAL STORAGE IN REFERENCE REPOSITORY AND OTHER
APPLICATIONS

EPA 520/6-78-005 B; PB-288 340; PB-288 336 (SET)

LOGAN, S.E.; BERBANO, M.C.

780101

U.S. EPA, WASHINGTON, DC. 366 P.

UNIV. OF NEW MEXICO

L,1;L,2;L,3;L,4,B;L,5,B;L,6;L,7;L,8;L,9;L,0,B

SEE ACN#672, 674 AND 675. A RADIOACTIVE WASTE MANAGEMENT SYSTEMS MODEL, DEVELOPED AND IMPLEMENTED BY THE UNIV. OF NEW MEXICO UNDER CONTRACT WITH THE U.S. EPA, IS PRESENTED. THE SYSTEMS MODEL AND ASSOCIATED COMPUTER CODE CALLED AMRAW (ASSESSMENT METHOD FOR RADIOACTIVE WASTE), HAS TWO PARTS. THE FIRST PART, AMRAW-A, CONSISTS OF THE SOURCE TERM (RADIOACTIVE INVENTORY VERSUS TIME), THE RELEASE MODEL, AND THE ENVIRONMENTAL MODEL. IMPLEMENTATION, WITH CALCULATED RESULTS, OF AMRAW-A FOR TERMINAL STORAGE IN A BEDDED SALT REFERENCE REPOSITORY IS PRESENTED. PRELIMINARY DEMONSTRATIONS FOR THE REPOSITORY OPERATIONS PHASE OF WASTE MANAGEMENT AND TERMINAL STORAGE IN A SHALE FORMATION ARE DESCRIBED; POSSIBLE APPLICATIONS TO OTHER RADIOACTIVE AND NONRADIOACTIVE HAZARDOUS MATERIALS ARE DISCUSSED. AMRAW UNIQUELY LINKS ALL STEPS TOGETHER IN A CONTINUOUS CALCULATION SEQUENCE.

674

DEVELOPMENT AND APPLICATION OF A RISK ASSESSMENT METHOD FOR
RADIOACTIVE WASTE MANAGEMENT, VOL. III. ECONOMIC
ANALYSIS; DESCRIPTION AND IMPLEMENTATION OF AMRAW-B
MODEL

EPA 520/6-78-005 C; PB-288 341; PB-288 338 (SET)

LOGAN, S.E.; SCHULZE, W.D.; BEN-DAVID, S.; BROOKSHIRE, D.S.

780101

U.S. EPA, WASHINGTON, DC. 155 P.

UNIV. OF NEW MEXICO

C,1;C,4;C,5;C,7;L,4,B;L,5,B;L,7;L,0,B

SEE ACN#672, 673, AND 675. A RADIOACTIVE WASTE MANAGEMENT SYSTEMS MODEL, DEVELOPED AND IMPLEMENTED BY THE UNIV. OF NEW MEXICO UNDER CONTRACT WITH THE U.S. EPA, IS PRESENTED. THE SYSTEMS MODEL AND ASSOCIATED COMPUTER CODE CALLED AMRAW (ASSESSMENT METHOD FOR RADIOACTIVE WASTE), HAS TWO PARTS. THE SECOND PART OF THE SYSTEMS MODEL, AMRAW-B, IS THE ECONOMIC MODEL WHICH CALCULATES HEALTH EFFECTS CORRESPONDING TO THE VARIOUS ORGAN DOSE RATES FROM AMRAW-A, COLLECTS THESE HEALTH EFFECTS IN TERMS OF ECONOMIC COSTS AND ATTRIBUTES THESE COSTS TO RADIONUCLIDES, DECAY GROUPS, AND ELEMENTS INITIALLY IN THE WASTE INVENTORY. IMPLEMENTATION, WITH CALCULATED RESULTS, OF AMRAW-B FOR TERMINAL STORAGE IN A BEDDED SALT REFERENCE REPOSITORY IS PRESENTED. PRELIMINARY DEMONSTRATIONS FOR THE REPOSITORY OPERATIONS PHASE OF WASTE MANAGEMENT AND TERMINAL STORAGE IN A SHALE FORMATION ARE DESCRIBED; POSSIBLE APPLICATIONS TO OTHER

RADIOACTIVE AND NONRADIOACTIVE HAZARDOUS MATERIALS ARE DISCUSSED. AMRAW UNIQUELY LINKS ALL STEPS TOGETHER IN A CONTINUOUS CALCULATION SEQUENCE.

675

DEVELOPMENT AND APPLICATION OF A RISK ASSESSMENT METHOD FOR RADIOACTIVE WASTE MANAGEMENT, VOL IV, AMRAW COMPUTER CODE USERS MANUAL

EPA 520/6-78-005 D; PB-288 342; PB-286 336 (SET)

LOGAN, S.E.

780101

U.S. EPA, WASHINGTON, DC, 166 P.

UNIV. OF NEW MEXICO

C,1;C,2;C,3;C,4;C,5;C,6;C,7;C,8;C,9;L,4,B;L,5,B

SEE ACN=672, 673, AND 674. A RADIOACTIVE WASTE MANAGEMENT SYSTEMS MODEL, DEVELOPED AND IMPLEMENTED BY THE UNIV. OF NEW MEXICO UNDER CONTRACT WITH THE U.S. EPA, IS PRESENTED. THIS IS THE COMPUTER CODE USER'S MANUAL FOR THE CODE CALLED AMRAW (ASSESSMENT METHOD FOR RADIOACTIVE WASTE).

676

INCREMENT OF ANALYSIS. AN ESTIMATE OF AIRBORNE RELEASE OF PLUTONIUM FROM BABCOCK AND WILCOX PLANT AS A RESULT OF SEVERE WIND HAZARD AND EARTHQUAKE

PNL-2812

MISHIMA, J.; SCHWENDIMAN, L.C.; AYER, J.E.

780101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 71 P.

PACIFIC NORTHWEST LABORATORY

I,1;I,2;I,5;I,7;I,9;I,0;

THIS REPORT COVERS THE POTENTIAL RELEASE OF RADIONUCLIDES FROM THE B & W PLANT (FUEL FABRICATION) AT LEECHBURG, PA, DUE TO WIND HAZARD AND EARTHQUAKE. THE OBJECTIVE OF THIS INCREMENT IS TO PROVIDE "REALISTIC" ESTIMATES OF THE QUANTITY OF PU THAT MAY BE MADE AIRBORNE AS A RESULT OF THE POSTULATED DAMAGE SCENARIOS AND RELEASED TO THE AMBIENT ATMOSPHERE AROUND THE FACILITY. THE ESTIMATED AIRBORNE RELEASES FORM THE BASIS FOR THE CALCULATED DOSE WHICH IS ONE COMPONENT OF THE RISK ANALYSIS THAT IS THE OBJECTIVE OF THIS ENTIRE STUDY.

677

SOURCE TERM AND RADIATION DOSE ESTIMATES FOR POSTULATED DAMAGE TO THE 102 BUILDING AT THE GENERAL ELECTRIC VALLECITOS NUCLEAR CENTER

PNL-2844

MISHIMA, J.; MCPHERSON, R.B.; SCHWENDIMAN, L.C.; WATSON, E.C.; AYER, J.E.

790101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 77 P.

PACIFIC NORTHWEST LABORATORY

I,1;I,2;I,5;I,7;I,9;I,0

THREE SCENARIOS REPRESENTING SIGNIFICANT LEVELS OF CONTAINMENT LOSS DUE TO MODERATE, SUBSTANTIAL, AND MAJOR DAMAGE TO THE 102 BUILDING AT THE VALLECITOS NUCLEAR CENTER ARE POSTULATED, AND THE POTENTIAL RADIATION DOSES TO THE GENERAL POPULATION AS A RESULT OF THE AIRBORNE RELEASES OF RADIONUCLIDES ARE ESTIMATED. THE DAMAGE SCENARIOS ARE NOT CORRELATED TO ANY SPECIFIC LEVEL OF SEISMIC ACTIVITY. THE THREE SCENARIOS ARE: (1) MODERATE DAMAGE SCENARIO - PERFORATION OF THE ENCLOSURES IN AND THE STRUCTURE COMPRISING THE PLUTONIUM ANALYTICAL LABORATORY, (2) SUBSTANTIAL DAMAGE SCENARIO - COMPLETE LOSS OF CONTAINMENT OF THE PLUTONIUM ANALYTICAL LABORATORY AND LOSS OF THE FILTERS SEALING THE INLET TO THE RADIOACTIVE MATERIALS LABORATORY HOT CELLS, AND (3) MAJOR DAMAGE SCENARIO - THE DAMAGE OUTLINED IN (2) PLUS THE PERFORATION OF THE ENCLOSURES HOLDING SIGNIFICANT INVENTORIES OF DISPERSIBLE PU IN AND THE STRUCTURE COMPRISING THE ADVANCED FUELS LABORATORY.

678

AN INCREMENT OF ANALYSIS. ESTIMATED AIRBORNE RELEASE OF PLUTONIUM FROM WESTINGHOUSE CHESWICK SITE AS A RESULT OF POSTULATED DAMAGE FROM SEVERE WIND AND SEISMIC HAZARD

PNL-2965

MISHIMA, J.; SCHWENDIMAN, L.C.; AYER, J.E.

790101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 65 P.

PACIFIC NORTHWEST LABORATORY

I,1; I,2;I,5;I,7;I,9;I,0;

THE POTENTIAL MASS AIRBORNE RELEASES OF PU (SOURCE TERM) AS A RESULT OF WIND AND SEISMIC HAZARD ARE ESTIMATED FOR THE WESTINGHOUSE PLUTONIUM FUEL DEVELOPMENT LABORATORIES, CHESWICK, PENNSYLVANIA SITE. THE POSTULATED SOURCE TERMS BECOME THE BASIS FOR THE ESTIMATION OF POTENTIAL DOSE TO THE "MAXIMUM" INDIVIDUAL BY INHALATION AND TO THE TOTAL POPULATION LIVING WITHIN A PRESCRIBED RADIUS OF THE SITE. THE "RESPIRABLE FRACTION" OF AIRBORNE PARTICLES IS THUS OF PRINCIPAL CONCERN.

679

FINAL ENVIRONMENTAL STATEMENT. PORTSMOUTH GASEOUS DIFFUSION PLANT EXPANSION, PIKETON, OHIO. VOL. 1. TEXT

ERDA-1549

U.S. ERDA

770101

U.S. ERDA, WASHINGTON, DC. 1200 P.

U.S. ERDA

G,1;G,2;G,3;G,5,B;G,5,D;G,5,F;G,5,H;G,7;G,9;G,0,B;G,0,D;G,0,F;G,0,H;0,1;0,2;0,3;0,5,B;0,5,D;0,5,F;0,5,H;0,9;0,0,B;0,0,D;0,0,F;0,0,H

THIS ENVIRONMENTAL STATEMENT WAS PREPARED BY ERDA TO COVER THE REASONABLY FORESEEABLE ENVIRONMENTAL, SOCIAL, ECONOMIC AND TECHNOLOGICAL COSTS AND BENEFITS RESULTING FROM THE CONSTRUCTION AND OPERATION OF ADDITIONAL ENRICHMENT CAPACITY AT THE PORTSMOUTH GASEOUS DIFFUSION PLANT NEAR PIKETON, OHIO, AND REASONABLY AVAILABLE ALTERNATIVES THERETO. AT THE TIME IT WAS DETERMINED TO PROVIDE ADDITIONAL ENRICHMENT CAPACITY, IT WAS THOUGHT THE DEMAND FOR SUCH CAPACITY REQUIRED THAT IT BE AVAILABLE BY 1985. THE GASEOUS DIFFUSION PROCESS WAS THE ONLY TECHNOLOGY THOUGHT TO BE ABLE TO PROVIDE THE NEEDED CAPACITY ON THAT TIME FRAME. THEREFORE, THE DRAFT OF THIS ENVIRONMENTAL STATEMENT FOCUSED ON THE ENVIRONMENTAL EFFECTS OF EXPANDING CAPACITY AT PORTSMOUTH VIA THIS PROCESS. UPON FURTHER REVIEW OF THE PROJECTED DEMAND FOR U ENRICHMENT IT WAS DETERMINED THAT THE EXPANSION OF ENRICHMENT CAPACITY COULD BE DELAYED ONE TO TWO YRS PERMITTING GAS CENTRIFUGE TECHNOLOGY TO BE DEVELOPED AS A REASONABLE ALTERNATIVE IN THE NEW TIME FRAME. THE PRESIDENT SUBSEQUENTLY ANNOUNCED IN HIS APRIL 1977 ENERGY MESSAGE THAT THE GAS CENTRIFUGE TECHNOLOGY WILL BE USED IN THE NEXT ADDITION TO URANIUM ENRICHMENT CAPACITY. ACCORDINGLY, THIS FINAL STATEMENT PROVIDES ADDITIONAL INFORMATION ON A GAS CENTRIFUGE PLANT AT PORTSMOUTH. TO BE CONSISTENT WITH THE DRAFT, THE FINAL STATEMENT STILL CONSIDERS AN ADD-ON GASEOUS DIFFUSION PLANT AS THE BASE CASE AND A CENTRIFUGE PLANT AS THE ALTERNATIVE.

680

FINAL ENVIRONMENTAL IMPACT STATEMENT, PORTSMOUTH GASEOUS DIFFUSION PLANT EXPANSION, PIKETON, OHIO. VOL. 2.

APPENDICES

ERDA-1549

U.S. ERDA

770101

U.S. ERDA, WASHINGTON, DC. 547 P.

U.S. ERDA

G,1;G,9

SEE ACN=679. THIS VOLUME CONTAINS APPENDICES A - G.

681

FUEL CYCLE RISK ASSESSMENT - PRELIMINARY DRAFT

NONE

ERDMANN, R.C.; GARCIA, A.A.; FULLWOOD, R.R.; RITZMAN, R.L.; STEVENS, C.A.

761101

SCIENCE APPLICATIONS, INC. PALO ALTO, CA. 64 P.

SCIENCE APPLICATIONS, INC.

D,1;D,9;D,0;E,1;E,9;E,0;I,1;I,4;I,5;J,1;J,2;J,4;J,5;K,1;K,4;K,5;

L,1;L,4;L,5;M,1;M,4;M,5;N,1;N,4;N,5;O,1;O,4;C,5

THIS DOCUMENT DESCRIBES THE MEANS BY WHICH THE FUEL CYCLE FOR LIGHT WATER REACTORS WILL BE ASSESSED FROM A RISK VIEWPOINT. THESE FUEL CYCLE COMPONENTS INCLUDE: REPROCESSING, FUEL

FABRICATION, TRANSPORTATION, WASTE HANDLING AND STORAGE, AND CERTAIN MINING AND MILLING OPERATIONS. ALL MANNER OF RELEASES WILL BE CONSIDERED, WHETHER DUE TO CONTINUOUS NORMAL OPERATION OR FROM ACCIDENTS. THE IMPACT PARAMETERS USED IN THE PAST TO COMPARE ACCIDENT RISKS AT REACTORS WERE EARLY FATALITIES, LATENT INJURIES AND FATALITIES, AND PROPERTY DAMAGE. MANY SUB-GROUPINGS OF IMPACTS WERE ALSO DETERMINED. IT IS EXPECTED THAT THESE SAME IMPACT MEASURES (BASED UPON MAN REM, PRINCIPALLY FOR THE MEDICAL IMPACTS) WILL BE USED IN THE FUEL CYCLE RISK STUDY, SUPPLEMENTED POSSIBLY TO TAKE INTO ACCOUNT NON-ACCIDENT EXPOSURES AND/OR VOLUNTARY RISKS TO PERSONNEL.

682

PROCEEDINGS: NUCLEAR CRITICALITY SAFETY NATIONAL TOPICAL MEETING, APRIL 8-10, 1980, EL PASO, TEXAS

SAND-80-1675

ESTES, B.F.; COLVIN, M.J., (EDS.)

800101

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM. 440 P.

SANDIA NATIONAL LABORATORIES

C,1;G,1;M,1;M,4;M,5;O,1;P,1

THE MEMBERS OF THE NUCLEAR CRITICALITY SAFETY DIVISION HAVE PLAYED A SIGNIFICANT ROLE IN DEVELOPMENT OF A SAFE NUCLEAR POWER PROGRAM, OF THE ACCIDENTAL CRITICALITY INCIDENTS WHICH HAVE OCCURRED, NONE HAS BEEN SHOWN TO BE THE RESULT OF INADEQUATE OR ERRONEOUS CRITICALITY SAFETY ANALYSIS. THE SPENT FUEL STORAGE PROBLEM REMAINS AN IMPORTANT ONE, AND SOLUTIONS NOW BEING CONSIDERED INCLUDE THE DISASSEMBLY OF SPENT FUEL BUNDLES WITH DENSE STORAGE OF INDIVIDUAL RODS IN CONTAINERS. THE CRITICALITY SPECIALISTS WILL BE CALLED UPON TO ESTABLISH APPROPRIATE SAFETY CRITERIA FOR THE ACCOMPLISHMENT OF THIS.

684

WORKING PAPER FOR A PROBABILITY/CONSEQUENCE ANALYSIS OF TRANSPORTATION OF NUCLEAR WASTES

SAI/SR-171-77-PA

FULLWOOD, R.R.; MENDOZA, Z.; KITZMAN, R.

770901

SCIENCE APPLICATIONS, INC., PALO ALTO, CA. 198 P.

SCIENCE APPLICATIONS, INC.

O,1;O,3;O,5;B;O,7;O,9;O,0,B

THIS REPORT APPLIES THE PROBABILISTIC FAULT TREE METHODOLOGY TO THE ANALYSIS OF THE RADIOLOGICAL RISKS ASSOCIATED WITH THE SHIPMENT OF WASTES RESULTING FROM NUCLEAR POWER GENERATION. THE RISKS ASSOCIATED WITH THE TRANSPORTATION OF SPENT FUEL, PLO₂, SOLIDIFIED HIGH LEVEL WASTE, CLADDING WASTE AND NON-HIGH LEVEL WASTE ARE ANALYZED. THE RESULTS ARE SUMMARIZED IN TABLES 4.1 AND 4.2. CLEARLY THE HIGHEST RISK IS ASSOCIATED WITH THE TRANSPORTATION OF PLUTONIUM DIOXIDE FOLLOWED SEVERAL ORDERS OF MAGNITUDE LOWER BY TRU NON-HIGH LEVEL WASTE.

THE REMAINING MODES IN DESCENDING ORDER ARE: SOLICIFIED HIGH LEVEL WASTE, NON-TRU NON-HIGH LEVEL WASTE, CLADDING HULLS, RAIL SHIPMENT OF SPENT FUEL AND LAST IS TRUCK SHIPMENT OF SPENT FUEL.

685

ENVIRONMENTAL REPORT. GENERAL ELECTRIC NUCLEAR FACILITY,
WILMINGTON, NORTH CAROLINA

NEDO-20197

GENERAL ELECTRIC

740101

GENERAL ELECTRIC, WILMINGTON, NC. 250 P.

GENERAL ELECTRIC CO.

H,1;H,3;H,5,B;H,9;O,1

THIS ER ASSESSES THE ENVIRONMENTAL EFFECTS OF THE MANUFACTURE OF NUCLEAR FUEL AT FACILITIES OWNED AND OPERATED BY GENERAL ELECTRIC AND LOCATED IN NEW HAMOVER CCUNTY, NEAR WILMINGTON, NC. OPERATIONS AT THESE FACILITIES WERE FIRST LICENSED BY THE U.S. AEC IN JANUARY 1969.

686

ASSESSMENT OF HANFORD BURIAL GROUNDS AND INTERIM TRU STORAGE
RHO-CD-78, (REV.)

GELGER, J.F.; BROWN, D.J.; ISAACSON, R.E.

770801

ROCKWELL HANFORD OPERATIONS, RICHLAND, WA. 70 P.

ROCKWELL HANFORD OPERATIONS

K,1;N,1

A REVIEW AND ASSESSMENT IS MADE OF THE HANFORD LOW LEVEL SOLID RADIOACTIVE WASTE MANAGEMENT SITES AND FACILITIES. SITE FACTORS CONSIDERED FAVORABLE FOR WASTE STORAGE AND DISPOSAL ARE (1) LIMITED PRECIPITATION, (2) A HIGH DEFICIENCY OF MOISTURE IN THE UNDERLYING SEDIMENTS (3) GREAT DEPTH TO WATER TABLE, ALL OF WHICH MINIMIZE RADIONUCLIDE MIGRATION BY WATER TRANSPORT, AND (4) HIGH SORBTIVE CAPACITY OF THE SEDIMENTS. FACILITIES ARE IN PLACE FOR 20 YR RETRIEVABLE STORAGE OF TRANSURANIC (TRU) WASTES AND FOR DISPOSAL OF NONTRANSURANIC RADIOACTIVE WASTES. AUXILIARY FACILITIES AND SERVICES (UTILITIES, ROADS, FIRE PROTECTION, SHOPS, ETC.) ARE CONSIDERED ADEQUATE. SUPPORT STAFFS SUCH AS ENGINEERING, RADIATION MONITORING, PERSONNEL SERVICES, ETC., ARE AVAILABLE AND ARE SHARED WITH OTHER OPERATIONAL PROGRAMS. THE SITE AND ASSOCIATED FACILITIES ARE CONSIDERED WELL SUITED FOR SOLID RADIOACTIVE WASTE STORAGE OPERATIONS. HOWEVER, RECOMMENDATIONS ARE MADE FOR STUDY PROGRAMS TO IMPROVE CONTAINMENT, WASTE PACKAGE STORAGE LIFE, LAND USE ECONOMY, RETRIEVABILITY AND SECURITY OF TRU WASTES.

687

ON THE DEVELOPMENT OF QUANTITATIVE RISK ACCEPTANCE CRITERIA
ALO-130; UCLA-ENG-7969

GRIESMEYER, J.M.; OKKENT, D.

810101

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM, 54 P.

UNIVERSITY OF CALIFORNIA, LOS ANGELES

P,0

THIS REPORT ADDRESSES THE DEVELOPMENT OF APPROPRIATE CRITERIA FOR QUANTITATIVELY JUDGING THE ACCEPTANCE OF RISK BY SOCIETY. RISKS CANNOT BE TOTALLY ELIMINATED FROM NEW TECHNOLOGICAL VENTURES; THEY CAN ONLY BE REDUCED AND MANAGED AND ARE ONLY ONE OF MANY SETS OF ISSUES CONSIDERED IN THE DECISION PROCESS. UNCERTAINTIES ARISE IN THE TECHNICAL ESTIMATION OF BOTH RISKS AND BENEFITS, AND IN ADDITION, DIFFERENCES AMONG INDIVIDUALS IN THE ASSIGNMENT OF VALUES RESULT IN CONTROVERSIES OVER THE EVALUATION OF RISKS AND BENEFITS. CONSIDERABLE COSTS TO SOCIETY ARISE FROM THE CONFLICT OVER ACCEPTING TECHNOLOGICAL RISKS: ANXIETY AND DISMAY DUE TO CONFLICTING INFORMATION; LITIGATION COSTS; RETROFITS; AND MISPLACED INVESTMENTS AND COSTLY DELAYS THAT RESULT FROM INDUSTRY'S INABILITY TO PREDICT PUBLIC RISK ACCEPTANCE OR TO PLAN FOR REGULATORY REQUIREMENTS. MANAGEMENT OF RISKS IS AS MUCH A SOCIO-POLITICAL PROBLEM AS IT IS A TECHNICAL ONE. BECAUSE OF THE TRADE-OFFS INVOLVED IN THE ECONOMIC, SOCIO-POLITICAL, AND TECHNICAL DECISIONS TO BUILD OR NOT TO BUILD A LARGE TECHNOLOGICAL FACILITY, THE QUESTION 'HOW SAFE IS SAFE ENOUGH' WILL NOT BE SUBJECT TO A UNIQUE ANSWER.

688

EPRI NUCLEAR FUEL-CYCLE ACCIDENT RISK ASSESSMENT

NUCLEAR SAFETY STAFF

810501

U.S. DOE

U.S. DOE

NUCL. SAF. 22(3):300-306.

D,3;D,5,B;D,0,B;E,3;E,5,B;E,5,D;I,3;I,5,B;I,0,B;J,3;J,5,B;J,0,B;
L,3;L,5,B;L,0,B;N,3;N,5,B;N,0,B;O,3;O,5,B;C,0,B

THE PRESENT RESULTS OF THE NUCLEAR FUEL-CYCLE ACCIDENT RISK CONDUCTED BY EPRI SHOW THAT THE TOTAL RISK CONTRIBUTION OF THE NUCLEAR FUEL CYCLE IS ONLY ABOUT 1% OF THE ACCIDENT RISK OF THE POWER PLANT; HENCE, WITH LITTLE ERROR, THE ACCIDENT RISK OF NUCLEAR ELECTRIC POWER IS ESSENTIALLY THAT OF THE POWER PLANT ITSELF. THE POWER-PLANT RISK, ASSUMING A VERY LARGE USAGE OF NUCLEAR POWER BY THE YR 2005, IS ONLY ABOUT 0.5% OF THE RADIOLOGICAL RISK OF NATURAL BACKGROUND. THE SMALLNESS OF THE FUEL-CYCLE RISK RELATIVE TO THE POWER-PLANT RISK MAY BE ATTRIBUTED TO THE LACK OF INTERNAL ENERGY TO DRIVE AN ACCIDENT AND THE SMALL AMOUNT OF DISPERSEIBLE MATERIAL. THIS WORK AIMS AT A REALISTIC ASSESSMENT OF THE PROCESS HAZARDS, THE EFFECTIVENESS OF CONFINEMENT AND MITIGATION SYSTEMS AND PROCEDURES, AND THE ASSOCIATED LIKELIHOOD OF ERRORS AND THE ESTIMATED SIZE OF ERRORS. THE PRIMARY PROBABILISTIC ESTIMATION TOOL IS FAULT-TREE ANALYSIS, WITH THE RELEASE SOURCE TERMS CALCULATED USING

PHYSIOCHEMICAL PROCESSES, DOSES AND HEALTH EFFECTS ARE CALCULATED WITH CRAC (CONSEQUENCES OF REACTOR ACCIDENT CODE). NO EVACUATION OR MITIGATION IS CONSIDERED; SOURCE TERMS MAY BE CONSERVATIVE THROUGH THE ASSUMPTION OF HIGH FUEL BURNUP (40,000 MWDT/T) AND SHORT COOLING PERIOD (90 TO 150 D); HIGH-EFFICIENCY PARTICULATE AIR FILTER EFFICIENCIES ARE DERIVED FROM EXPERIMENTS. FUTURE WORK WILL INCLUDE REFINEMENTS OF THE WORK PRESENTED HERE AS WELL AS ALTERNATIVE FUEL CYCLES, ROUTINE AND OCCUPATIONAL RISKS, AND TREATMENT OF FUEL-CYCLE STEPS BELIEVED TO PRESENT NEGLIGIBLE RISK COMPARED WITH THOSE PRESENTED HERE.

689

RISK, FEAR AND PUBLIC SAFETY

AECL-7404

SIDDALL, E.

810401

AECL, MISSISSAUGA, ONTARIO. 35 P.

AECL, MISSISSAUGA

P,2;P,5;P,9

PT. 1 OF THE REPORT ADVOCATES A RATIONAL APPROACH TO PUBLIC SAFETY BASED ON UNBIASED QUANTITATIVE ASSESSMENT OF OVERALL RISKS AND BENEFITS OF ANY TECHNOLOGICAL ACTIVITY. IT SHOWS THAT IMPROVED SAFETY SHOULD BE ATTAINABLE AT LESS COST THAN IS THE CASE AT PRESENT. PART 2 OFFERS AN EXPLANATION OF WHY SO LITTLE HAS BEEN ACHIEVED IN THIS DIRECTION AND OUTLINES THE MAJOR ERRORS IN PRESENT PRACTICES. PART 3 SUGGESTS WHAT MIGHT REALISTICALLY BE DONE TOWARDS THE ACHIEVEMENT OF SOME OF THE POSSIBLE BENEFITS. FACTORS WHICH ARE IMPORTANT IN THE STUDY OF SAFETY AND EVIDENCE SUPPORTING THE ARGUMENTS ARE DISCUSSED IN SIX APPENDICES. IT IS URGED THAT THE SCIENTIFIC AND TECHNOLOGICAL COMMUNITY SHOULD IMPROVE ITS UNDERSTANDING OF SAFETY AS A SPECIALIZATION AND SHOULD ENDEAVOUR TO LEAD RATHER THAN FOLLOW IN OUR PRESENT POLITICAL SYSTEM.

690

PROBABILISTIC ASPECTS OF FAULTING IN ANISOTROPIC MEDIA

SAND79-0895C

CRANWELL, R.M.; DONATH, F.A.

790101

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM. 8 P.

SANDIA NATIONAL LABORATORIES

C,1;C,2;C,3;C,0;L,2;L,3

WHEN CONSIDERING THE POSSIBILITY OF RELEASE OF RADIOACTIVE WASTE FROM THE CONFINES OF A WASTE REPOSITORY IN LAYERED GEOLOGIC MEDIA, IT IS GENERALLY ACCEPTED THAT FAULTING PRESENTS A POTENTIAL THREAT TO THE LONG TERM ISOLATION OF THIS WASTE FROM CIRCULATING GROUNDWATER. A FAULT CAN PENETRATE EITHER THE ISOLATING BARRIER MEDIA OR THE DEPOSITORY ITSELF TO FORM A POTENTIAL CONDUIT FOR GROUNDWATER TO MAKE CONTACT WITH THE RADIOACTIVE WASTE.

691

RISK ASSESSMENT METHODS FOR NUCLEAR WASTE MANAGEMENT SYSTEMS
ORP/CSD-77-1

PELTO, P.J.; BARTLETT, J.W.; SMITH, T.H.

770201

U.S. EPA, WASHINGTON, DC. 275 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

WORKSHOP ON ISSUES PERTINENT TO THE DEVELOPMENT OF ENVIRONMENTAL
PROTECTION CRITERIA FOR RADIOACTIVE WASTES. PP. 2.11-2.43.

C,3;C,4;C,5;L,1;N,1

RADIOACTIVE WASTE IS GENERATED IN A VARIETY OF FORMS BY
OPERATIONS IN THE NUCLEAR FUEL CYCLE. NUMEROUS MANAGEMENT
SYSTEMS HAVE BEEN DEvised TO IMMOBILIZE AND ISOLATE THESE
WASTES. SUCH SYSTEMS INCLUDE MULTISITE PROCESSING OPERATIONS,
TRANSPORTATION, AND STORAGE/ISOLATION. THIS PAPER REVIEWS RISK
ASSESSMENT METHODS AND THEIR POTENTIAL APPLICATION TO NUCLEAR
WASTE MANAGEMENT SYSTEMS. PREVIOUS AND ONGOING STUDIES ON THE
RISK/SAFETY OF HIGH-LEVEL WASTE MANAGEMENT SYSTEMS ARE DISCUSSED
ALONG WITH THEIR LIMITATIONS AND POTENTIAL IMPROVEMENTS.

692

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE OPERATION OF
THE HUMECA URANIUM MILL, RIO ALGOM CORPORATION

DOCKET NO. 40-8084; NUREG-0046

U.S. NRC

760401

U.S. NRC, WASHINGTON, DC. 660 P.

U.S. NRC, DIVISION OF FUEL CYCLE AND MATERIAL SAFETY

D,1;D,9;E,1;E,9

EXPLORATORY DRILLING BY THE RIO ALGOM CORP. HAS LED TO THE
DISCOVERY OF A URANIUM ORE BODY OVER 1,000,000 TONS LYING AT A
DEPTH OF 2,500 FT ON THE DOWN-THROW SIDE OF THE LISBON VALLEY
FAULT IN SAN JUAN COUNTY, UTAH. BASED ON THE RESULTS OF THIS
EXPLORATORY DRILLING, RIO ALGOM DECIDED TO DEVELOP AN
UNDERGROUND MINE AND A SURFACE MILLING OPERATION TO CONCENTRATE
THE U. CONTRACTS TOTALING 8.4 MILLION POUNDS OF U OXIDE (U₃O₈)
HAVE BEEN SIGNED. MINING DEVELOPMENT AND OPERATIONS ARE BEING
CARRIED OUT AND THE 500 TON PER DAY MILL IS OPERATING UNDER AN
INTERIM LICENSE ISSUED BY THE COMMISSION ON JUNE 7, 1972. THIS
INTERIM LICENSE WAS ISSUED IN ACCORDANCE WITH THE PROVISIONS OF
PARAGRAPH A.14 OF APPENDIX D, 10 CFR PART 50. THIS EIS IS BASED
ON INFORMATION CONTAINED IN CORRESPONDENCE, APPLICATIONS AND
REPORTS RECEIVED FROM RIO ALGOM.

693

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE SEGUCYAH
URANIUM HEXAFLUORIDE PLANT, KERR-MCGEE NUCLEAR
CORPORATION

NUREG-75/007

U.S. NRC

750201

U.S. NRC, WASHINGTON, DC. 300 P.

U.S. NRC, DIVISION OF MATERIALS AND FUEL CYCLE FACILITY LICENSING
F,1;F,2;F,3;F,4;F,5;F,9

THE SEQUOYAH URANIUM HEXAFLUORIDE PLANT, OWNED AND OPERATED BY KERR-MCGEE CORPORATION, OCCUPIES ABOUT 75 ACRES OF A 2100 ACRE RURAL SITE IN SEQUOYAH COUNTY, OK, AT THE CONFLUENCE OF THE ILLINOIS AND ARKANSAS RIVERS. THE SITE ABUTS INTERSTATE HIGHWAY 40 ABOUT 40 MILES WEST OF FORT SMITH, AR, AND 150 MILES EAST OF OKLAHOMA CITY. THE FUNCTION OF THIS FACILITY IS TO CONVERT URANIUM CONCENTRATES, RECEIVED FROM SEVERAL U MILLS, TO THE PURIFIED VOLATILE UF₆ COMPOUND USED AS THE FEED MATERIAL FOR THE GASEOUS DIFFUSION ENRICHMENT OF THE CONTAINED U-235 ISOTOPE. THE PLANT WHICH STARTED OPERATION IN FEBRUARY 1970, IS DESIGNED TO PRODUCE 5000 SHORT TONS OF U PER YR AS UF₆. THIS IS THE FINAL STATEMENT OF ENVIRONMENTAL CONSIDERATIONS ASSOCIATED WITH THE PROPOSED CONTINUATION OF A SOURCE MATERIAL LICENSE FOR THE PLANT.

694

DRAFT ENVIRONMENTAL STATEMENT, PORTSMOUTH GASEOUS DIFFUSION
PLANT EXPANSION, PIKETON, OHIO

ERDA-1549

U.S. ERDA

760601

U.S. ERDA, WASHINGTON, DC. 1220 P.

U.S. ERDA

G,1;G,2;G,9

THE PRODUCTION FROM EXISTING U.S. ERDA ENRICHMENT PLANTS IS CURRENTLY FULLY COMMITTED TO EXISTING OR PLANNED DOMESTIC AND FOREIGN REACTORS. TO PROVIDE FUEL FOR ADDITIONAL NUCLEAR REACTORS INCREASED URANIUM ENRICHMENT CAPACITY IS REQUIRED. THE POSTULATED EXPANSION OF ENRICHMENT CAPACITY THROUGH THE YR 2000 WAS EVALUATED BY THE U.S. ERDA IN THE DRAFT ENVIRONMENTAL STATEMENT, EXPANSION OF U.S. URANIUM ENRICHMENT CAPACITY (ERDA-1543). CONSTRUCTION OF AN ADD-ON PLANT AT THE EXISTING PORTSMOUTH GASEOUS DIFFUSION PLANT SITE IS PART OF THE ERDA "HEDGE PLANT" TO INSURE THAT ADDITIONAL ENRICHMENT CAPACITY IS AVAILABLE IN THE EVENT THAT PRIVATE INDUSTRY IS NOT ABLE TO MEET THE NATION'S URANIUM ENRICHMENT EXPANSION NEEDS ON A TIMELY BASIS. AFTER WEIGHING THE ECONOMIC, TECHNOLOGICAL, AND SOCIAL BENEFITS AGAINST THE ECONOMIC, ENVIRONMENTAL, AND SOCIAL COSTS AND AFTER CONSIDERING THE REASONABLY AVAILABLE ALTERNATIVES AND THEIR BENEFITS AND COSTS, THE STAFF CONCLUDES THAT THE EXPANSION OF THE U.S. URANIUM ENRICHMENT CAPACITY BY CONSTRUCTION AND OPERATION OF THE ADD-ON GASEOUS DIFFUSION PLANT AT THE PORTSMOUTH SITE SHOULD BE UNDERTAKEN. (FOR THE FINAL EIS SEE ACN= 679, 680.)

696

SYSTEM ANALYSIS OF SHALLOW LAND BURIAL. VOL. 1. CODE MANUAL
NUREG/CR-1963, VOL. 1

LESTER, D.; BUCKLEY, D.; DONELSON, S.; DURA, V.; HECHT, M.;
HORTON, W.; NAKAI, T.; PASTERNAK, T.; ROBERTSON, L.; STULA,
R.; STODDARD, J.

810301

U.S. NRC, WASHINGTON, DC. 120 P.
SCIENCE APPLICATIONS, INC., LA JOLLA, CA
C,2;C,4;C,5;N,1;N,2;N,4;N,5;N,7;N,8;N,9

SEE ACN=697 AND 698. THIS IS VOLUME 1 OF A THREE VOL. SET DESCRIBING THE SYSTEM MODEL FOR SHALLOW LAND BURIAL. IT IS INTENDED AS A CODE MANUAL CONTAINING SUFFICIENT INFORMATION FOR A NEW USER TO OPERATE THE CODE. THIS MANUAL GIVES A BRIEF SUMMARY OF THE CODE TECHNICAL CONTENT, PROCEDURES FOR USE, INPUT/OUTPUT FORMATS, SAMPLE PROBLEMS AND EXAMPLES OF INPUT DATA. THE HEART OF THE MANUAL IS A CATALOG OF SCENARIOS FROM WHICH THE USER MAY CHOOSE. A SYSTEMS MODEL FOR SLB OF LOW-LEVEL WASTE WAS ASSEMBLED FROM EXISTING MODELS AVAILABLE IN THE NUCLEAR INDUSTRY. THE MODEL COVERS WASTE PACKAGING, TRANSPORTATION, BURIAL, AND POST BURIAL ACTIVITIES. SUBPROGRAMS WERE DEVELOPED FOR UNSATURATED ZONE SEEPAGE, AQUIFER TRANSPORT, WIND EROSION, AND ATMOSPHERIC TRANSPORT. RELEASE VIA AVAILABLE PATHWAYS ARE CONVERTED TO POPULATION DOSE COMMITMENTS USING STANDARD REGULATORY GUIDE AND ICRP TECHNIQUES. THE SYSTEM MODEL STARTS WITH AN INITIATING EVENT SELECTED FROM A LIST OF SCENARIOS FROM AN EVENT TREE ANALYSIS PATHWAY SEQUENCE. INVENTORY, AND RELEASE FRACTION FOR EACH SCENARIO ARE AVAILABLE WITHIN A STANDARD DATA BASE. THE EXECUTIVE PROGRAM WHICH EXECUTES THE SYSTEM MODEL CALLS SUBROUTINE IN PROPER SEQUENCE AND PROVIDES FOR THE ANALYSIS OF SEVERAL HUNDRED ACCIDENT AND SCENARIO POSSIBILITIES.

697

SYSTEM ANALYSIS OF SHALLOW LAND BURIAL. VOL. 2. TECHNICAL
BACKGROUND

NUREG/CR-1963, VOL. 2

LESTER, D.; BUCKLEY, D.; DONELSON, S.; DURA, V.; HECHT, M.;
HORTON, W.; NAKAI, T.; PASTERNAK, T.; ROBERTSON, L.; STULA,
R.; STODDARD, J.

810101

U.S. NRC, WASHINGTON, DC. 350 P.
SCIENCE APPLICATIONS, INC. LA JOLLA, CA
N,1;N,2;N,3;B,N,4;B,N,5;B,N,7;N,8;N,9;N,0,B

SEE ACN=696 AND 698. THIS IS VOL. 2 OF A THREE VOL. SET DETAILING THE ACTIVITIES AND RESULTS OF THE SYSTEM ANALYSIS OF SHALLOW LAND BURIAL PROJECT. ACTIVITIES UNDER FOUR PROJECT TASKS ARE DESCRIBED: IDENTIFY POTENTIAL RADIONUCLIDE RELEASE PATHWAYS, SYSTEMS MODEL FOR SHALLOW LAND BURIAL OF LLW, SENSITIVITY AND OPTIMIZATION STUDY, AND REFERENCE FACILITY DOSE ASSESSMENT.

698

SYSTEM ANALYSIS OF SHALLOW LAND BURIAL. VOL. 3. APPENDICES
NUREG/CR-1963, VOL. 3

LESTER, D.; BUCKLEY, D.; DONELSON, S.; DURA, V.; HECHT, M.;
HORTON, W.; NAKAI, T.; PASTERNAK, T.; ROBERTSON, L.; STULA,
R.; STODDARD, J.

810101

U.S. NRC, WASHINGTON, DC. 240 P.
SCIENCE APPLICATIONS, INC., LA JOLLA, CA
N,1;N,2;N,3;N,7;N,8;N,9

SEE ACN#696 AND 697. THIS APPENDIX IS VOL. 3 OF A THREE
VOL. REPORT ON THE SYSTEMS ANALYSIS OF SHALLOW LAND BURIAL
PROJECT AND CONTAINS THE COMPLETE DATA BASE.

699

TRANSPORTATION ACCIDENT RISKS IN THE NUCLEAR POWER INDUSTRY
1975-2020

NSS 8191.1

HODGE, C.V.; JARRETT, A.A.

741101

HOLMES & NARVER, INC., ANAHEIM, CA. 121 P.

HOLMES & NARVER, INC.

O,1;O,3;O,5,B;O,9;O,0,B

A QUANTITATIVE ASSESSMENT WAS MADE OF THE ACCIDENT RISKS
ASSOCIATED WITH THE TRANSPORTATION OF RADIOACTIVE MATERIAL IN
THE NUCLEAR POWER INDUSTRY TO THE YR 2020. A SCENARIO WAS
DEVELOPED FOR THE PERIOD FROM 1975 TO 2020 FOR SHIPMENTS BETWEEN
NUCLEAR REACTORS, CHEMICAL REPROCESSING PLANTS, FUEL FABRICATION
FACILITIES AND WASTE REPOSITORIES. TECHNICAL DATA FROM NUMEROUS
SOURCES WERE COLLECTED FOR SHIPMENTS OF SPENT FUEL, RECYCLED
PLUTONIUM, HIGH-LEVEL RADIOACTIVE SOLID WASTE AND
FISSION-PRODUCT GASES. ASSUMPTIONS WERE DEVELOPED REGARDING
TRANSPORT MODES, SHIPPING CONTAINERS, TRANSPORT PATHWAYS FOR
DISPERSION OF RELEASED RADIOACTIVITY, POPULATION DISTRIBUTION
AND HEALTH RESPONSES TO RADIOLOGICAL EXPOSURE. FAULT TREE
ANALYSIS WAS USED TO ESTIMATE THE PROBABILITY OF RELEASE FROM
SHIPPING CONTAINERS TAKING INTO CONSIDERATION THE TRANSPORT MODE,
SEVERITY OF THE ACCIDENT AND DAMAGE TO THE PACKAGE. ESTIMATES
WERE MADE OF THE FRACTION OF THE RADIOACTIVE CONTENTS WHICH
COULD BE RELEASED AS A RESULT OF EACH CLASS OF ACCIDENT.
CALCULATIONS WERE MADE OF THE ANNUAL FREQUENCY OF ACCIDENTS AND
THE FREQUENCY OF RADIOLOGICAL RELEASES. RISKS WERE CHARACTERIZED
BY THE PROBABILITY OF RELEASE AND THE MAGNITUDE OF THE RESULTING
EXPOSURE. BOTH INDIVIDUAL EXPOSURE AND POPULATION DOSES WERE
CALCULATED.

700

RADON DAUGHTER EXPOSURE TO URANIUM MINERS

COHEN, B.L.

#20101

PERGAMON PRESS, NEW YORK

UNIV. OF PITTSBURGH

HEALTH PHYS. 42(4):449-457.

D,5,C;D,5,E;D,5,G

RADON EXPOSURES TO U.S. U MINERS UNDER PRESENT CONDITIONS AVERAGE ABOUT 1.3 WLM PER YR ~ 60 WLM PER FULL WORKING LIFETIME. THIS IS INTERMEDIATE BETWEEN (1) THE LOWEST EXPOSURES FOR WHICH THERE HAVE BEEN EXCESS LUNG CANCERS REPORTED AMONG U.S. MINERS (120-240 WLM) AND (2) AVERAGE ENVIRONMENTAL RADON EXPOSURES (16 WLM), SO MODELS BASED ON THESE TWO SITUATIONS ARE USED TO ESTIMATE EXPECTED EFFECTS ON PRESENT URANIUM MINERS. IN MODEL A, THE LOSS OF LIFE EXPECTANCY IS 45 DYS, THE SMR (STANDARDIZED MORTALITY RATIO) FOR LUNG CANCER IS 1.10, AND THE SMR FOR ALL CAUSES BETWEEN AGES 18 AND 65 IS 1.013. IN MODEL B THESE ARE 10 DAYS, 1.02 AND 1.002 RESPECTIVELY. IT IS SHOWN THAT THE RADON EXPOSURES TO MINERS ARE SIMILAR TO THOSE TO MILLIONS OF AMERICANS FROM ENVIRONMENTAL EXPOSURE, AND THAT MINER HEALTH RISKS ARE COMPARABLE TO THOSE OF OTHER RADIATION WORKERS. THEIR LUNG CANCER RISK FROM RADON IS 7-50 TIMES LESS THAN THEIR JOB-RELATED ACCIDENT MORTALITY RISK, AND REPRESENTS 0.7-4% OF THEIR TOTAL RISK IN MINING. MINERS SUFFER FROM MANY DISEASES WITH SMR VERY MUCH LARGER THAN FOR RADON-INDUCED LUNG CANCER, AND THERE ARE MANY OTHER OCCUPATIONS AND INDUSTRIES WITH FAR HIGHER SMR FOR LUNG CANCER THAN THAT FROM RADON EXPOSURES TO MINERS.

701

DISPOSAL OF RADIOACTIVE WASTES BY STORAGE IN A SALT MINE IN
THE FEDERAL REPUBLIC OF GERMANY

STI/PUB/264; CONF-700905

ALBRECHT, E.; KUERN, K.; PERZL, F.; DIEFENBACHER, W.; HEIL, J.;
KRAUSE, H.; SCHUCHARDT, M.C.

700101

IAEA, VIENNA

GESELLSCHAFT FUER STRAHLENFORSCHUNG MBH, MUNICH

MANAGEMENT OF LOW- AND INTERMEDIATE LEVEL RADIOACTIVE WASTE. PP.
735-759.

N,1;N,4,A;N,4,C

DISPOSAL OF LOW- AND INTERMEDIATE-LEVEL RADWASTE IN THE ASSE SALT MINE IN LOWER SAXONY HAS BEEN ACCOMPLISHED IN AN EXTENSIVE PROGRAM OF SCIENTIFIC RESEARCH AND TECHNOLOGICAL DEVELOPMENT. 200 LITRE DRUMS OF WAST WERE EMPLACED IN SALT MINE CHAMBERS IN VARIOUS CONFIGURATIONS AT A DEPTH OF 750 METERS. TRANSPORTATION AND HANDLING TECHNIQUES WITHIN THE MINE WERE EVALUATED AND SAFETY MONITORING OF THE OPERATION CARRIED OUT AT ALL TIMES. OPERATIONS TO DATE HAVE NOT ENCOUNTERED ANY SIGNIFICANT COMPLICATIONS OR RADIOACTIVE CONTAMINATION.

702

A COST/BENEFIT ANALYSIS OF METHODS FOR CONTROLLING THE
RELEASE OF RADIOACTIVE MATERIALS IN THE NUCLEAR FUEL
CYCLE

STI/PUB/465; INEA-CN-36/429

BLANCO, R.E.; DAHLMAN, R.C.; DAVIS, W., JR.; FINNEY, B.C.;
GROENIER, M.S.; HILL, G.B.; KIBBEY, A.H.; KITTS, F.C.;
LINDAUER, R.B.; MOORE, R.E.; PECHIN, W.H.; REDDY, J.W.;
RYON, A.D.; SEAGREN, R.D.; SEARS, M.B.; WITHERSPOON, J.P.

770101

IAEA, VIENNA

OAK RIDGE NATIONAL LABORATORY

NUCLEAR POWER AND ITS FUEL CYCLES, VOL. 5, PP. 351-365.

C,1;C,5,D;P,1;P,5,D

COST/BENEFIT SURVEYS WERE MADE TO DETERMINE THE COST (IN DOLLARS) AND EFFECTIVENESS OF RADWASTE TREATMENT SYSTEMS FOR DECREASING THE RELEASE OF RADIOACTIVE MATERIALS FROM MODEL FUEL CYCLE FACILITIES, AND TO DETERMINE THE BENEFITS IN TERMS OF REDUCTION IN RADIOLOGICAL DOSE COMMITMENT TO INDIVIDUALS AND POPULATIONS IN THE SURROUNDING AREAS. THE STUDIES INCLUDE MILLING OF U ORES, CONVERSION OF VIRGIN U AND RECYCLE U TO UF₆, FABRICATION OF LWR FUELS CONTAINING ENRICHED U OR ENRICHED U AND PU, FABRICATION OF HIGH-TEMPERATURE GAS-COOLED REACTOR FUELS CONTAINING U-233 AND TH, REPROCESSING OF LWR AND HTGR FUELS. CONCEPTUAL FLOWSHEETS WERE PREPARED FOR EACH MODEL FACILITY ILLUSTRATING THE TREATMENT METHODS OF GASEOUS AND LIQUID EFFLUENTS. THE 'BASE' CASE REPRESENTS THE LOWEST TREATMENT COST, CURRENT TREATMENT TECHNOLOGY, AND HIGHEST RADIOLOGICAL DOSE. IN SUCCEEDING CASES, INCREASINGLY EFFICIENT RADWASTE TREATMENT EQUIPMENT IS ADDED TO THE 'BASE' PLANT TO REDUCE THE AMOUNTS OF RADIOACTIVE MATERIALS RELEASED. THE TECHNOLOGY RANGES FROM THAT CURRENTLY AVAILABLE TO THAT WHICH MAY BE DEVELOPED OVER THE NEXT 30 YRS. THE STATUS OF DEVELOPMENT FOR THESE TECHNOLOGIES IS DISCUSSED. THE DOSE ESTIMATES ARE FOR MAXIMUM INDIVIDUAL TOTAL BODY AND ORGAN DOSES AT THE PLANT BOUNDARY AND FOR POPULATION TOTAL-BODY AND ORGAN DOSES OUT TO 89 KM. COMPARISONS OF THE DOSES VS ANNUAL COSTS IN DOLLARS ARE PRESENTED. IN SUMMARY, THEY INDICATE THAT (1) THE ANNUAL DOSES CAN BE REDUCED TO VERY LOW FRACTIONS OF THE NATURAL BACKGROUND DOSE BY THE SUCCESSFUL DEVELOPMENT AND APPLICATION OF THE RADWASTE TREATMENT METHODS; AND (2) EXCLUDING MILLS, THE CAPITAL COSTS FOR THE TREATMENT METHODS VARY FROM 0.02 TO 8% OF THE CAPITAL COST OF THE BASE PLANTS AND THE TOTAL ANNUAL OPERATING COST (FIXED CHARGES PLUS OPERATING COSTS) VARY FROM 0.009 TO 7.0% OF THE CAPITAL COSTS FOR THE PLANT.

703

A METHODOLOGY FOR RISK ANALYSIS OF NUCLEAR WASTE MANAGEMENT
SYSTEMS

BNWL-SA-4899

SMITH, T.H.; WINEGARDNER, W.K.; JANSEN, G., JR.; WILLIAMS, L.D.;

MCSWEENEY, T.I.

740601

BATTELLE, PACIFIC NORTHWEST LABORATORIES, RICHLAND, WA, 23 P.
BATTELLE, PACIFIC NORTHWEST LABORATORIES

C,1;C,2;C,3;C,4,A;C,5,B;C,6;C,0,A;C,0,B;L,1;L,2;L,3

THE PAPER WAS PUBL. IN TRANS. AM. NUC. SOC, 18:191. THIS REPORT DESCRIBES A METHODOLOGY FOR RA OF NUCLEAR WASTE MANAGEMENT SYSTEMS. THE REQUIRED INFORMATION AND CALCULATIONS ARE DISCUSSED, ALONG WITH COMPUTER CODES USED FOR INVENTORY CALCULATIONS, FAULT TREE EVALUATIONS, LIQUID AND AIRBORNE TRANSPORT, AND DOSES TO MAN. THE REPORT ANALYZES A HIGH-LEVEL WASTE MANAGEMENT SCHEME PROPOSED FOR THE YR 2000. THE RESULTS ARE INTENDED TO GUIDE R&D EFFORTS, FORMULATIONS OF WASTE PRODUCT CRITERIA, AND COMPARISONS OF ALTERNATIVE WASTE MANAGEMENT SCHEMES.

704

SAFETY ASPECTS OF REPROCESSING AND PLUTONIUM FUEL
FACILITIES IN PNC

STI/PUB/465; IAEA-CN-36/550

AKUISO, H.; NAKAJIMA, K.; KONU, K.; MUTO, T.; SATO, S.

770101

IAEA, VIENNA

POWER REACTOR AND NUCLEAR FUEL DEVELOPMENT CORP.
NUCLEAR POWER AND ITS FUEL CYCLE. VOL. 5. PP. 793-805.
J,1;J,4;J,5;J,7;1,1;1,4;1,5;1,7

PNC COMPLETED THE CONSTRUCTION OF THE FIRST JAPANESE REPROCESSING PLANT IN 1974, AND THE STARTUP IS NOW UNDER WAY. THE PLANT WILL HAVE A CAPACITY OF 0.7 METRIC TONS OF SPENT FUEL PER DAY. VARIOUS SAFETY MEASURES FOR EARTHQUAKE, RADIATION, CRITICALITY, FIRE, EXPLOSION AND LEAKAGE OF RADIOACTIVE MATERIALS ARE DISCUSSED. R&D FOR THE REMOVAL OF KR-85 AND REDUCING RADIOACTIVITY RELEASED TO THE SEA ARE BEING CARRIED OUT. THE SOLIDIFICATION OF RADIOACTIVE LIQUID WASTE IS ALSO BEING INVESTIGATED. THE SAFETY CONTROL OF PU R&D AND FUEL FABRICATION IN THE PU-HANDLING FACILITY HAS BEEN SUCCESSFUL WITHOUT SIGNIFICANT ABNORMAL OCCURRENCE FOR 10 YRS. BY A POLICY OF 'ZERO-CONTAMINATION CONTROL' THE SURFACE AND AIRBORNE CONTAMINATION IN THE OPERATION ROOMS IS MAINTAINED AT THE BACKGROUND LEVEL IN USUAL OPERATION. PU INTAKE WAS FOUND TO BE AT MAXIMUM ABOUT ONE-HUNDRETH OF THE MPB. EXTERNAL EXPOSURE HAS BEEN GENERALLY CONTROLLED BELOW THREE-TENTHS OF A REM FOR THREE MONTHS, BY SHIELDING AND PROCESS AUTOMATION. THE RADIOACTIVITY CONCENTRATION OF EXHAUST AIR AND LIQUID EFFLUENT DISPOSAL IS MAINTAINED FAR BELOW THE REGULATION LEVEL. NUCLEAR MATERIAL CONTROL IS MAINTAINED BY A COMPUTER SYSTEM AND NO CRITICALITY PROBLEM HAS OCCURRED. THE SAFEGUARDS SYSTEM AND INSTALLATIONS HAVE BEEN IMPROVED AND ARE SUFFICIENT TO SATISFY THE IAEA REGULATIONS.

705

RISK ANALYSIS OF THE FUEL CYCLE IN THE NETHERLANDS

STI/PUB/465; IAEA-CN-36/288

VAN OTTERLOO, R.W.

770101

IAEA, VIENNA

N.V. KEPA, ARNHEM

NUCLEAR POWER AND ITS FUEL CYCLE, VOL. 5, PP. 179-191.

G,1;G,2;G,3;G,4,A;G,4,C;G,5,B;G,5,D;H,1;H,2;H,3; H,4,A;H,4,C;H,5,
B;H,5,D;M,1;M,2;M,3;M,4,A;M,4,C;M,5,B; N,5,D;O,1;O,2;O,3;O,
5,B;O,5,D

THE RISK ANALYSIS OF THE FUEL CYCLE HAS BEEN MADE BY ORDER OF THE MINISTER OF ECONOMIC AFFAIRS AND HAS BEEN PREPARED BY PERSONNEL OF THE INTERESTED PARTIES. THE ANALYSIS IS BASED ON A TOTAL OUTPUT CAPACITY OF NUCLEAR POWER STATIONS OF APPROX. 3500 MWE. THE RISKS OF ALL THE PHASES OF THE FUEL CYCLE HAVE BEEN ASSESSED AS FAR AS THIS IS OR WILL BE APPLIED IN THE NEAR FUTURE WITHIN OUR FRONTIER. ALSO NORMAL OPERATION OF THE POWER PLANTS AND THE RISKS OF ITS RADIOACTIVE RELEASES ARE ASSESSED. THE PREDOMINANT RISK OF THE FUEL CYCLE IS THE RISK CAUSED BY CORE MELT IN A NUCLEAR POWER PLANT. THE RA OF THE TWO EXISTING POWER STATIONS BORSSELE AND DODEWAARD HAS BEEN APPLIED ANALOGOUS TO WASH-1400. THE RELIABILITY ANALYSIS METHOD (FAULT TREES AND EVENT TREES) AND THE COMPUTER CODES AND FAILURE DATA WERE APPLIED AS FAR AS THIS WAS JUSTIFIABLE. THE RISK, CAUSED BY A CORE MELT, OF THE THREE NEW 1000 MWE PLANTS HAS BEEN ASSESSED BY USING WASH-1400 RESULTS. A CONCLUSION THAT CAN BE DRAWN FROM THIS STUDY IS: THE RISKS FOR THE DUTCH POPULATION FROM AN INSTALLED NUCLEAR CAPACITY OF 3500 MWE ARE DETERMINED BY THE NUCLEAR POWER STATIONS; THE RISKS RESULTING FROM SECONDARY ACTIVITIES, SUCH AS FUEL ENRICHMENT, FUEL FABRICATION, TRANSPORTS AND WASTE TREATMENT ARE SMALL AS COMPARED TO THOSE FROM THE NUCLEAR POWER PLANTS AND ARE MOREOVER IN MANY CASES MORE EASILY INFLUENCED BY TECHNICAL MEASURES AND/OR REGULATIONS.

706

A PERSPECTIVE ON THE RADIATION PROTECTION PROBLEM AND RISK

ANALYSIS FOR THE NUCLEAR ERA

STI/PUB/465; IAEA-CN-36/395

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770101

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NUCLEAR POWER AND ITS FUEL CYCLE, VOL. 7, PP. 295-308.

P,1;P,4,C;P,5,D;P,9;P,0

THE PROJECTED LARGE SCALE USE OF NUCLEAR ENERGY AND SOURCES OF IONIZING RADIATIONS WOULD INVOLVE THE RADIATION EXPOSURE OF LARGER NUMBERS OF OCCUPATIONAL WORKERS, INDIVIDUALS AND GROUPS IN THE POPULATION, AND THE POPULATION AT LARGE. THERE IS AN URGENT NEED FOR PROJECTING THESE EXPOSURES IN A PROPER PERSPECTIVE, BY COMPARING THE ASSOCIATED RISKS WITH THE RISKS

FROM ALTERNATIVE ENERGY SOURCES, A COMPARATIVE STUDY OF THE RISK OF CANCER MORTALITY FROM RADIATIONS AND AIRBORNE CHEMICAL POLLUTANTS HAS BEEN PRESENTED. RADIATION RISK DATA IS GIVEN IN TERMS OF CANCER DEATHS PER MILLION PER YR FOR A GIVEN DOSE RATE, BASED ON THE HUMAN EXPERIENCE. THE LUNG CANCER RISKS OF THE COMBINED PRODUCTS OF COAL BURNING AND A SPECIFIC CARCINOGEN BENZO(A)PYRENE HAVE ALSO BEEN ESTIMATED, BASED ON THE EXTENSIVE EPIDEMIOLOGICAL DATA AVAILABLE FOR DIFFERENT COUNTRIES. USING THE DOSE-RESPONSE DATA FOR RADIATION EXPOSURE AT DIFFERENT ANNUAL DOSE RATES, DOSE EQUIVALENTS OF CHEMICAL POLLUTANTS HAVE BEEN DETERMINED. WHEREAS THE ESTIMATED RISK FOR POWER REACTOR EFFLUENTS IS FOUND TO BE ONLY 1% OF THE RISK AT THE ICRP DOSE LIMITS FOR ERRORS OCCUR FREQUENTLY, BUT SELDOM IDENTICALLY; PERSONNEL ERRORS CONTRIBUTE TO A SIGNIFICANT PERCENTAGE OF THE INCIDENTS; AIRBORNE RELEASE RISK IS SMALL; NO SIGNIFICANT CHEMICAL TOXICITY HAZARDS AND NO UNIQUE INDUSTRIAL HAZARDS WERE IDENTIFIED.

707

AN ASSESSMENT METHODOLOGY OF ENVIRONMENTAL RISKS ASSOCIATED
WITH RADIOACTIVE WASTE MANAGEMENT

STI/PUB/465; IAEA-CN-36/28

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NUCLEAR POWER AND ITS FUEL CYCLE. VOL. 4. PP. 291-302.

C,1;C,2;C,3 ;C,5;C,6;C,7;L,1;L,2;L,3;L,5,D;L,6;L,7

THIS PAPER DESCRIBES A COMPREHENSIVE MODEL DEVELOPED DURING 1976 FOR THE PUBLIC HEALTH AND ENVIRONMENTAL IMPACTS FROM THE DISPOSAL OF HIGH-LEVEL AND TRU WASTE IN GEOLOGICAL FORMATIONS. PARAMETRIC STUDIES HAVE BEEN PERFORMED WITH THIS MODEL FOR VARIOUS GEOLOGICAL DISPOSAL MEDIA AND FOR WASTE IN DIFFERENT FORMS. EPA HAS PLANNED TO UTILIZE THESE PARAMETRIC RISK CALCULATIONS TO TRANSLATE PROBABILITIES AND CONSEQUENCES OF RISK OCCURRENCES INTO A COST-EFFECTIVENESS PERSPECTIVE FOR DECISION-MAKING PURPOSES. THIS COMPREHENSIVE MODEL CONSISTED OF A RELEASE OR FAULT-TREE MODEL, AN ENVIRONMENTAL MODEL AND AN ECONOMIC MODEL. FAULT TREES HAVE BEEN CONSTRUCTED TO PROVIDE THE RELATIONSHIPS BETWEEN VARIOUS GEOPHYSICAL, METEOROLOGICAL AND MAN-CAUSED EVENTS WHICH ARE POTENTIAL MECHANISMS FOR RELEASE OF RADIOACTIVE MATERIAL TO THE ENVIRONMENT FROM WASTE REPOSITORIES. THE ENVIRONMENTAL MODEL INCLUDES TRANSPORT TO AND ACCUMULATIONS AT VARIOUS RECEPTORS IN THE BIOSPHERE, INCLUDING A DETERMINATION OF PATHWAYS FROM ENVIRONMENTAL INPUT CONCENTRATIONS TO RADIATION DOSE TO MAN. THE ECONOMIC RESULTS ARE USED TO COMPARE AND ASSESS THE VARIOUS DISPOSAL CONCEPTS AS A BASIS FOR FORMULATING POLICY DECISIONS. IMPLEMENTATION OF THIS ASSESSMENT METHODOLOGY IS POSSIBLE FOR A WHOLE RANGE OF RADIOACTIVE AND NON-RADIOACTIVE HAZARDOUS MATERIALS WHICH REQUIRE PERPETUAL CARE. THE OUTPUT WILL BE USED BY EPA IN THE SHORT TERM TO DEVELOP GENERAL

ENVIRONMENTAL STANDARDS APPLICABLE TO ANY RADWASTE MANAGEMENT ALTERNATIVE.

708

CHEMICAL SEPARATION AND NUCLEAR TRANSMUTATION OF BY-PRODUCT ACTINIDES

EUR-6871; CONF-8005143

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800101

HARWOOD ACADEMIC PUBL., NEW YORK

COMMISSION OF THE EUROPEAN COMMUNITIES, ISPRA

RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL, PP. 181-203.

I,1;J,1;L,1;P,1

THE PAPER PRESENTS THE MOST IMPORTANT RESULTS AND CONCLUSIONS OF THE ASSESSMENT STUDIES CARRIED OUT BY THE JOINT RESEARCH CENTRE-ISPRA AND BY OTHER ORGANIZATIONS ON THE ADVANCED WASTE DISPOSAL STRATEGY BASED ON CHEMICAL SEPARATION OF BY-PRODUCT ACTINIDES (BPA'S) FROM HLW AND THEIR TRANSMUTATION IN NUCLEAR REACTORS. THE TECHNOLOGICAL DEVELOPMENTS REQUIRED FOR THE IMPLEMENTATION OF THIS STRATEGY HAVE BEEN IDENTIFIED: THEY CONCERN MAINLY FUEL REPROCESSING, BPA RECOVERY FROM ALL IMPORTANT WASTE STREAMS AND FUEL REFABRICATION. AFTER CONSIDERATION OF DIFFERENT STRATEGIES FOR BPA TRANSMUTATION, THE HOMOGENEOUS RECYCLING IN FBR'S APPEARS TO BE MOST SUITABLE DUE TO ITS TRANSMUTATION RATE AND THE COMPATIBILITY OF BPA'S WITH ITS FUEL CYCLE. THE FUEL CYCLE WITH TRANSMUTATION HAS BEEN COMPARED WITH AN ADVANCED REFERENCE FUEL CYCLE ON THE BASIS OF COSTS AND RISKS. THE LARGE EFFORT REQUIRED FOR THE DEVELOPMENT AND IMPLEMENTATION OF THIS NEW FUEL CYCLE, THE INCREASED COSTS OPERATING THE FUEL CYCLE COMPARED WITH THE MARGINAL BENEFITS IN THE LONG-TERM RISK OF GEOLOGICAL DISPOSAL, MAKE THIS STRATEGY NOT VERY ATTRACTIVE.

709

DISPOSAL IN SALT FORMATIONS

EUR-6871; CONF-8005143

KUEHN, K.; VERKERK, B.

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HARWOOD ACADEMIC PUBL., NEW YORK

GESELLSCHAFT FUER STRAHLEN- UND UMWELTFORSCHUNG MBH

RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL, PP. 385-419.

C,7;L,1;L,2;L,3;L,4;L,5;L,7

RESULTS OF R&D WORK PERFORMED UNDER CONTRACT WITH THE COMMISSION OF THE EUROPEAN COMMUNITY FROM 1975 TO 1979 ARE REPORTED. THE MAIN OBJECTIVE OF THE GERMAN PROGRAM IS TO PERFORM A TEST DISPOSAL OPERATION WITH REAL HLW GLASS BLOCKS IN THE ASSE SALT MINE. THE DUTCH PROGRAM COVERS A BROADER RANGE FROM SITE SELECTION TO SAFETY ANALYSIS. THE GERMAN LAB EXPERIMENTS CONCENTRATE ON ROCK MECHANICAL PROBLEMS AND ON THE NATURALLY OCCURRING WATER IN HALITE. IN SITU EXPERIMENTS IN THE ASSE SALT

MINE VERIFY QUESTIONS OF HEAT DISSIPATION, BRINE MIGRATION, AND STRAIN AND STRESS DETERMINATIONS, IN A FIELD OF HLW CANISTERS. FIELD EXPERIMENTS MONITOR SEISMIC EVENTS AND THEIR CONSEQUENCES ON UNDERGROUND OPENINGS AS WELL AS PROFILES OF TEMPERATURE, DENSITY AND CONCENTRATION IN FLOODED SHAFTS. THERMAL AND THERMO-MECHANICAL COMPUTER PROGRAMS ARE DEVELOPED. TECHNICAL FACILITIES AND EQUIPMENT FOR THE TEST DISPOSAL WERE DESIGNED. FIVE SALT DOMES IN THE NETHERLANDS WERE PRESELECTED FOR FURTHER INVESTIGATION. A REPOSITORY DESIGN WAS DEVELOPED. THERMAL EFFECTS OF HLW DISPOSAL ARE CALCULATED BY COMPUTER PROGRAMS. A DRY-DRILLING EXPERIMENT OF A BOREHOLE 300 M IN DEPTH WAS SUCCESSFULLY PERFORMED IN THE ASSE SALT MINE AND IS BEING MONITORED FOR CONVERGENCE. SAFETY STUDIES RESULT IN NO UNDUE RISK.

710

RISK ANALYSIS OF GEOLOGICAL DISPOSAL OF RADIOACTIVE WASTES
EUR-6871; CONF-8005143

GIRARDI, F.; DE MARSILY, G.; WEBER, J.
800101

HARWOOD ACADEMIC PUBL., NEW YORK
COMMISSION OF THE EUROPEAN COMMUNITIES
RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL, PP. 531-551.
L,1;L,2;N,1;N,2

THE PROBLEMS OF RA OF GEOLOGICAL DISPOSAL OF RADWASTE ARE BRIEFLY SUMMARIZED. SEVERAL CHARACTERISTICS, SUCH AS THE VERY LONG TIME SPAN CONSIDERED, MAKE IT RATHER UNIQUE AMONG THE PROBLEMS OF MODERN SOCIETY. THE SAFETY OF NUCLEAR WASTE DISPOSAL IN GEOLOGICAL FORMATIONS IS BASED ON SEVERAL BARRIERS, NATURAL AND MAN-MADE, WHICH PREVENT DISPOSED RADIONUCLIDES FROM REACHING THE BIOSPHERE. THEY INCLUDE (1) THE PHYSICO-CHEMICAL FORM OF THE CONDITIONED WASTE, (2) THE WASTE CONTAINER, (3) THE GEOLOGICAL ISOLATION, (4) BUFFERING AND BACKFILLING MATERIALS, RADIONUCLIDE RETENTION IN THE GEOSPHERE, AND (5) ENVIRONMENTAL DILUTION AND ISOLATION PROCESSES. THE KNOWLEDGE AVAILABLE ON EACH BARRIER AND ITS MODELING IS REVIEWED. SPECIFIC DISPOSAL STRATEGIES IN CLAY, GRANITE AND SALT FORMATIONS ARE CONSIDERED, OUTLINING THE PERFORMANCE OF THE BARRIERS IN EACH PARTICULAR STRATEGY, AND RESULTS OBTAINED IN PRELIMINARY EVALUATIONS.

713

SCENARIO DEVELOPMENT AND EVALUATION RELATED TO THE RISK
ASSESSMENT OF HIGH LEVEL RADIOACTIVE WASTE
REPOSITORIES. FINAL REPORT, JUNE 1979-1980

NUREG/CR-1608; CGS/NR85F060
SCHWARIZ, F.W.; DONATH, F.A.
800101

NTIS; U.S. GPO, NRC. 100 P.
CGS, INC.
C,1;C,2;C,3;C,5;C,7;L,1;L,2;L,3;L,5;L,7

THIS STUDY EXAMINES THE CONSEQUENCES OF DISRUPTIVE FEATURES WITHIN A GEOLOGIC REPOSITORY SYSTEM INTENDED FOR THE ISOLATION OF HIGH-LEVEL NUCLEAR WASTE. THE PRESENCE OF FAULT ZONES HAVING 'HIGH' HYDRAULIC CONDUCTIVITY DOES NOT CHANGE SIGNIFICANTLY THE CONFINEMENT CAPABILITIES OF A REFERENCE REPOSITORY SYSTEM (RRS) IN BEDDED SALT. FAULT ZONES OF 'LOW' HYDRAULIC CONDUCTIVITY CAN REDUCE OR ENHANCE THE CONFINEMENT CAPABILITIES, DEPENDING UPON CONDUCTIVITY MAGNITUDE AND LOCATION OF THE DEPOSITORY IN THE SYSTEM. THE ANALYSIS INDICATES THAT WITH ACCURATE CHARACTERIZATION AND PROPER UNDERSTANDING, A RRS WITH A FAULT ZONE MIGHT BE UTILIZED TO PROVIDE CONFINEMENT CHARACTERISTICS SUPERIOR TO THOSE OF THE UNFAULTED SYSTEM. THE PRESENCE OF FRACTURES DISTRIBUTED UNIFORMLY THROUGHOUT A TYPICAL GRANITE MASS COULD RESULT IN UNACCEPTABLE CONFINEMENT CAPABILITY FOR A REPOSITORY SYSTEM IN GRANITE. PRELIMINARY RESULTS EMPHASIZE THE NEED TO EVALUATE CRITICALLY THE ASSUMPTIONS INVOLVED IN MODELING GROUNDWATER FLOW IN FRACTURED MEDIA AND TO ACCURATELY CHARACTERIZE THE REPOSITORY SYSTEM.

714

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE WASTE: SMALL SAMPLE SENSITIVITY ANALYSIS TECHNIQUES FOR COMPUTER MODELS, WITH AN APPLICATION TO RISK ASSESSMENT

NUREG/CR-1397; SAND80-0020

IMAN, R.L.; CONOVER, W.J.; CAMPBELL, J.E.

800101

NTIS; U.S. GPO, NRC. 130 P.

SANDIA NATIONAL LABORATORIES

C,1;C,3;C,8;L,1;L,3;L,8

A VARIETY OF SITUATIONS REQUIRE THAT DECISIONS AND JUDGEMENTS BE MADE IN THE FACE OF UNCERTAINTY. THE SOURCE OF THIS UNCERTAINTY MAY BE LACK OF KNOWLEDGE ABOUT PROBABILITY DISTRIBUTIONS ASSOCIATED WITH INPUT VARIABLES, OR ABOUT DIFFERENT HYPOTHESIZED FUTURE CONDITIONS, OR MAY BE PRESENT AS A RESULT OF DIFFERENT STRATEGIES ASSOCIATED WITH A DECISION MAKING PROCESS. IN THIS PAPER A GENERALIZATION OF LATIN HYPERCUBE SAMPLING IS GIVEN THAT ALLOWS THESE AREAS TO BE INVESTIGATED WITHOUT MAKING ADDITIONAL COMPUTER RUNS. IN PARTICULAR IT IS SHOWN HOW WEIGHTS ASSOCIATED WITH LATIN HYPERCUBE INPUT VECTORS MAY BE CHANGED TO REFLECT DIFFERENT PROBABILITY DISTRIBUTION ASSUMPTIONS ON KEY INPUT VARIABLES AND YET PROVIDE AN UNBIASED ESTIMATE OF THE CUMULATIVE DISTRIBUTION FUNCTION OF OUTPUT VARIABLE. THIS ALLOWS FOR DIFFERENT DISTRIBUTION ASSUMPTIONS ON INPUT VARIABLES TO BE STUDIED WITHOUT ADDITIONAL COMPUTER RUNS AND WITHOUT FITTING A RESPONSE SURFACE. IN ADDITION THESE SAME WEIGHTS CAN BE USED IN A MODIFIED NONPARAMETRIC FRIEDMAN TEST TO COMPARE TREATMENTS. SAMPLE SIZE REQUIREMENTS NEEDED TO APPLY THE RESULTS OF THE WORK ARE ALSO CONSIDERED. THE PROCEDURES PRESENTED IN THIS REPORT ARE ILLUSTRATED USING A MODEL ASSOCIATED WITH THE RA OF A GEOLOGICAL DISPOSAL OF RADWASTE.

715

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: TRANSPORT MODEL SENSITIVITY ANALYSIS

NUREG/CR-1377; SAND80-0644

CAMPBELL, J.E.; IMAN, R.L.; REEVES, M.

800101

NTIS; U.S. GPO, NRC, 82 P.

SANDIA NATIONAL LABORATORIES

C,1;C,2;C,3;C,5;C,8;L,1;L,2;L,3;L,5;L,8; N,1;N,2;N,3;N,5;N,8

IN THIS REPORT, A SENSITIVITY ANALYSIS METHODOLOGY IS DEMONSTRATED FOR GEOSPHERE TRANSPORT. THE SENSITIVITY ANALYSIS USES TWO TRANSPORT SIMULATORS. ONE SIMULATOR IS THE GENERAL, MULTIDIMENSIONAL NUMERICAL MODEL SWIFT. THE OTHER IS THE SIMPLIFIED NETWORK FLOW MODEL NWFT, WHICH CONTAINS A ONE-DIMENSIONAL RADIONUCLIDE TRANSPORT SIMULATOR. STATISTICAL TECHNIQUES USED IN THE SENSITIVITY ANALYSIS INCLUDE LATIN HYPERCUBE SAMPLING AND STEPWISE REGRESSION ON RANKS. THE DEMONSTRATION PROBLEMS ARE BASED ON REFERENCE SITE GEOLOGY AND HYDROLOGY WHICH, ALTHOUGH HYPOTHETICAL, CONTAIN PROPERTIES OF REAL SITES. THREE DIFFERENT WASTE RELEASE SCENARIOS ARE EXAMINED.

716

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE

WASTE: THE DISTRIBUTED VELOCITY METHOD OF SOLVING THE
CONVECTIVE- DISPERSION EQUATION

NUREG/CR-1376 ; SAND80-0717

CAMPBELL, J.E.; LONGSINE, D.E.; REEVES, M.

800101

NTIS; U.S. GPO, NRC, 66 P.

SANDIA NATIONAL LABORATORIES

C,1;C,2;C,3;C,5;C,8;L,1;L,2;L,3;L,5;L,8;N,1;N,2;N,3;N,5;N,8

A NEW METHOD IS PROPOSED FOR TREATING CONVECTIVE-DISPERSIVE TRANSPORT. THE MOTIVATION FOR DEVELOPING THIS TECHNIQUE ARISES FROM THE DEMANDS OF PERFORMING A RA FOR A NUCLEAR WASTE REPOSITORY. THESE DEMANDS INCLUDE COMPUTATIONAL EFFICIENCY OVER A RELATIVELY LARGE RANGE OF PECLET NUMBERS AND THE ABILITY TO HANDLE CHAINS OF DECAYING RADIONUCLIDES WITH RATHER EXTREME CONTRASTS IN BOTH SOLUTION VELOCITIES AND HALF LIVES. TO THE EXTENT IT HAS BEEN TESTED TO DATE, THE DISTRIBUTED VELOCITY METHOD (DVM) APPEARS TO SATISFY THESE DEMANDS. INCLUDED IN THE PAPER ARE THE MATHEMATICAL THEORY, NUMERICAL IMPLEMENTATION, AN ERROR ANALYSIS EMPLOYING STATISTICAL SAMPLING AND REGRESSION ANALYSIS TECHNIQUES, AND COMPARISONS OF DVM WITH OTHER METHODS FOR CONVECTIVE/DISPERSIVE TRANSPORT.

717

GARD: A COMPUTER PROGRAM FOR THE GEOCHEMICAL ASSESSMENT OF
RADIONUCLIDE DISPOSAL

AECL-6318

ROSINGER, E.L.J.; TREMAINE, K.K.R.

780101

AECL, WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT, PINAWA,
MANITOBA. 55 P.

AECL, WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT
C,1;C,2;C,5;L,5

THE COMPUTER PROGRAM GARD IS BEING USED TO CALCULATE THE RATE OF MOVEMENT OF RADIONUCLIDES FROM A PROPOSED DEEP UNDERGROUND VAULT TO THE SURFACE OR NEAR SURFACE ENVIRONMENT. THE CONCEPTUAL MODEL REPRESENTS A DEEP UNDERGROUND VAULT IN IGNEOUS ROCK AND A SYSTEM OF FISSURES WHICH CONNECT THE VAULT WITH THE SURFACE OF THE GEOLOGIC FORMATION. AFTER A CERTAIN INITIAL PERIOD (CONTAINER INTEGRITY TIME), DURING WHICH THERE IS ASSUMED TO BE NO RELEASE, THE RADIONUCLIDES ARE ASSUMED TO BE RELEASED FROM A VAULT WITHIN A CERTAIN TIME (LEACH TIME) AND TRANSPORTED AS DISSOLVED SPECIES BY GROUNDWATER. IMPORTANT PHENOMENA INFLUENCING THEIR TRANSPORT ARE CONVECTION, RADIOACTIVE DECAY AND PHYSIOCHEMICAL PROCESSES SUCH AS SORPTION, ION EXCHANGE AND PRECIPITATION. FROM THE MATERIAL BALANCE, A SET OF PARTIAL DIFFERENTIAL EQUATIONS HAS BEEN FORMULATED. SIMULTANEOUS SOLUTION OF THESE EQUATIONS BY THE LAPLACE TRANSFORM TECHNIQUE LEADS TO EXPRESSIONS OF THE DISCHARGE RATES OF RADIONUCLIDE CHAINS AS A FUNCTION OF TIME AND DISTANCE.

718

RISK ASSESSMENT FOR RADIOACTIVE WASTE DISPOSAL

AECL-6322

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790101

NTIS; AECL, WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT, PINAWA,
MANITOBA. 21 P.

AECL, WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT
C,5;C,7;L,1;L,2;L,4;L,5;L,7;N,1;N,2;N,4;N,5;N,7

THE OBJECTIVES OF RA STUDIES FOR RADWASTE DISPOSAL ARE: TO SPECIFY THE FEATURES THAT PREVENT THE ESCAPE OF RADIONUCLIDES FROM A DEEP DISPOSAL VAULT, TO ESTIMATE HOW EFFECTIVE THESE FEATURES ARE LIKELY TO BE, AND TO DETERMINE THE POTENTIAL CONSEQUENCES OF THE EXPECTED SITUATION AND CONCEIVABLE BUT LIKELY SITUATIONS. THE MAJOR FEATURES TO BE ANALYZED INCLUDE THE INSOLUBLE NATURE OF THE WASTE FORM ITSELF, THE RESISTANCE OF ITS CONTAINER TO CORROSION OR MECHANICAL DAMAGE, THE EFFECTIVENESS OF THE MASSIVE ROCK BARRIER AND THE HOLD-UP AND DILUTION OF RADIONUCLIDES IN THE SURFACE ENVIRONMENT. COMPUTER MODELING IS USED IN A TECHNIQUE CALLED PATHWAY ANALYSIS TO BRING TOGETHER THE EXPERIMENTAL DATA, FIELD DATA AND UNDERSTANDING OF THE RELEVANT PHENOMENA INTO AN ASSESSMENT OF THE RESULTANT EFFECT ON MAN AND THE ENVIRONMENT.

719

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: A DISTRIBUTION-FREE APPROACH TO INDUCING RANK
CORRELATION AMONG INPUT VARIABLES FOR SIMULATION
STUDIES

NUREG/CR-1262; SAND80-0157

IMAN, R.L.; CONOVER, J.W.

800301

NTIS; U.S. GPO, NRC, 21 P.

SANDIA NATIONAL LABORATORIES

C,3;C,8;L,3;L,8;N,3;N,8

A METHOD FOR INDUCING A DESIRED RANK CORRELATION MATRIX ON
A MULTIVARIATE INPUT RANDOM VARIABLE IS INTRODUCED IN THIS
REPORT. THIS METHOD IS SIMPLE TO USE, IS DISTRIBUTION FREE,
PRESERVES THE EXACT FORM OF THE MARGINAL DISTRIBUTIONS ON THE
INPUT VARIABLES, AND MAY BE USED WITH ANY TYPE OF SAMPLING
SCHEME FOR WHICH CORRELATION OF INPUT VARIABLES IS A MEANINGFUL
CONCEPT. A SMALL SIMULATION STUDY PROVIDES AN ESTIMATE OF THE
BIAS AND VARIABILITY INVOLVED IN THE METHOD. INPUT VARIABLES
USED IN A MODEL FOR STUDY OF GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE PROVIDE AN EXAMPLE OF THE USEFULNESS OF THIS PROCEDURE.

720

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: SENSITIVITY ANALYSIS OF THE ENVIRONMENTAL
TRANSPORT MODEL

NUREG/CR-1636, VOL. 2; SAND79-1393

HELTON, J.C.; IMAN, R.L.

801201

NTIS; U.S. GPO, NRC, 228 P.

SANDIA NATIONAL LABORATORIES

C,1;C,2;C,3;C,5;C,8;L,1;L,2;L,3;L,5;L,8;N,1;N,2;N,3;N,5;N,8

RESULTS ARE PRESENTED FROM A SENSITIVITY ANALYSIS STUDY OF
A MODEL DEVELOPED TO REPRESENT THE SURFACE MOVEMENT OF
RADIONUCLIDES. THE STUDY HAS TWO PURPOSES: (1) TO DEVELOP A
CAPABILITY TO PERFORM SENSITIVITY ANALYSES OF THE MODEL AND (2)
TO ACQUIRE INSIGHT WITH RESPECT TO THE VARIABLES WHICH INFLUENCE
PREDICTIONS MADE BY THE MODEL. TWO VARIATIONS OF A HYPOTHETICAL
RIVER RECEIVING A RADIONUCLIDE DISCHARGE ARE DEFINED.
INDEPENDENT VARIABLES OF THE FOLLOWING TYPES ARE INTRODUCED:
VARIABLES WHICH DEFINE PHYSICAL PROPERTIES OF THE RIVER SYSTEM
AND VARIABLES WHICH SUMMARIZE RADIONUCLIDE PROPERTIES. THE
FOLLOWING DEPENDENT VARIABLES ARE INVESTIGATED: (1) RADIONUCLIDE
CONCENTRATION IN SOIL, (2) DISSOLVED RADIONUCLIDE CONCENTRATION
IN SURFACE-WATER AND (3) TOTAL RADIONUCLIDE CONCENTRATION IN
SURFACE-WATER. THE INVESTIGATION EMPLOYS SENSITIVITY ANALYSIS
TECHNIQUES BASED ON STEPWISE REGRESSION. THIS WORK CONSTITUTES
PART OF A PROGRAM AT SANDIA FUNDED BY NRC TO DEVELOP A
METHODOLOGY TO ASSESS THE RISK WITH GEOLOGIC DISPOSAL OF RAD-WASTE.

721

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: ASYMPTOTIC PROPERTIES OF THE ENVIRONMENTAL
TRANSPORT MODEL

NUREG/CR-1636, VOL. 3; SAND79-1908

HELTUN, J.C.; BROWN, J.B.; IMAN, R.L.

810201

NTIS; U.S. GPO, NRC, 166 P.

SANDIA NATIONAL LABORATORIES

C,1;C,2;C,3;C,5;C,8;L,1;L,2;L,3;L,5;L,8;N,1;N,2;N,3;N,5;N,8

THE ENVIRONMENTAL TRANSPORT MODEL IS A COMPARTMENTAL MODEL DEVELOPED TO REPRESENT THE SURFACE MOVEMENT OF NUCLIDES. THE PURPOSE OF THE PRESENT STUDY IS TO INVESTIGATE THE ASYMPTOTIC BEHAVIOR OF THE MODEL AND TO ACQUIRE INSIGHT WITH RESPECT TO SUCH BEHAVIOR AND THE VARIABLES WHICH INFLUENCE IT. FOR FOUR VARIABLES OF A HYPOTHETICAL RIVER RECEIVING A RADIONUCLIDE DISCHARGE, THE FOLLOWING PROPERTIES ARE CONSIDERED: PREDICTED ASYMPTOTIC VALUES FOR ENVIRONMENTAL RADIONUCLIDE CONCENTRATIONS AND TIME REQUIRED FOR RADIONUCLIDE CONCENTRATIONS TO REACH 90% OF THEIR PREDICTED ASYMPTOTIC VALUES. INDEPENDENT VARIABLES OF TWO TYPES ARE USED TO DEFINE EACH VARIATION OF THE RIVER: VARIABLES WHICH DEFINE PHYSICAL PROPERTIES AND VARIABLES WHICH SUMMARIZE RADIONUCLIDE PROPERTIES. SENSITIVITY ANALYSIS TECHNIQUES BASED ON STEPWISE REGRESSION ARE USED TO DETERMINE THE DOMINANT VARIABLES INFLUENCING THE BEHAVIOR OF THE MODEL.

722

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: SCENARIO DEVELOPMENT

NUREG/CR-1667; SAND80-1429

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SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM, 112 P.

SANDIA NATIONAL LABORATORIES

C,1;C,2;C,3;C,5;L,1;L,2;L,3;L,5;N,1;N,2;N,3;N,5

THIS IS A DRAFT REPORT. FOR SELECTING AND ANALYZING SCENARIOS, A DESCRIPTION OF THE REFERENCE SITE USED IN THE METHODOLOGY DEVELOPMENT IS PRESENTED. THIS DESCRIPTION CONTAINS THE STRATIGRAPHIC SEQUENCE OF THE REFERENCE SITE AND THE HYDRAULIC CHARACTERISTICS OF THE UNDISTURBED SYSTEM. INITIALLY, CONSIDERATION IS GIVEN TO A RELATIVELY LARGE NUMBER OF SCENARIOS. MANY OF THESE SCENARIOS CAN BE ELIMINATED. OTHERS CAN BE COMBINED AS A RESULT OF THEIR SIMILAR INFLUENCE ON THE REFERENCE SITES. THE SANDIA PROGRAM SCENARIOS ARE CATEGORIZED INTO THOSE PRIMARILY AFFECTING RELEASE FROM THE DEPOSITORY AND THOSE PRIMARILY AFFECTING TRANSPORT IN GROUNDWATER. A QUANTITATIVE EVALUATION (PER YR PROBABILITY OF OCCURRING) OF THE SET OF SCENARIOS ARRIVED AT IS PRESENTED.

723

INVESTIGATION OF THE ADEQUACY OF THE METEOROLOGICAL

TRANSPORT MODEL DEVELOPED FOR THE REACTOR SAFETY STUDY
CONF-780507

SPRUNG, J.L.; BROWN, W.D.; CHURCH, H.W.; MCGRATH, P.E.; RITCHIE,
L.T.; RUSSO, A.J.; STECK, G.P.; WAYLAND, J.R.; WALL, I.B.;
BLOND, R.M.

780101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
SANDIA NATIONAL LABORATORIES

PROBABILISTIC ANALYSIS OF NUCLEAR REACTOR SAFETY. VOL. 2. PP.
III.6-1-III.6-16.

C,5;P,1;P,2;P,5

RISK ESTIMATES FOR EARLY FATALITIES, CALCULATED USING THE
CONSEQUENCE MODEL (CRAC) OF THE REACTOR SAFETY STUDY, ARE
MINIMALLY SENSITIVE TO THE SPECIFICATION OF INVERSION LAYERS,
ARE ESSENTIALLY UNALTERED BY THE SUBSTITUTION OF SUBSTANTIALLY
MORE SOPHISTICATED PLUME RISE OR RAINSTORM/RUNOFF MODELS, AND
WOULD BE NEGLIGIBLY AFFECTED BY THE INCORPORATION OF WIND SHEAR.
REGRESSION ANALYSES SHOW THAT REACTOR SITE WIND AND POPULATION
DISTRIBUTIONS ARE NOT STRONGLY CORRELATED AND THAT POSITIVE AND
NEGATIVE CORRELATIONS OCCUR WITH NEARLY EQUAL FREQUENCY, WHICH
SUGGESTS THAT THEIR EFFECTS UPON AGGREGATE RISK CALCULATIONS
WOULD BE LARGELY SELF-CANCELLING. RESULTS FROM RISK CALCULATIONS
REPEATED USING DISPARATE METEOROLOGICAL FILES SUGGEST THAT
ADEQUATE RISK ESTIMATES FOR EARLY FATALITIES CAN BE OBTAINED FOR
SITES, FOR WHICH WIND SPEED, ATMOSPHERIC STABILITY, AND
PRECIPITATION DATA ARE UNAVAILABLE, BY SUBSTITUTING DATA FROM
ANOTHER SITE, WHICH HAS SIMILAR TOPOGRAPHY AND METEOROLOGY.
SUBSTITUTE METEOROLOGY CALCULATIONS SUGGEST THAT THE COMPOSITE
POPULATIONS USED IN THE REACTOR SAFETY STUDY CAUSED THE
PROBABILITIES OF EARLY FATALITIES FOR LOW CONSEQUENCE EVENTS TO
BE OVER-ESTIMATED BY ABOUT A FACTOR OF 3 AND TO BE
UNDERESTIMATED BY ABOUT THE SAME FACTOR FOR HIGHER CONSEQUENCE
EVENTS.

724

COST-BENEFIT ESTIMATE OF TRANSPORTING SPENT NUCLEAR FUEL BY
SPECIAL TRAINS

CONF-780507

GARRICK, B.J.; KAPLAN, S.

780101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
PICKARD, LOWE AND GARRICK, INC.

PROBABILISTIC ANALYSIS OF NUCLEAR REACTOR SAFETY. VOL. 3. PP.
IX.3-1-IX.3-10.

C,2;C,3;O,1;O,3;O,4;O,5

SPECIAL TRAINS HAVE BEEN ADVOCATED BY THE RAILROADS AS A
MEANS OF REDUCING THE RISK ASSOCIATED WITH THE SHIPMENT OF
RADIOACTIVE MATERIALS. SUCH TRAINS WOULD HAVE SEVERE LIMITATIONS
ON SPEED, PASSING CONDITIONS, AND TRAIN SIZE. THE RESULTING
EXTRA COST FOR SPECIAL TRAINS IS ABOUT \$20,000/AVERAGE SHIPMENT.
THE QUESTION TO BE ANSWERED IS, "IS THIS MUCH REDUCTION IN RISK,

EVEN IF IT COULD BE ACHIEVED BY SPECIAL TRAINS, WORTH THE \$20,000/SHIPMENT". A PROBABILISTIC RA IS PERFORMED BASED ON THE APPROPRIATE COMBINATION OF THE RESULTS OF SEVERAL GOVERNMENT STUDIES ON NUCLEAR TRANSPORTATION ACCIDENTS. THE CARGO INVOLVED IS SPENT FUEL FROM NUCLEAR POWER PLANTS. THE NUMBER \$1,000/MANREM HAS BEEN ADVANCED ESSENTIALLY AS A UTILITY FUNCTION FOR RADIATION. BASED ON THE \$1,000/MANREM NUMBER THE VALUE OF THE POSSIBLE REDUCTION IN RISK IS LESS THAN \$2,690/SHIPMENT. THIS VALUE IS SUBSTANTIALLY LESS THAN THE ESTIMATED EXTRA COST OF \$20,000/SHIPMENT.

725

PROBABILISTIC RISK ANALYSIS OF RADIOACTIVITY RELEASE AND
TRANSPORT FROM GEOLOGIC DISPOSAL OF RADIOACTIVE WASTES

CONF-780507

BERTUZZI, G.; CARETTA, A.; SHNEIDER, H.

780101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
COMMISSION OF THE EUROPEAN COMMUNITIES, ISPRA
PROBABILISTIC ANALYSIS OF NUCLEAR SAFETY. VOL. 3. PP.
IX.4-1-IX.4-12.

C,1;C,2;C,5;C,8;L,1;L,2;L,5,B;L,8;N,1;N,2;N,5,B;N,8

AN INTEGRATED MODELING SYSTEM FOR CALCULATING RADIONUCLIDE RELEASE AND BIOSPHERE TRANSPORT PROCESSES FROM GEOLOGIC DEPOSITORIES TO MAN, IS PRESENTED. BECAUSE OF LARGE UNCERTAINTIES IN THE MAJOR INPUT DATA, A PROBABILISTIC APPROACH HAS BEEN FOLLOWED, GIVING THE RESULTS IN FORM OF HISTOGRAMS. THIS TECHNIQUE ALLOWS THE IDENTIFICATION OF THOSE PARAMETERS WHICH CONTROL THE MODEL RESULTS AND ON WHICH MAJOR EFFORT MAY BE FOCUSED.

726

APPLYING BAYESIAN DECISION THEORY TO ASSESS REPROCESSING
ECONOMIC AND SOCIAL COST-BENEFITS

CONF-780507

HEISING, C.D.

780101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL
STANFORD UNIV.
PROBABILISTIC ANALYSIS OF NUCLEAR SAFETY. VOL. 2. PP.
IV.3-1-IV.3-10.

C,1;J,1 ;J,3;J,5

BAYESIAN DECISION THEORY, COMBINED WITH CONVENTIONAL SYSTEMS ANALYSIS TECHNIQUES INTO THE DISCIPLINE CALLED DECISION ANALYSIS, HAS BEEN APPLIED IN THIS WORK TO ASSESS ECONOMIC AND SOCIAL COST-BENEFITS ASSOCIATED WITH REPROCESSING NUCLEAR FUEL. PARTICULAR ATTENTION IS GIVEN TO THE MODELS WHICH HAVE BEEN DEVELOPED TO PLACE NUMERICAL ESTIMATES IN DOLLAR TERMS ON THE THREE CATEGORIES OF SOCIAL RISKS THAT HAVE BEEN IDENTIFIED WITH REPROCESSING. THESE CATEGORIES INCLUDE: (1) HEALTH, ENVIRONMENT,

AND SAFETY, (2) DIVERSION OF FISSIONABLE MATERIAL, INCLUDING SABOTAGE, TERRORIST ACTS, AND SUBNATIONAL DIVERSION, AND (3) NUCLEAR PROLIFERATION, DEFINED TO BE A DIVERSION AT THE NATIONAL LEVEL TO OBTAIN WEAPONS CAPABILITY. THE EMPHASIS IS PLACED ON THE THIRD CATEGORY, AS PROLIFERATION RISK HAS NOT BEEN TREATED ELSEWHERE IN A QUANTITATIVE FASHION; MOST ARGUMENTS HAVE IN THE MAIN BEEN QUALITATIVE CONJECTURES PUT FORTH BY POLITICAL SCIENTISTS.

727

DEVELOPMENT OF RISK ASSESSMENT METHODOLOGY APPLICABLE TO
RADIOACTIVE WASTE ISOLATION

CONF-780507

CAMPBELL, J.E.; MCGRATH, P.E.; CULLINGFORD, M.C.

780101

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

SANDIA NATIONAL LABORATORIES

PROBABILISTIC ANALYSIS OF NUCLEAR SAFETY, VOL. 8, PP.

IX.1-1-IX.1-16.

C,1;C,2;C,3;C,5;C,7;C,8;L,1;L,2;L,3;L,5,B;L,5,D;L,5,J;L,5,L;L,7;
L,8;N,1;N,2;N,3;N,5,B;N,5,D;N,5,J;N,5,L;N,7;N,8

THE RISK FROM RADIOACTIVE WASTE DISPOSAL IN DEEP GEOLOGIC FORMATION HAS NOT YET BEEN COMPLETELY ASSESSED. A COMPLETE ASSESSMENT SHOULD INCLUDE CREDIBLE ESTIMATES OF THE LIKELIHOOD THAT RADIOACTIVE MATERIALS WOULD ESCAPE THE REPOSITORY AND ENTER THE HUMAN ENVIRONMENT, AND THE MAGNITUDE OF THE RESULTANT CONSEQUENCES IN TERMS OF HUMAN HEALTH EFFECTS. IN ADDITION, SUCH AN ASSESSMENT SHOULD IDENTIFY THE DOMINANT CONTRIBUTORS TO RISK, AND TO THE EXTENT POSSIBLE, QUANTIFY THE UNCERTAINTIES IN RISK ESTIMATES. A COMPLETE RA MAY NOT BE POSSIBLE BECAUSE OF OUR LIMITED KNOWLEDGE OF VARIOUS ASPECTS OF GEOLOGY AND HYDROGEOLOGY IMPORTANT TO THE LONG-TERM SAFETY OF A RADWASTE REPOSITORY. THE RESULTS OF PAST ANALYSES ARE NOT ENTIRELY CONSISTENT, PERHAPS AS A DIRECT RESULT OF THE LIMITED KNOWLEDGE OF THE PHENOMENA INVOLVED. IT MAY, THEREFORE, SEEM PREMATURE TO ATTEMPT A RIGOROUS RA OF RADWASTE DISPOSAL IN DEEP, GEOLOGIC MEDIA AT THE PRESENT TIME. HOWEVER, THE VALUE OF SUCH ANALYSES LIES MORE IN THE INSIGHT AND INFORMATION THEY PROVIDE THAN IN THEIR PREDICTION OF ABSOLUTE LEVELS OF RISK.

728

STEPWISE REGRESSION WITH PRESS AND RANK REGRESSION (PROGRAM
USER'S GUIDE)

SAND79-1472

IMAN, R.L.; DAVENPORT, J.M.; FROST, E.L.; SHORTENCARIER, M.J.

800101

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM. 61 P.

SANDIA NATIONAL LABORATORIES

C,1;C,8

THIS REPORT CONTAINS A DESCRIPTION OF A STEPWISE MULTIPLE

REGRESSION PROGRAM. THIS PROGRAM PROVIDES FOR EITHER FORWARD STEPWISE OR BACKWARD ELIMINATION SOLUTION TO MULTIPLE REGRESSION PROBLEMS. THE PROGRAM ALSO PROVIDES PRESS VALUES THAT CAN BE USED FOR SUBSET SELECTION AS WELL AS PROVIDING OPTIONS FOR REGRESSION ANALYSIS ON THE RANKS OF THE DATA AND FOR A WEIGHTED REGRESSION ANALYSIS ON EITHER RAW OR RANK TRANSFORMED DATA. THIS DOCUMENT HAS BEEN WRITTEN AND DESIGNED FOR USERS OF THIS STEPWISE PROGRAM.

729

LATIN HYPERCUBE SAMPLING (PROGRAM USER'S GUIDE)

SAND79-1473

IMAN, R.L.; DAVENPORT, J.M.; ZEIGLER, D.K.

800101

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM. 82 P.

SANDIA NATIONAL LABORATORIES

C,1;C,8

THIS DOCUMENT HAS BEEN DESIGNED FOR USERS OF THE PROGRAM DEVELOPED AT SANDIA TO GENERATE LATIN HYPERCUBE SAMPLES. LATIN HYPERCUBE SAMPLING IS A RECENTLY DEVELOPED SAMPLING TECHNIQUE FOR GENERATING INPUT VECTORS INTO COMPUTER MODELS FOR PURPOSES OF SENSITIVITY ANALYSIS STUDIES. IN ADDITION TO PROVIDING A COST EFFECTIVE AND RELIABLE SAMPLING SCHEME, THE LATIN HYPERCUBE SAMPLING TECHNIQUE ALSO PROVIDES THE USER WITH THE FLEXIBILITY TO EFFICIENTLY STUDY EFFECTS OF DISTRIBUTIONAL ASSUMPTIONS ON KEY INPUT VARIABLES WITHOUT RUNNING THE COMPUTER MODEL.

730

POTENTIAL OF CIGARETTE SMOKING AND RADIATION; EVIDENCE FROM
A SPUTUM CYTOLOGY SURVEY AMONG URANIUM MINERS AND
CONTROLS

BAND, P., FELDSTEIN, M.; SACCOMANNO, G.; WATSON, L.; KING, G.

800101

AMERICAN CANCER SOCIETY, PHILADELPHIA

INSTITUT DU CANCER DE MONTREAL

CANCER 45:1273-1277.

D,3;D,4,A;D,4,C;D,5,B;D,5,D;D,6;D,9

TO ASSESS THE EFFECT OF CIGARETTE SMOKING AND OF EXPOSURE OF RADON DAUGHTERS, A PROSPECTIVE SURVEY CONSISTING OF PERIODIC SPUTUM CYTOLOGY EVALUATION WAS INITIATED AMONG 249 UNDERGROUND U MINERS AND 123 MALE CONTROLS. SPUTUM CYTOLOGY SPECIMENS SHOWING MODERATE ATYPIA, MARKED ATYPIA, OR CANCER CELLS WERE CLASSIFIED AS ABNORMAL. AS COMPARED TO CONTROL SMOKERS, MINERS WHO SMOKE HAD A SIGNIFICANTLY HIGHER INCIDENCE OF ABNORMAL CYTOLOGY. FOR MINER SMOKERS, THE OBSERVED FREQUENCIES OF ABNORMAL CYTOLOGY WERE LINERALLY RELATED TO CUMULATIVE EXPOSURE TO RADON DAUGHTERS AND TO THE NUMBER OF YRS OF U MINING. A STATISTICAL MODEL RELATING THE PROBABILITY OF ABNORMAL CYTOLOGY TO THE RISK FACTOR WAS INVESTIGATED USING A BINARY LOGISTIC REGRESSION. THE

ESTIMATED FREQUENCY OF ABNORMAL CYTOLOGY WAS SIGNIFICANTLY DEPENDENT, FOR CONTROLS, ON THE DURATION OF CIGARETTE SMOKING, AND FOR MINERS, ON THE DURATION OF CIGARETTE SMOKING AND OF U MINING.

731

HEALTH EFFECTS OF URANIUM MINING AND MILLING FOR COMMERCIAL NUCLEAR POWER

BRANAGAN, E.F., JR.; GOTCHY, R.L.

800101

ANN ARBOR SCIENCE, ANN ARBOR, MI

U.S. NRC

HEALTH IMPLICATIONS OF NEW ENERGY TECHNOLOGIES, PP. 99-117.

D,2;D,3;D,5,B;D,5,D;D,5,J;D,5,L;D,9;E,2;E,3;E,5,B;E,5,D;E,5,J;E,5,L;E,9

RADIOLOGICAL HEALTH EFFECTS POTENTIALLY ASSOCIATED WITH U MINING AND MILLING HAVE BEEN ESTIMATED ON BOTH A REGIONAL AND CONTINENTAL BASIS. ESTIMATES OF RADON RELEASES FROM MINING WERE TAKEN FROM TESTIMONY PRESENTED IN LICENSING HEARINGS DURING 1978. ESTIMATES OF THE HEALTH EFFECTS FROM MILLING WERE DERIVED FROM A DRAFT EIS ON U MILLING. HEALTH EFFECTS PER ANNUAL FUEL REQUIREMENT (AFR) WERE PRESENTED ON BOTH A CUMULATIVE AND CONTINUOUS BASIS. IN GENERAL, POTENTIAL HEALTH EFFECTS TO THE GENERAL PUBLIC BECAUSE OF BOTH THE MINING AND MILLING OF ONE AFR ARE A VERY SMALL FRACTION OF THE HEALTH EFFECTS CAUSED BY BACKGROUND RADIATION, ON EITHER A CUMULATIVE BASIS OR A CONTINUOUS BASIS. ON A CUMULATIVE BASIS (FROM 1978 TO THE YR 3000), POTENTIAL HEALTH EFFECTS DUE TO MILLING ARE ABOUT AN ORDER OF MAGNITUDE LESS THAN THOSE DUE TO MINING.

732

WEATHER SEQUENCE SAMPLING FOR RISK CALCULATIONS

RITCHIE, L.T.; ALDRICH, D.C.; BLOND, R.M.

810601

AMERICAN NUCLEAR SOCIETY, LA GRANGE PARK, IL

SANDIA NATIONAL LABORATORIES

TRANS. AM. NUCL. SOC. 38:113-115.

C,5;C,7;C,8

RISK STUDIES SUCH AS WASH-1400 NORMALLY EVALUATE POTENTIAL ACCIDENT CONSEQUENCES OVER A RANGE OF METEOROLOGICAL CONDITIONS. THIS PAPER PRESENTS A NEW TECHNIQUE FOR WEATHER SEQUENCE SAMPLING THAT CAN RESULT IN SIGNIFICANTLY IMPROVED CONFIDENCE IN RISK ESTIMATES, PARTICULARLY FOR LOW-PROBABILITY, HIGH-CONSEQUENCE EVENTS. THE TECHNIQUE IS SIMPLE, DOES NOT REQUIRE SIGNIFICANT ADDITIONAL COMPUTATION TIME, AND CAN RESULT IN IMPROVED CONFIDENCE IN RISK ESTIMATES.

733

TECHNICAL SUPPORT FOR IMPROVING THE LICENSING REGULATORY
BASE FOR SELECTED FACILITIES ASSOCIATED WITH THE FRONT
END OF THE FUEL CYCLE

PNL-4086

SCHREIBER, R.E.; BRITE, D.W.; CLARK, R.G.; DAVENPORT, L.C.;
JAMISON, J.D

820101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 104 P.

PACIFIC NORTHWEST LABORATORY

F,1;F,2;F,4,A;F,4,C;F,5,B;F,5,D;H,1;H,2;H,4,A;H,4,C;H,5,B;H,5,D

THIS STUDY CONCENTRATED ON THE RENEWAL LICENSING
ACCOMPLISHED IN THE LAST FEW YRS AT 5 TYPICAL FACILITIES, AND
INCLUDED ANALYSES OF LICENSING DOCUMENTS AND INTERVIEWS WITH
INDIVIDUALS INVOLVED WITH DIFFERENT ASPECTS OF THE LICENSING
PROCESS. THOSE INTERVIEWED INCLUDED NMSS STAFF, INSPECTION AND
ENFORCEMENT OFFICIALS, AND SELECTED LICENSEES. FROM THE RESULTS
OF THE ANALYSES AND INTERVIEWS, IT WAS CONCLUDED THAT THE
REGULATORY BASE IS ADEQUATE BUT SHOULD BE CODIFIED FOR GREATER
VISIBILITY. IT IS RECOMMENDED THAT NMSS CLARIFY DISTINCTIONS
AMONG LEGAL REQUIREMENTS OF THE LICENSEE, ACCEPTANCE CRITERIA
EMPLOYED BY NMSS, AND GUIDANCE USED BY ALL. A PRELICENSING
CONFERENCE WOULD BE A PRACTICAL MEANS OF SETTING LICENSE
CONDITIONS ACCEPTABLE TO ALL PARTIES INVOLVED.

734

FLOOD RISK ANALYSIS METHODOLOGY DEVELOPMENT PROJECT FINAL
REPORT

NUREG/CR-2678; ORNL/TM-6314

WAGNER, D.P.; CASADA, M.L.; FUSSELL, J.B.

820101

NTIS; U.S. GPO, NRC. 124 P.

OAK RIDGE NATIONAL LABORATORY

C,3;C,4;C,5;C,7;C,9;C,0;P,3;P,4;P,5;P,7;P,9;P,0

THIS REPORT PRESENTS THE CONCEPTS AND METHODOLOGY NECESSARY
TO PERFORM FLOOD RISK ANALYSIS FOR NUCLEAR POWER PLANTS, ONCE
THE FLOODING LEVEL VERSUS PROBABILITY IS KNOWN. THE METHODOLOGY
IS CONSISTENT WITH ACCEPTED PRA TECHNIQUES AND IS USABLE EITHER
DURING THE NORMAL COURSE OF A PRA OR AS AN "ADD ON" ANALYSIS FOR
AN EXISTING PRA.

735

ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISOLATION SYSTEMS.
A CONCEPTUAL SIMULATION MODEL FOR RELEASE SCENARIO
ANALYSIS OF A HYPOTHETICAL SITE IN COLUMBIA PLATEAU
BASALT

PNL-2892

STOTILEMYRE, J.A.; PETRIE, G.M.; BENSON, G.L.; ZELLMER, J.T.

810101

PACIFIC NORTHWEST LABORATORY, RICHLAND, WA. 124 P.

PACIFIC NORTHWEST LABORATORY

C,1;C,2;C,3;C,6;C,7;L,1;L,2;L,3;L,6;L,7;N,1;N,2;N,3;N,6;N,7

THIS STATUS REPORT GIVES AN EVOLVING METHODOLOGY FOR RELEASE SCENARIO DEVELOPMENT FOR UNDERGROUND NUCLEAR WASTE REPOSITORIES. IT IS INTENDED FOR USE AS A REFERENCE POINT AND A PRELIMINARY DESCRIPTION OF AN EVOLVING GEOSCIENCE METHODOLOGY. WHEN COMPLETED IT WILL BE USED AS A TOOL IN DEVELOPING DISRUPTIVE RELEASE SCENARIOS FOR ANALYZING THE LONG-TERM SAFETY OF GEOLOGICAL NUCLEAR WASTE REPOSITORIES. EXAMPLE SUBMODELS DESCRIBED INCLUDE: CLIMATE; PRECIPITATION, RUNOFF, AND INFILTRATION; CONTINENTAL GLACIATION; ALPINE GLACIATION; GEOMORPHIC EVENTS; DEFORMATION; METEORITES; MAGMATIC ACTIVITY; AND UNDETECTED FEATURES.

736

ENVIRONMENTAL PROTECTION IN UNDERGROUND URANIUM MINING

O'BRIEN, N.

790101

MINING JOURNAL LTD., LONDON

DENISON MINES LTD.

MIN. MAG. 140(1):14-15, 17, 19, 21, 23, 25.

D,1;D,4;D,6;D,9

THIS PAPER DESCRIBES THE GENERAL PRINCIPLES OF CURRENT UNDERGROUND ATMOSPHERIC CONTROL IN U MINES IN ONTARIO, WITH PARTICULAR REFERENCE TO PRACTICES AT THE DENISON MINE IN THE ELLIOT LAKE AREA.

737

THE INFLUENCE AND MODELING OF WASTE NUCLIDE AQUEOUS

SPECIATION ON GEOSPHERE RETARDATION PROCESSES RELEVANT TO RISK ASSESSMENT

CONF-820303

MULLER, A.B.; DUDA, L.E.

820101

UNIV. OF ARIZONA, TUCSON, AZ

SANDIA NATIONAL LABORATORIES

WASTE MANAGEMENT '82. VOL. 1. PP. 513-528.

C,2;C,5;C,7;L,2;L,5;L,7;N,2;N,5;N,7

IN THIS PAPER THE PHYSICAL PROCESSES INVOLVED IN RETARDATION ARE EXAMINED IN DETAIL, WITH THE INTENTION OF DEVELOPING FURTHER INSIGHTS INTO THE MECHANISMS INVOLVED. THIS SHOULD PROVIDE THE BASIS FOR IMPROVED RETARDATION MODELING IN THE RA METHODOLOGY BEING DEVELOPED. COMPUTATIONAL SEQUENCE AND COUPLING TO HYDRAULIC TRANSPORT CODES ARE DESCRIBED.

738

RADIOLOGICAL PROTECTION CRITERIA RISK ASSESSMENTS FOR WASTE DISPOSAL OPTIONS

CONF-820303

HILL, M.D.

820101

UNIV. OF ARIZONA, TUCSON, AZ

NATIONAL RADIOLOGICAL PROTECTION BOARD

WASTE MANAGEMENT '82. VOL. 3. PP. 47-57.

C,1;C,5;L,1;L,5;N,1;N,5

IT IS SUGGESTED THAT THE CRITERIA USED TO DECIDE WHETHER WASTE DISPOSAL OPTIONS ARE ACCEPTABLE FROM A RADIOLOGICAL PROTECTION POINT OF VIEW SHOULD BE AS FOLLOWS: (1) THE MAXIMUM RISK TO AN INDIVIDUAL FROM WASTE DISPOSAL SHOULD NOT EXCEED 10 MINUS 5/YR, RISK BEING DEFINED AS THE PROBABILITY OF DEATH; (2) THE TOTAL RISKS ASSOCIATED WITH WASTE DISPOSAL SHOULD BE ALARA; AND (3) COST-BENEFIT ANALYSIS SHOULD BE USED AS AN AID TO ALARA DECISIONS. THESE SUGGESTED CRITERIA ARE AT PRESENT UNDER DISCUSSION AT NRPE.

739

ANALYTICAL METHODS FOR EVALUATING THE RADIOLOGICAL ASPECTS OF THE GENERAL ELECTRIC BOILING WATER REACTOR

APED-5756

HORTON, M.R.; WILLIAMS, W.A.; HOLTZCLAW, J.W.

690101

NTIS. 112 P.

GENERAL ELECTRIC CO. SAN JOSE, CA

C,1;C,2;P,1 ;P,2;P,4;P,5

THE MATHEMATICAL MODELS AND CONVERSION FACTORS WHICH ARE USED IN EVALUATING THE SAFETY ASPECTS OF THE BWR ARE DETAILED. THE FOLLOWING ASPECTS OF A HYPOTHETICAL COLLANT LOSS ACCIDENT ARE DISCUSSED: CONTAINMENT RESPONSE ANALYSIS, CORE HEATUP ANALYSIS, FISSION PRODUCT RELEASE FROM FUEL, IODINE PARTITION AND DECONTAMINATION FACTORS, FISSION PRODUCT BEHAVIOR IN THE PRIMARY CONTAINMENT, FISSION PRODUCT ACTIVITY IN THE PRIMARY AND SECONDARY CONTAINMENT, AND FISSION PRODUCT ACTIVITY RELEASED TO THE ENVIRONMENT. THE FOLLOWING ADDITIONAL HYPOTHETICAL ACCIDENTS ARE CONSIDERED: STEAM LINE BREAK, REFUELING, CONTROL ROD DROP, FISSION PRODUCT TO THE ATMOSPHERE, AND RADIOLOGICAL EFFECTS. PARAMETERS USED BY G. E. FOR ACCIDENT ANALYSIS CALCULATIONS ARE TABULATED.

740

AWAY-FROM-REACTOR STORAGE OF SPENT NUCLEAR FUEL: FACTORS AFFECTING DEMAND

R-2558-DOE

DINNEEN, P.M.; SOLOMON, K.A.; TRIPLETT, M.B.

800101

RAND CORP., SANTA MONICA, CA. 73 P.

RAND CORP., SANTA MONICA, CA

M,1

THE RESULTS OF AN ANALYSIS OF FACTORS AFFECTING THE DEMAND

FOR U.S. GOVERNMENT-PROVIDED AFR STORAGE OF SPENT NUCLEAR FUEL ARE PRESENTED. THE PURPOSE OF THE ANALYSIS IS TO ASSIST POLICYMAKERS IN PREDICTING MORE ACCURATELY THE DEMAND FOR GOVERNMENT AFR STORAGE RELATIVE TO THE DEMAND FOR OTHER STORAGE OPTIONS. CRITICAL PARAMETERS CONSIDERED ARE: REGULATORY TREATMENT OF THE FEE FOR GOVERNMENT AFR SERVICES, THE DEMAND FOR NUCLEAR ENERGY, POLITICAL DECISIONS REGARDING REPROCESSING AND THE BREEDER PROGRAM, ON-SITE STORAGE EXPANSION, TIMING AND AVAILABILITY OF GOVERNMENT AFRS, THE EXTENT TO WHICH TRANSSHIPMENT OF SPENT FUEL IS PERMITTED, THE AVAILABILITY OF SHIPPING CASKS, THE EXTENT OF FOREIGN DEMAND FOR AFRS, AND HOW AND BY WHOM AFRS ARE FINANCED.

741

EARTHQUAKE SAFETY OF NUCLEAR POWER PLANTS

UCL-52000-82-4

LAWRENCE LIVERMORE NATIONAL LABORATORY

820101

LAWRENCE LIVERMORE NATIONAL LABORATORY, LIVERMORE, CA

LAWRENCE LIVERMORE NATIONAL LABORATORY

E & T REV. (APR.):1-13.

C,2;C,3;C,4;C,5;C,7;C,9;P,2;P,3;P,4;P,5;P,7;P,9

AN EARTHQUAKE RA THAT ADDRESSES THE INTERRELATIONSHIPS OF A NUCLEAR POWER PLANT AND ITS EMERGENCY SAFETY FEATURES HAS BEEN DEVELOPED. A FIVE-STEP ASSESSMENT METHOD IS PRESENTED: EARTHQUAKE HAZARD, ACCIDENT SEQUENCES, FAILURE MODES OF EMERGENCY SAFETY SYSTEMS, FAILURE PROBABILITIES OF CRITICAL COMPONENTS, AND PROBABILITY OF CORE MELT AND RADIOACTIVE RELEASE. UNIT 1 OF THE ZION NUCLEAR POWER PLANT WAS SELECTED FOR THE EVALUATION.

742

RISK MANAGEMENT AND DECISION RULES FOR LIGHT WATER REACTORS

ALU-134; UCLA-ENG-8054

GRIESMEYER, J.M.; OKRENT, D.

810101

NTIS, 28 P.

UNIV. OF CALIFORNIA LOS ANGELES, SCHOOL OF ENGINEERING AND APPLIED SCIENCE

C,1;C,2;C,3;C,5 ;P,1;P,2;P,3;P,5

A PRELIMINARY PROPOSAL FOR A LWR RISK MANAGEMENT FRAMEWORK IS PRESENTED. DECISION RULES CONSIDERED ARE HAZARD STATES, INDIVIDUAL RISKS, SOCIETAL IMPACTS, AND SOCIETAL IMPACT REDUCTION - ALARA. RISK QUANTIFICATION INCLUDES PROBABILISTIC SAFETY PROFILER AND PREPARATION, REVIEW AND MAINTENANCE OF SAFETY PROFILE. ESTABLISHMENT OF A RISK CERTIFICATION PANEL IS PROPOSED.

743

REALISTIC RISK ESTIMATES

LEVENSON, M.; RAHN, F.

810101

IAEA, VIENNA

BECHTEL POWER CORP.; ELECTRIC POWER RESEARCH INSTITUTE

INT. AT. ENERGY AGENCY BULL. 23(4):37-39.

C,1;C,2;C,8 ;P,1;P,2;P,8

THIS IS A REVIEW OF AN EPRI REPORT BY THESE AUTHORS WHICH CRITICIZES THE WASH-1400 REPORT IN THAT IT OVERESTIMATES CONSEQUENCES WHICH IN TURN MAY LEAD TO PLACING LARGE SEGMENTS OF SOCIETY AT UNNECESSARY RISK.

744

PROBABILISTIC TREATMENT OF FAULTING IN GEOLOGIC MEDIA

DONATH, F.A.; CRANWELL, R.M.

810101

AMERICAN GEOPHYSICAL UNION, WASHINGTON, DC

UNIV. OF ILLINOIS, URBANA

AM. GEOPHYS. UNION, GEOPHYS. MONOGR. SER. 24:231-241.

C,1;C,3;C,7;L,1;L,3;L,7;N,1;N,3;N,7

A METHOD IS PRESENTED FOR ASSESSING THE PROBABILITY OF FAULTING WITHIN GEOLOGIC MEDIA. FOR SPECIFIED FRACTURE OR FRICTIONAL SLIDING CRITERIA AND ROCK PROPERTIES, THE PROBABILITY OF A NEW FAULT CAN BE CALCULATED AS CONDITIONAL ON THE STATE OF STRESS. FOR AN ASSUMED STRESS VARIATION WITH TIME, THE PROBABILITY OF THE STRESSES REACHING CRITICAL VALUES BY ANY TIME 'T' CAN BE DETERMINED. COUPLING OF THE CONDITIONAL PROBABILITY OF FAULTING WITH THE PROBABILITY OF ACHIEVING A GIVEN STATE OF STRESS BY SOME SPECIFIED TIME 'T' ALLOWS CALCULATION OF THE PROBABILITY OF FAULTING BY TIME 'T'.

745

THE USE OF RANK TRANSFORM IN REGRESSION

IMAN, R.L.; CONOVER, W.J.

791101

AMERICAN STATISTICAL SOCIETY, WASHINGTON, DC

SANDIA NATIONAL LABORATORIES

TECHNOMETRICS 21(4):499-509.

C,3;C,8;C,9

THE RANK TRANSFORM IS A SIMPLE PROCEDURE WHICH INVOLVES REPLACING THE DATA WITH THEIR CORRESPONDING RANKS. THE RANK TRANSFORM HAS PREVIOUSLY BEEN SHOWN TO BE USEFUL IN HYPOTHESIS TESTING WITH RESPECT TO EXPERIMENTAL DESIGNS. THIS STUDY SHOWS THE RESULTS OF USING THE RANK TRANSFORM IN REGRESSION. TWO SETS OF DATA ARE CONSIDERED FOR PURPOSES OF ILLUSTRATING THE RANK TRANSFORM IN SIMPLE AND MULTIPLE REGRESSION. ALSO GIVEN ARE THE RESULTS OF A MONTE CARLO STUDY WHICH COMPARES REGRESSION ON

RANKS WITH SOME PUBLISHED MONTE CARLO RESULTS ON ISOTONIC REGRESSION. THIS MONTE CARLO STUDY IS ALSO MODIFIED TO COMPARE REGRESSION ON RANKS WITH ROBUST REGRESSION. ANOTHER ILLUS. GIVES THE RESULTS OF ANALYSES ON LARGE COMPUTER CODES BY REGRESSION ON RANKS. THE RANK TRANSFORM IS A SIMPLE, REPEATABLE PROCESS THAT COMPARES FAVORABLY WITH OTHER METHODS. THIS STUDY INDICATES THE METHOD WORKS QUITE WELL ON MONOTONIC DATA.

746

OCCUPATIONAL HEALTH AND SAFETY IN UNDERGROUND MINES

MARTINSON, M.J.

760201

MINE VENTILATION SOCIETY OF SOUTH AFRICA, JOHANNESBURG

J. MINE VENT. SOC. S. AFR. 29(2):29-51.

D,1;D,2;D,4,A;D,4,C;D,9

THIS PAPER IS THE CONCLUSION OF A PRESIDENTIAL ADDRESS. TOPICS COVERED ARE: ALPHA RADIATION IN U.S. U MINES, MINE VENTILATION CRITERIA, CURRENT MINE VENTILATION DESIGN PRACTICE, VENTILATION DESIGN IN TERMS OF STATUTORY REGULATIONS, VENTILATION DESIGN BASED ON RISK, SUPPORT OF MINE WORKINGS, MINE INRUSHES, ACCEPTABILITY OF RISK, EMPLOYER'S DUTY OF CARE, AND U.S. FEDERAL COAL MINE HEALTH AND SAFETY ACT OF 1969.

747

AIRBORNE RADIATION HAZARDS IN URANIUM MINING

BASSON, J.K.

800501

MINE VENTILATION SOCIETY OF SOUTH AFRICA, JOHANNESBURG

ATOMIC ENERGY BOARD, PELINDABA

J. MINE VENT. SOC. S. AFR. 33(5):74-81.

D,1;D,4,A;D,4,C;D,4,E;D,4,G

FOLLOWING A BRIEF INTRO. TO RADIOACTIVITY AND RADIATION PHYSICS, THE LATE EFFECTS ON MAN ARE SUMMARIZED, WHICH LEAD TO THE RECOMMENDATIONS OF THE ICRP. THE RADIATION HAZARDS OF U MINING AND MILLING ARE DESCRIBED, SHOWING THAT THE EXTERNAL RADIATION EXPOSURE IS USUALLY INSIGNIFICANT. INHALATION HAZARDS DUE TO CHEMICAL AS WELL AS RADIOACTIVE TOXICITY OF U PRESENT A MORE SERIOUS PROBLEM, AND MONITORING METHODS ARE OUTLINED. THE EMANATION OF RADON GAS FROM THE U-BEARING ROCK PRESENTS A UNIQUE HAZARD DUE TO THE RETENTION OF ITS PARTICULATE RADIOACTIVE DAUGHTERS IN THE LUNG. THE MPE IS BASED ON EPIDEMIOLOGICAL DATA ARISING FROM THE INCREASED INCIDENCE OF LUNG CANCER, ESPECIALLY IN THE U.S. U MINES, WHICH HAS NOT BEEN OBSERVED IN SOUTH AFRICAN MINERS EXPOSED TO LOW RADON LEVELS.

748

PRODUCTION OF REFINED UF-6 FROM ORE CONCENTRATES BY

FLUIDIZATION AND FRACTIONAL DISTILLATION TECHNIQUES

LAWROSKI, S.; JONKE, A.A.; LEVITZ, N.; PEETKUS, E.J.; LITTY, A.H.F.; RODGER, W.A.; VOGEL, G.J.; STEUNENBERG, R.K.; SANDUS, O.; MECHAN, W.J.; LIIMATAINEN, R.C.; KESSIE, R.W.; TREVORKOW, L.; VOGEL, R.C.

580101

UNITED NATIONS

ARGONNE NATIONAL LABORATORY

PEACEFUL USES OF ATOMIC ENERGY, PROC. 2ND UN INT. CONF. VOL. 4.

PRODUCTION OF NUCLEAR MATERIALS AND ISOTOPES. PP. 44-57.

F,1

DEVELOPMENT WORK HAS DEMONSTRATED THE FEASIBILITY OF CONVERTING U CONCENTRATES TO CRUDE UF-4 CONTINUOUSLY IN FLUIDIZED-BED EQUIPMENT. STUDIES ON THE FLUORINATION OF CRUDE UF-4 TO UF-6 SHOWED THAT FEED MATERIALS CONTAINING LITTLE OR NO Na IMPURITY COULD BE PROCESSED WITHOUT DIFFICULTY. APPRECIABLE PURIFICATION OF THE ORE CONCENTRATES OCCURRED IN EACH OF THE PROCESS STEPS PRIOR TO DISTILLATION AND THE REMAINING IMPURITIES WERE PRIMARILY V AND MO.

749

PRODUCTION OF PURE URANIUM HEXAFLUORIDE FROM ORE CONCENTRATES

RUCH, W.C.; PETERSON, D.A.; GASKILL, E.A.; TEPP, H.G.

600101

AMERICAN CHEMICAL SOCIETY, WASHINGTON, DC

ALLIED CHEMICAL CORP.

CHEM. ENG. PROG., SYMP. SER. 56(28):35-41.

F,1

EQUIPMENT DESIGN AND OPERATING CRITERIA ARE PRESENTED FOR THE NEW ALLIED CHEMICAL UF-6 PRODUCTION FACILITIES EMPLOYING NEWLY DEVELOPED PROCESSING METHODS. UF-6 IS PRODUCED BY DIRECT REDUCTION, HYDROFLUORINATION, AND FLUORINATION OF ORE CONCENTRATES IN FLUID-BED REACTORS AND PURIFIED BY FRACTIONAL DISTILLATION.

750

OKLO - GEOLOGIC ISOLATION IMPLICATIONS

CONF-761020

APT, K.E.; BRYANT, E.A.; BROOKINS, D.G.

760101

UNIV. OF ARIZONA, TUCSON, AZ

LOS ALAMOS SCIENTIFIC LABORATORY

WASTE MANAGEMENT '76. PP. 200-205.

P,1;L,1

THE OKLO "NATURAL REACTOR" IS DISCUSSED AS AN EXAMPLE OF SUCCESSFUL GEOLOGIC ISOLATION OF RADWASTE. THE DEPOSIT IS LOCATED IN GABON, AFRICA, IN THE MIDDLE PROTEROZOIC FRANCEVILLE

BASIN. U MINERALIZATION IS WITHIN A STRATIFORM CRE-BODY, WITH 6 TABULAR "REACTOR ZONES" RECOGNIZED, EACH ABOUT 1 M THICK AND SEVERAL HUNDRED SQ M IN AREA. RADIOGEOLOGY OF THE REACTOR IS DESCRIBED.

751

RISK ASSESSMENT METHODOLOGY DEVELOPMENT FOR WASTE ISOLATION IN GEOLOGIC MEDIA, TECHNICAL REVIEW OF NUREG/CR-1636, VOLS. 1, 2 & 3.

NUREG/CR-1672, VOL. 3; SAI-280-82-PA

STEVENS, C.A.; FULLWOOD, R.R.; AMIRIJAFARI, B.; BASIN, S.L.; COHEN, J.; KAUL, D.

820601

U.S. GPO, NRC, 100 P.

SCIENCE APPLICATIONS, INC., MENLO PARK

C,1;C,2;C,3;C,5;C,8;L,1;L,2;L,3;L,5;L,6;L,8;N,1;N,2;N,3;N,5;N,6;N,8

A REVIEW OF THREE DOCUMENTS THAT WERE PREPARED FOR THE U.S. NRC BY SANDIA IS PRESENTED IN THIS REPORT. THE DOCUMENTS COVERED IN THE PRESENT REVIEW INCLUDE VOLS. 1-3 (ACN=84, 720, 721). THIS CONSTITUTES THE THIRD PHASE OF THE REVIEW; THE FIRST TWO PHASES WERE REPORTED IN VOLS. 1 AND 2 (ACN=122, 123). THE THREE VOLUMES OF THE SET ARE WELL WRITTEN. VOL. 1 OF NUREG/CR-1636 DESCRIBES THE "PATHWAYS-TO-MAN" MODEL DESIGNED TO FORECAST THE LONG-TERM DISTRIBUTION AND BUILDUP OF RADIONUCLIDES IN THE BIOSPHERE AND THE "TRANSPORT-TO-MAN" MODEL WHICH DESCRIBES THE ACCUMULATION OF RADIONUCLIDES IN MAN. THE REVIEWERS GENERALLY AGREE THAT THE COMPARTMENT MODEL USED TO DESCRIBE ENVIRONMENTAL TRANSPORT IS CAPABLE OF ACCURATELY CALCULATING THE PHENOMENA IF SUITABLE DATA IS AVAILABLE. IN PRACTICE, LACK OF DATA COULD LIMIT THE USEFULNESS OF THE METHODOLOGY. VOL. 2 PRESENTS THE RESULTS OF A SENSITIVITY ANALYSIS OF THE ENVIRONMENTAL TRANSPORT MODEL. STEPWISE REGRESSION ON RANK TRANSFORMED DATA WAS THE BASIS FOR SANDIA'S SENSITIVITY ANALYSIS. THIS REPORT WAS, IN GENERAL, NOT AS WELL WRITTEN AS VOLUME 1. THE REASONS FOR SELECTING CERTAIN INPUT VARIABLES, AND NOT OTHERS, FOR THE SENSITIVITY ANALYSIS ARE NOT CLEAR. THE INPUT DATA AND ASSOCIATED UNCERTAINTY RANGES DON'T APPEAR TO HAVE BEEN SELECTED FROM REAL GEOPHYSICAL SOURCES. MANY RESULTS ARE PRESENTED; HOWEVER, THEIR SIGNIFICANCE IS NOT MADE VERY CLEAR. IN VOL. 3, THE COMPARTMENT MODEL IS USED TO DERIVE THE ASYMPTOTIC VALUES OF 245/CN CONCENTRATION IN SUB-ZONES OF GROUND WATER, SOIL, SURFACE WATER, AND SEDIMENT. THE TIMES TO REACH 90% OF THE ASYMPTOTIC VALUES ARE ALSO COMPUTED. THE PURPOSE OF THE STUDY IS "TO INVESTIGATE THE ASYMPTOTIC BEHAVIOR OF THE MODEL AND TO ACQUIRE INSIGHT WITH RESPECT TO SUCH BEHAVIOR AND THE VARIABLES WHICH INFLUENCE IT." THE AUTHORS DON'T DISCUSS HOW THE METHODOLOGY AND RESULTS OF THE STUDY ARE TO BE USED IN AN OVERALL RA OF A WASTE REPOSITORY. AS IN VOLUME 2, MANY RESULTS ARE PRESENTED, BOTH IN TABULAR AND GRAPHICAL FORM; HOWEVER, THEIR SIGNIFICANCE IS HARDLY DISCUSSED.

752

NON-RADIOLOGICAL IMPACTS OF TRANSPORTING RADIOACTIVE MATERIAL

SANDB1-1703; TTC/0236

RAO, R.K.; WILMOT, E.L.; LUNA, R.E.

820201

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM. 250 P.
NUS, CORP.

O,4,E;O,4,F;O,4,G;O,4,H;O,5,F;O,5,H;O,8;O,9,E;O,9,F;O,9,G;O,9,H
ESTIMATES OF HEALTH EFFECTS THAT RESULT FROM EXPOSURE TO
AIR POLLUTANTS GENERATED DURING NORMAL (ACCIDENT-FREE) TRANSPORT
OF RADIOACTIVE MATERIALS AND FROM ACCIDENTS ARE PROVIDED FOR USE
IN PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS. THE RESULTS
ARE PRESENTED FOR TRUCK AND RAIL MODES AND UNCERTAINTIES
ASSOCIATED WITH THESE RESULTS ARE DISCUSSED. SINCE THESE HEALTH
EFFECTS HAVE NO RELATION TO THE RADIOACTIVE MATERIAL BEING
HAULED, THEIR MEASURE IS APPLICABLE TO SHIPMENTS OF ALL SIMILAR
WEIGHT LOADS. THE POLLUTANT HEALTH EFFECTS ARE CALCULATED FOR
AND APPLICABLE TO URBAN AREAS ONLY WHILE THE ACCIDENT HEALTH
EFFECTS ARE AVERAGES OVER ALL POPULATION ZONES IN THE U.S.

753

TECHNICAL ASSESSMENT OF BARNWELL NUCLEAR FUELS PLANT, FINAL REPORT

EPRI NP-2459-LD

WILLIAMS, R.F.; LEWIS, M.; RODGER, W.; MCBRIDE, J.; FULLWOOD,
R.R.; GUZANI, T.; SZULINSKI, M.; KUPP, R.W.

820601

ELECTRIC POWER RESEARCH INSTITUTE, MENLO PARK, CA. 250 P.
ELECTRIC POWER RESEARCH INSTITUTE

J,1;J,2;J,4,C;J,9

IN 1977-78, A TEAM OF SEVEN INDEPENDENT INVESTIGATORS AND
FIVE ADDITIONAL CONTRIBUTORS KNOWLEDGEABLE IN THE VARIOUS
ASPECTS OF FUEL REPROCESSING CONDUCTED A REVIEW OF THE BARNWELL
NUCLEAR FUEL PROCESSING PLANT. THE REVIEW TEAM CONCLUDED THAT
CONSIDERING ONLY TECHNICAL FACTORS THE PLANT IS OPERABLE ON AGED
(3 TO 5 YR) LWR FUEL WITHOUT MAJOR MODIFICATIONS. THE TEAM
FURTHER CONCLUDED THAT OPERATION AS AN EXPERIMENTAL OR RESEARCH
AND DEVELOPMENT FACILITY IS TECHNICALLY POSSIBLE AND
JUSTIFIABLE. OPERATION AS A COMMERCIAL FACILITY DOES NOT APPEAR
TO BE APPROPRIATE BECAUSE OF POLITICAL AND INSTITUTIONAL
CONSIDERATIONS. THE BODY OF THE REPORT IDENTIFIES THE FACTORS
INVESTIGATED, QUESTIONS RAISED BY THE REVIEW TEAM, AND PRESENTS
THE DETAILED FINDINGS OF THE PROJECT. THIS DATA INCLUDES
IDENTIFICATION OF MAJOR COSTS ASSOCIATED WITH COMPONENTS NEEDED
TO OPERATE THE PLANT.

754

PROJEKT SICHERHEITSTUDEN ENTSORGUNG (PSE), PROJECT SAFETY

STUDIES OF THE BACK END OF THE FUEL CYCLE, INTERIM
SUMMARY REPORT

NONE

MAASS, K.E. ; LEVI, H.W.; MEMMERT, G.; VENZLAFF, H.; WINGENDER,
H.J.

810601

HAHN-MEITNER-INSTITUT FUR KERNFORSCHUNG BERLIN GMBH, 350 P.

HAHN-MEITNER-INSTITUT FUR KERNFORSCHUNG BERLIN GMBH

C,1;C,2;I,1;I,2;I,5,B;I,7;I,0;J,1;J,2;J,5,B;J,7;J,0;L,1;L,2;L,5,
B;L,7;L,0; M,1;M,2;M,5,B;M,7;M,0;O,1;O,2;O,5,B;O,7;O,0

THIS REPORT SUMMARIZES WORK TO DATE IN THE PSE PROJECT
BEING CONDUCTED BY THE GERMAN GOVERNMENT TO ANALYSE RISKS IN THE
BACK END OF THE FUEL CYCLE. PROJECT SCOPE AND OBJECTIVES ARE
DESCRIBED AND RESULTS TO DATE ARE SUMMARIZED. ABOUT HALF OF THE
WORK HAS DEALT WITH SAFETY OF GEOLOGIC ISOLATION. CONSIDERABLE
METHODS DEVELOPMENT WORK HAS BEEN COMPLETED. FOCUS IS IN
RADIOLOGICAL RISKS TO THE PUBLIC FROM ACCIDENTS. (IN GERMAN)

755

SAFETY ASSESSMENT OF GEOLOGIC REPOSITORIES FOR NUCLEAR WASTE
CONF-770625

BARTLETT, J.W.; BURKHOLDER, H.C.; WINEGARDNER, W.K.

770101

SOCIETY FOR INDUSTRIAL AND APPLIED MATHEMATICS, PHILADELPHIA.
849 P.

BATTELLE, PACIFIC NORTHWEST LABORATORIES

NUCLEAR SYSTEMS RELIABILITY ENGINEERING AND RISK ASSESSMENT.

INT. CONF. PP. 630-660.

L,1;L,2;L,3;L,5,B;L,5,D;L,8;N,1;N,2;N,3;N,5,B;N,5,D;N,8;

THE REPORT FORM OF THIS PAPER IS BNWL-SA-6068. THIS PAPER
OUTLINES THE SA METHODS, UNIQUE FEATURES OF THE ASSESSMENT
PROBLEMS THAT AFFECT SELECTION OF METHODS AND RELIABILITY OF
RESULTS, AND AVAILABLE RESULTS. ALSO DISCUSSED ARE POTENTIAL
DIRECTIONS FOR FUTURE WORK.

756

AIRBORNE RELEASE OF PARTICLES IN OVERHEATING INCIDENTS
INVOLVING PLUTONIUM METAL AND COMPOUNDS

STI/PUB/195; CONF-680811

SCHWENDIMAN, L.C.; MISHIMA, J.; RADASCH, C.A.

680101

IAEA, VIENNA

BATTELLE, PACIFIC NORTHWEST LABORATORIES

TREATMENT OF AIRBORNE RADIOACTIVE WASTES. PP. 117-131.

J,6;P,1;P,5

OBSERVATIONS ARE GIVEN FROM A STUDY IN WHICH THE AIRBORNE
RELEASE OF PU AND ITS COMPOUNDS WAS MEASURED DURING AN EXPOSURE
OF THE MATERIAL OF INTEREST CONTAINING PU TO TEMPERATURES WHICH
MAY RESULT FROM FIRES. THE DATA REPORTED CAN BE USED IN
ASSESSING THE CONSEQUENCES OF OFF-STANDARD SITUATIONS INVOLVING

PU AND ITS COMPOUNDS IN FIRES.

757

DISTRIBUTED VELOCITY METHOD OF SOLVING THE
CONVECTIVE-DISPERSION EQUATION: 1. INTRODUCTION,
MATHEMATICAL THEORY, AND NUMERICAL IMPLEMENTATION. 2.
ERROR ANALYSIS AND COMPARISON WITH OTHER METHODS

CAMPBELL, J.E.; LONGSINE, D.E.; REEVES, M.

810101

CML PUBL.

SANDIA NATIONAL LABORATORIES

ADV. WATER RESOUR. 4:102-108, 109-116.

C,1;C,2;C,3;C,5;C,8;L,3;L,5;L,8;N,3;N,5;N,8

THE MOTIVATION FOR DEVELOPING THIS TECHNIQUE ARISES FROM
THE DEMANDS OF PERFORMING RA FOR A NUCLEAR WASTE REPOSITORY.
THESE DEMANDS INCLUDE COMPUTATIONAL EFFICIENCY OVER A RELATIVELY
LARGE RANGE OF PECLET NUMBERS, THE ABILITY TO HANDLE CHAINS OF
DECAYING RADIONUCLIDES WITH RATHER EXTREME CONTRASTS IN BOTH
SOLUTION VELOCITIES AND HALF LIVES, AND THE ABILITY TO TREAT
LEACH- OR SOLUBILITY-LIMITED SOURCES. TO THE EXTENT IT HAS BEEN
TESTED TO DATE, THE DISTRIBUTED VELOCITY METHOD APPEARS TO
SATISFY THESE DEMANDS. PT. 1 CONTAINS AN OVERALL INTRODUCTION
AND THE MATHEMATICAL THEORY, NUMERICAL IMPLEMENTATION AND
EXAMPLE RESULTS. PT.2 CONTAINS AN ERROR ANALYSIS EMPLOYING
STATISTICAL SAMPLING AND REGRESSION ANALYSIS TECHNIQUES, AND
COMPARISONS OF THE DISTRIBUTED VELOCITY METHOD WITH OTHER
METHODS FOR CONVECTIVE-DISPERSIVE TRANSPORT.

758

COMPONENT FAILURE-RATE DATA WITH POTENTIAL APPLICABILITY TO
A NUCLEAR FUEL REPROCESSING PLANT

DP-1633

DEXTER, A.H.; PERKINS, W.C.

820701

NTIS. 42 P.

SAVANNAH RIVER LABORATORY

C,9;J,9

APPROX 1,223 PIECES OF COMPONENT FAILURE-RATE DATA, UNDER
136 SUBJECT CATEGORIES, HAVE BEEN COMPILED FROM PUBLISHED
LITERATURE AND COMPUTER SEARCHES OF A NUMBER OF DATA BASES.
COMPONENT SELECTIONS WERE BASED ON POTENTIAL APPLICABILITY TO
FACILITIES FOR REPROCESSING SPENT NUCLEAR FUELS. THE DATA WILL
BE USEFUL IN QUANTIFYING FAULT TREES FOR PROBABILISTIC SAFETY
ANALYSES AND RISK ASSESSMENTS.

759

PORTSMOUTH GASEOUS DIFFUSION PLANT SITE, PIKETON, OHIO.
FINAL ENVIRONMENTAL IMPACT STATEMENT. VOL. 1

ERDA-1555

U.S. ERDA

770501

NTIS. 555 P.

U.S. ERDA

G,1;G,2;G,3;G,5,B;G,5,D;G,7;G,9;G,0

THIS EIS PROVIDES A DETAILED ANALYSIS OF THE ENVIRONMENTAL EFFECTS ASSOCIATED WITH CONTINUED OPERATION OF THE PORTSMOUTH GASEOUS DIFFUSION PLANT, ONE OF THE THREE GOVERNMENT-OWNED U ENRICHMENT PLANTS OPERATED BY ERDA. THE U ENRICHMENT CAPACITY OF THE PLANT IS CURRENTLY BEING INCREASED THROUGH A CASCADE IMPROVEMENT PROGRAM AND A CASCADE UPGRATING PROGRAM.

760

EXPANSION OF U.S. URANIUM ENRICHMENT CAPACITY. FINAL

ENVIRONMENTAL STATEMENT

ERDA-1543

U.S. ERDA

760401

NTIS. 600 P.

U.S. ERDA

G,1;G,2;G,3;G,5,B;G,5,D;G,7;G,9;G,0

THE ENVIRONMENTAL IMPACTS OF CONSTRUCTION AND OPERATION OF THE POSTULATED 11 ADDITIONAL PLANTS WOULD INVOLVE THE COMMITMENT OF APPROX 8,000 ACRES OF LAND FOR PLANT SITES AND POWER TRANSMISSION LINES. THE MAJOR IMPACT ASSOCIATED WITH THE EXPANSION WILL BE DUE TO THE PRODUCTION OF POWER REQUIRED TO OPERATE THE ENRICHMENT PLANTS. THIS IMPACT WILL BE MINIMAL SINCE IT IS ANTICIPATED THAT THE MAJORITY OF NEW PLANTS WILL USE THE GAS CENTRIFUGE PROCESS WHICH REQUIRES ONLY CA. 10% AS MUCH ELECTRICITY AS THE CURRENTLY USED GASEOUS DIFFUSION PROCESS. THE RADIATION DOSE TO POPULATION LIVING WITHIN 50 MI OF THE PLANTS IS ESTIMATED TO BE 0.05% OF THE DOSE RECEIVED FROM NATURAL RADIATION BACKGROUND.

4.2 PERSONAL AND CORPORATE AUTHOR

ADCOCK, F.E.

44

ATMX-600 RAILCAR SAFETY ANALYSIS REPORT FOR PACKAGING (SARP)

AECL, WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT

288

ASSESSMENT OF MATERIALS FOR NUCLEAR FUEL IMMOBILIZATION
CONTAINERS

AHMED, J.U.

470

ENVIRONMENTAL IMPACTS OF THE PRODUCTION AND USE OF NUCLEAR
ENERGY: A SUMMARY OF THE UNITED NATIONS ENVIRONMENT
PROGRAMME STUDY

AHMED, S.

115

ON THE USE OF POINT ESTIMATES IN RISK ASSESSMENT

116

UNCERTAINTY PROPAGATION IN PROBABILISTIC RISK ASSESSMENT:
A COMPARATIVE STUDY

AHNER, S.

380

ENGINEERED INTERMEDIATE STORAGE OF SOLIDIFIED HIGH LEVEL
WASTES/A COMPARISON OF AN AIR COOLED AND A WATER COOLED
CONCEPT

502

STORAGE OF HIGH-LEVEL WASTE IN ENGINEERED STRUCTURES:
AIR-COOLED AND WATER-COOLED CONCEPTS

AKUTSU, H.

704

SAFETY ASPECTS OF REPROCESSING AND PLUTONIUM FUEL
FACILITIES IN PNC

ALBENESIUS, E.L.

533

LONG RANGE MANAGEMENT OF TRANSURANIUM-CONTAMINATED SOLID
WASTES AT SAVANNAH RIVER

ALBRECHT, E.

701

DISPOSAL OF RADIOACTIVE WASTES BY STORAGE IN A SALT MINE IN
THE FEDERAL REPUBLIC OF GERMANY

ALEXANDER, B.M.

382

VOLUME REDUCTION SYSTEM FOR SOLID AND LIQUID TRU WASTE FROM
THE NUCLEAR FUEL CYCLE; JANUARY-MARCH 1978

384

VOLUME REDUCTION SYSTEM FOR SOLID AND LIQUID TRU WASTE FROM
THE NUCLEAR FUEL CYCLE; JULY-SEPTEMBER 1978

ALEXANDER, C.W.

101

ORIGIN AND CHARACTERISTICS OF LOW-LEVEL NON-TRANSURANIC
WASTE FROM THE NUCLEAR FUEL CYCLE

399

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT.
IV. MISCELLANEOUS ASPECTS

ALLARD, B.

513

SORPTION OF LONG-LIVED RADIONUCLIDES IN CLAY AND ROCK. PT.
1. DETERMINATION OF DISTRIBUTION COEFFICIENTS

ALSMILLER, F.S.

49

MONTE CARLO SIMULATION OF TURBULENT ATMOSPHERIC TRANSPORT
AND COMPARISONS WITH EXPERIMENTAL DATA

AMERICAN NATIONAL STANDARDS INSTITUTE

226

CRITERIA FOR THE DESIGN OF PLANTS FOR THE MANUFACTURE OF
MIXED OXIDE (U-PU)FUELS

AMES, L.L.

391

CHARACTERIZATION OF THE HANFORD 300 AREA BURIAL GROUNDS -
TASK II - GEOCHEMICAL ANALYSIS

ANDERSEN, J.A.

385

PAT-2 (PLUTONIUM AIR-TRANSPORTABLE MODEL 2) SAFETY ANALYSIS
REPORT

ANDERSON, M.

534

FALLOUT ON THE FREEWAY. THE HAZARDS OF TRANSPORTING
RADIOACTIVE WASTES IN MICHIGAN

ANDERSON, P.A.

138

DRY STORAGE OF SPENT NUCLEAR FUEL. A PRELIMINARY SURVEY OF
EXISTING TECHNOLOGY AND EXPERIENCE

ANDERSON, R.T.

503

STUDIES AND RESEARCH CONCERNING BNFP: NUCLEAR SPENT FUEL
TRANSPORTATION STUDIES

ANDREWS, W.B.

2

PACIFIC NORTHWEST LABORATORY SPENT FUEL TRANSPORTATION AND
HANDLING FACILITY MODELS

392

AN ASSESSMENT OF THE RISK OF TRANSPORTING LIQUID CHLORINE
BY RAIL

ANGERMAN, C.L.

331

DURABILITY OF CONTAINERS FOR STORING SOLIDIFIED RADIOACTIVE
WASTES

338

SAFETY ANALYSIS REPORT FOR THE PUO2-236 FUEL FORM FACILITY

ANONYMOUS

523

URANIUM HAZARDS STRESSED BY HAN

ANSPACH, W.

390

TRANSPORTATION OF LIGHT WATER REACTOR FUEL BY GOODS TRAIN -
ESTIMATION OF POTENTIAL RELEASE IN THE EVENT OF ACCIDENTS

ANYAKORA, S.N.

48

SOME DATA ON THE RELIABILITY OF INSTRUMENTS IN THE CHEMICAL
PLANT ENVIRONMENT

AOKI, S.

147

LICENSING EXPERIENCES, RISK ASSESSMENT DEMONSTRATION TEST
ON NUCLEAR FUEL PACKAGES AND DESIGN CRITERIA FOR SEA GOING
VESSEL CARRYING SPENT FUEL IN JAPAN

APOSTOLAKIS, G.

480

MATHEMATICAL METHODS OF PROBABILISTIC SAFETY ANALYSIS

APT, K.E.

750

OKLO - GEOLOGIC ISOLATION IMPLICATIONS

ARNETT, L.M.

329

QUALITATIVE SAFETY ANALYSIS - II

ARNETT, R.C.

292

HANFORD GROUNDWATER SCENARIO STUDIES

293

CONCEPTUAL AND MATHEMATICAL MODELING OF THE HANFORD
GROUNDWATER FLOW REGIME

417

PARAMETRIC AND SENSITIVITY ANALYSIS OF WASTE ISOLATION IN A
BASALT MEDIUM

420

RADIONUCLIDE RELEASE SCENARIO SELECTION PROCESS FOR A
POSSIBLE REPOSITORY IN BASALT

ARTHUR D. LITTLE, INC.

154

TECHNICAL SUPPORT OF STANDARDS FOR HIGH-LEVEL RADIOACTIVE
WASTE MANAGEMENT. VOL. A. SOURCE TERM CHARACTERIZATION

ATLANTIC RICHFIELD HANFORD CO.

291

RADIATION PROTECTION STANDARD

AVOGADRO, A.

237

TRANSPORT THROUGH DEEP AQUIFERS OF TRANSURANIC NUCLIDES
LEACHED FROM VITRIFIED HIGH-LEVEL WASTES

AYER, J.E.

146

ANALYSIS OF THE EFFECTS OF ABNORMAL NATURAL PHENOMENA ON
EXISTING PLUTONIUM FABRICATION PLANTS

AZAMAEVA, L.G.

304

ABOVE-GROUND STORAGE FACILITIES FOR VITRIFIED HIGHLY ACTIVE WASTES

BAES, C.F., III

431

DIRECTORY OF PARAMETERS USED IN A SERIES OF ASSESSMENT APPLICATIONS OF THE AIRDUS-EPA AND DARLAB COMPUTER CODES

BALUKOVA, V.D.

505

LATEST RESEARCH AND ADVANCES IN THE TREATMENT OF LOW- AND INTERMEDIATE-LEVEL RADIOACTIVE WASTES IN BULGARIA, HUNGARY, THE USSR AND CZECHOSLOVAKIA

BAND, P., FELDSTEIN, M.

730

POTENTIAL OF CIGARETTE SMOKING AND RADIATION; EVIDENCE FROM A SPUTUM CYTOLOGY SURVEY AMONG URANIUM MINERS AND CONTROLS

BARNEY, G.S.

421

IDENTIFICATION OF KEY RADIONUCLIDES IN A NUCLEAR WASTE REPOSITORY IN BASALT

BARRACLOUGH, J.T.

80

GECHYDROLOGIC STUDY OF A BURIAL SITE FOR SOLID LOW-LEVEL RADIOACTIVE WASTES AT THE IDAHO NATIONAL ENGINEERING LABORATORY

BARSELL, A.R.

348

GERMAN RISK STUDY - MAIN REPORT: A STUDY OF THE RISK DUE TO ACCIDENTS IN NUCLEAR POWER PLANTS

BARTLETT, J.W.

50

AN OVERVIEW OF WASTE ISOLATION SAFETY ASSESSMENT METHODS

755

SAFETY ASSESSMENT OF GEOLOGIC REPOSITORIES FOR NUCLEAR WASTE

BASSON, J.K.

747

AIRBORNE RADIATION HAZARDS IN URANIUM MINING

BATTELLE, PACIFIC NORTHWEST LABORATORIES

195
ALTERNATIVES FOR MANAGING WASTES FROM REACTORS AND
POST-FISSION OPERATIONS IN THE LWR FUEL CYCLE, VOL. 1

196
ALTERNATIVES FOR MANAGING WASTES FROM REACTORS AND
POST-FISSION OPERATIONS IN THE LWR FUEL CYCLE, VOL. 2

197
ALTERNATIVES FOR MANAGING WASTES FROM REACTORS AND
POST-FISSION OPERATIONS IN THE LWR FUEL CYCLE, VOL. 3

198
ALTERNATIVES FOR MANAGING WASTES FROM REACTORS AND
POST-FISSION OPERATIONS IN THE LWR FUEL CYCLE, VOL. 4

199
ALTERNATIVES FOR MANAGING WASTES FROM REACTORS AND
POST-FISSION OPERATIONS IN THE LWR FUEL CYCLE, VOL. 5

312
TECHNOLOGY FOR COMMERCIAL RADIOACTIVE WASTE MANAGEMENT

313
TECHNOLOGY FOR COMMERCIAL RADIOACTIVE WASTE MANAGEMENT

314
TECHNOLOGY FOR COMMERCIAL RADIOACTIVE WASTE MANAGEMENT

315
TECHNOLOGY FOR COMMERCIAL RADIOACTIVE WASTE MANAGEMENT

316
TECHNOLOGY FOR COMMERCIAL RADIOACTIVE WASTE MANAGEMENT

317
ENVIRONMENTAL ASPECTS OF COMMERCIAL RADIOACTIVE WASTE
MANAGEMENT

318
ENVIRONMENTAL ASPECTS OF COMMERCIAL RADIOACTIVE WASTE
MANAGEMENT

319
ENVIRONMENTAL ASPECTS OF COMMERCIAL RADIOACTIVE WASTE
MANAGEMENT

389
ALTERNATIVE PROCESSES FOR MANAGING EXISTING COMMERCIAL
HIGH-LEVEL RADIOACTIVE WASTES

BECHTEL NATIONAL, INC., NUCLEAR FUEL OPERATIONS, SAN FRANCISCO
137
AN ASSESSMENT OF LWR SPENT FUEL DISPOSAL OPTIONS, VOL. 3.
STUDY BASES AND SYSTEM DESIGN CONSIDERATIONS (APPENDICES)

BENJAMIN, A.S.
453
SPENT FUEL HEATUP FOLLOWING LOSS OF WATER DURING STORAGE

456
SPENT-FUEL HEATUP FOLLOWING LOSS OF WATER DURING STORAGE

BERMAN, W.R.
489
ANALYSIS OF SOME NUCLEAR WASTE MANAGEMENT OPTIONS, VOL. 1.
ANALYSIS AND INTERPRETATION, VOL. 2 APPENDICES

BERNHARDT, D.E.
134
RADON EXHALATION FROM URANIUM MILL TAILINGS PILES.
DESCRIPTION AND VERIFICATION OF THE MEASUREMENT METHOD

BERNREUTER, D.L.
504
SEISMIC EVALUATION OF COMMERCIAL PLUTONIUM FABRICATION
PLANTS IN THE UNITED STATES

BERTOZZI, G.
257
EVALUATION OF THE SAFETY OF STORING RADIOACTIVE WASTES IN
GEOLOGICAL FORMATIONS: A PRELIMINARY APPLICATION OF THE
FAULT TREE ANALYSIS TO SALT FORMATIONS.

725
PROBABILISTIC RISK ANALYSIS OF RADIOACTIVITY RELEASE AND
TRANSPORT FROM GEOLOGIC DISPOSAL OF RADIOACTIVE WASTES

BINGHAM, G.E.
355
FINAL SAFETY ANALYSIS REPORT FOR THE IRRADIATED FUELS
STORAGE FACILITY

BISHOP, W.P.
179
ENVIRONMENTAL SURVEY OF THE REPROCESSING AND WASTE
MANAGEMENT PORTIONS OF THE LWR FUEL CYCLE. A TASK FORCE
REPORT

BLANCO, R.C.

76

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE FOR USE IN ESTABLISHING "AS LOW AS PRACTICABLE" GUIDES - FABRICATION OF LIGHT-WATER REACTOR FUELS CONTAINING PLUTONIUM

BLANCO, R.E.

416

HIGH-LEVEL WASTE PROGRAM. PROGRESS REPORT, OCTOBER 1, - MARCH 31, 1979

702

A COST/BENEFIT ANALYSIS OF METHODS FOR CONTROLLING THE RELEASE OF RADIOACTIVE MATERIALS IN THE NUCLEAR FUEL CYCLE

BLOEMKE, J.O.

79

DISPOSAL OF NUCLEAR WASTES BY TRANSMUTATION

BLOOM, S.G.

136

ANALYSIS OF INTERACTIONS OF MECHANICAL DEFORMATIONS AND MASS TRANSFER ON HEAT TRANSFER FROM AN UNDERGROUND NUCLEAR WASTE REPOSITORY

BODEAU, D.J.

266

DATA BASE FOR RADIATION EVENTS IN THE COMMERCIAL NUCLEAR FUEL CYCLE 1959-1978

BOECK, H.

464

ANALYSIS OF RISKS IN THE NUCLEAR FUEL CYCLE

BONZON, L.L.

452

FINAL REPORT ON SPECIAL IMPACT TESTS OF PLUTONIUM SHIPPING CONTAINERS. DESCRIPTION OF TEST RESULTS

BRANAGAN, E.F., JR.

731

HEALTH EFFECTS OF URANIUM MINING AND MILLING FOR COMMERCIAL NUCLEAR POWER

BRANDSTETTER, A.

51

DEVELOPMENT AND TESTING OF LONG-TERM SAFETY ASSESSMENT
METHODOLOGY FOR GEOLOGIC WASTE REPOSITORIES

410

WASTE ISOLATION SAFETY ASSESSMENT PROGRAM TECHNICAL
PROGRESS REPORT FOR FY-1979

BRESESTI, M.

256

RADIOACTIVE WASTE DISPOSAL IN GEOLOGICAL FORMATIONS:
RESEARCH ACTIVITIES OF THE COMMISSION OF THE EUROPEAN
COMMUNITIES

BRESLIN, J.

156

NATIONAL PROGRAM FOR MANAGEMENT OF COMMERCIAL HIGH-LEVEL
WASTE. REPORT ON GEOLOGIC EXPLORATION ACTIVITIES

BROBST, W.A.

148

TRANSPORTATION ACCIDENTS: HOW PROBABLE?

BROWN, C.H.

393

RISK COMPARISON OF CENTRALIZING OR DECENTRALIZING
PROCESSING FACILITIES FOR DEFENSE TRANSURANIC WASTE

BROWN, J.B.

90

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: EFFECTS OF VARIABLE HYDROLOGIC PATTERNS ON THE
ENVIRONMENTAL TRANSPORT MODEL

BRUECHER, H.

52

CONTRIBUTIONS TO THE RISK EVALUATION OF A HIGH-LEVEL WASTE
SOLIDIFICATION PLANT

53

CONTRIBUTIONS TO THE RISK EVALUATION OF A HIGH-LEVEL WASTE
SOLIDIFICATION PLANT

BUCKNER, J.T.

175

METHODOLOGY DEVELOPMENT FOR RISK ASSESSMENT OF FUEL
PROCESSING

BUELT, J.L.

445

SAFETY ASSESSMENT OF THE LIQUID-FED CERAMIC MELTER PROCESS

BUETZER, P.

255

GEOSPHERE TRANSPORT MODEL FOR RISK EVALUATION: CALCULATION
OF MAXIMUM CONCENTRATION OF ACTIVITY AT GIVEN DISTANCES
FROM THE WASTE DISPOSAL SITE DUE TO WATER INVASION

BURKHOLDER, H.C.

254

SAFETY ASSESSMENT AND GEOSPHERE TRANSPORT METHODOLOGY FOR
THE GEOLOGIC ISOLATION OF NUCLEAR WASTE MATERIALS

BURNS, E.T.

578

PRELIMINARY INVESTIGATION OF FIRE AS A CONTRIBUTOR TO CRBRF
RISK, PT. 1

BURNS, R.E.

281

HIGH-LEVEL WASTE CONCENTRATION AND STORAGE: AN OVERVIEW

455

CONCENTRATION AND STORAGE OF HIGH LEVEL RADIOACTIVE WASTES
- AN OVERVIEW

BURTON, H.M.

342

TASK FORCE EVALUATION OF TRU WASTE RETRIEVAL METHODS, FINAL
REPORT

BUSLIK, A.J.

451

I-131 RELEASE PROBABILITY DISTRIBUTION FOR FUEL HANDLING
ACCIDENT

CALIFORNIA ENERGY RESOURCE CONSERVATION AND DEVELOPMENT COMMISSIO

374

NUCLEAR FUEL REPROCESSING AND HIGH LEVEL WASTE DISPOSAL:
INFORMATION HEARINGS, VOL. 12, PUBLIC AND PRIVATE ROLES,
PT. 2

CAMPBELL, J.E.

86

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: THE NETWORK FLOW AND TRANSPORT (NWF1) MODEL

89

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: INTERIM REPORT

165

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: THE NEFT/DVM COMPUTER CODE USERS MANUAL

715

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: TRANSPORT MODEL SENSITIVITY ANALYSIS

716

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: THE DISTRIBUTED VELOCITY METHOD OF SOLVING THE
CONVECTIVE- DISPERSION EQUATION

727

DEVELOPMENT OF RISK ASSESSMENT METHODOLOGY APPLICABLE TO
RADIOACTIVE WASTE ISOLATION

757

DISTRIBUTED VELOCITY METHOD OF SOLVING THE
CONVECTIVE-DISPERSION EQUATION: 1. INTRODUCTION,
MATHEMATICAL THEORY, AND NUMERICAL IMPLEMENTATION. 2. ERROR
ANALYSIS AND COMPARISON WITH OTHER METHODS

CANDOLFO, G.

510

SOME ASPECTS OF THE RISKS ASSOCIATED WITH A MIXED OXIDE
FUEL FABRICATION PLANT

CARTER, J.L.

299

ACORN: A COMPUTER PROGRAM FOR PLOTTING FAULT TREES

CHANNELL, J.K.

307

CALCULATED RADIATION DOSES FROM DEPOSITION OF MATERIAL
RELEASED IN HYPOTHETICAL TRANSPORTATION ACCIDENTS INVOLVING
WIPP-RELATED RADIOACTIVE WASTES

CHATURVEDI, L.

309

WIPP SITE AND VICINITY GEOLOGICAL FIELD TRIP

CHEM-NUCLEAR SYSTEMS, INC.

3

PROCEDURES, LICENSE AND SAFETY ANALYSIS REPORT FOR
CHEM-NUCLEAR SYSTEMS, INC. CNSI 1600 TYPE B RADWASTE
SHIPPING CASK (USA/9091B)

4
PROCEDURES, LICENSE AND SAFETY ANALYSIS REPORT FOR
CHEM-NUCLEAR SYSTEMS, INC. CNSI 14-195H TYPE A RADWASTE
SHIPPING CASK (USA/9094/A)

CHEUNG, H.

132
NUCLEAR WASTE FORM RISK ASSESSMENT FOR U.S. DEFENSE WASTE
AT SAVANNAH RIVER PLANT. ANNUAL REPORT FISCAL YEAR 1980

CHICKEN, J.C.

522
SUMMARY OF THE RISK ASSESSMENT MODE OF THE TRANSPORT OF
PLUTONIUM NITRATE

CHIKALLA, T.D.

507
NUCLEAR WASTE MANAGEMENT QUARTERLY PROGRESS REPORT JULY
THROUGH SEPTEMBER 1980

CLAIBORNE, H.C.

162
TRIP REPORT: WORKSHOP ON RISK ANALYSIS AND GEOLOGIC
MODELING IN RELATION TO THE DISPOSAL OF RADIOACTIVE WASTES
IN GEOLOGICAL FORMATIONS

170
EXPECTED ENVIRONMENTS IN HIGH-LEVEL NUCLEAR WASTE AND SPENT
FUEL REPOSITORIES IN SALT

253
THE UNITED STATES PROGRAM FOR THE SAFETY ASSESSMENT OF
GEOLOGIC DISPOSAL OF COMMERCIAL RADIOACTIVE WASTES

425
POTENTIAL CONTAINMENT FAILURE MECHANISMS AND THEIR
CONSEQUENCES AT A RADIOACTIVE WASTE REPOSITORY IN BEDDED
SALT IN NEW MEXICO

CLANCY, J.J.

509
DATA BASE FOR RADIOACTIVE WASTE MANAGEMENT. VOL. 1. REVIEW
OF RADIOACTIVE WASTE DISPOSAL HISTORY

CLARK, D.A.

520
STATE-OF-THE-ART: URANIUM MINING, MILLING, AND REFINING
INDUSTRY

CLARKE, R.K.

5

SEVERITIES OF TRANSPORTATION ACCIDENTS. VOLS. I-IV. SUMMARY,
CARGO AIRCRAFT, MOTOR CARRIERS, TRAIN

CLONINGER, M.O.

131

AN ANALYSIS ON THE USE OF ENGINEERED BARRIERS FOR GEOLOGIC
ISOLATION OF SPENT FUEL

COATS, D.W.

508

EVALUATION OF THE SEISMIC INTEGRITY OF A PLUTONIUM-HANDLING
FACILITY

COHEN, B.L.

55

ANALYSIS, CRITIQUE, AND REEVALUATION OF HIGH-LEVEL WASTE
REPOSITORY WATER INTRUSION SCENARIO STUDIES

56

A GENERIC HAZARD EVALUATION OF LOW-LEVEL WASTE BURIAL
GROUNDS

125

ENVIRONMENTAL IMPACTS OF HIGH LEVEL RADIOACTIVE WASTE
DISPOSAL

700

RADON DAUGHTER EXPOSURE TO URANIUM MINERS

COHEN, J.J.

54

REVIEW OF ISSUES RELEVANT TO ACCEPTABLE RISK CRITERIA FOR
NUCLEAR WASTE MANAGEMENT

107

RISK ASSESSMENT AND RADIOACTIVE WASTE MANAGEMENT

401

DETERMINATION OF PERFORMANCE CRITERIA FOR HIGH-LEVEL
SOLIDIFIED NUCLEAR WASTE

423

DETERMINATION OF ACCEPTABLE RISK CRITERIA FOR NUCLEAR WASTE
MANAGEMENT

COLE, C.R.

395

SUMMARY OF FOUR RELEASE CONSEQUENCE ANALYSES FOR
HYPOTHETICAL NUCLEAR WASTE REPOSITORIES IN SALT AND GRANITE

COMMITTEE ON THE BIOLOGICAL EFFECTS OF IONIZING RADIATION

567

THE EFFECTS ON POPULATIONS OF EXPOSURE TO LOW LEVELS OF
IONIZING RADIATION: 1980

COONS, W.E.

418

THE FUNCTIONS OF AN ENGINEERED BARRIER SYSTEM FOR A NUCLEAR
WASTE REPOSITORY IN BASALT

COOPERSTEIN, R.

344

PRELIMINARY ENVIRONMENTAL ANALYSIS OF A GENERIC FUEL
REPROCESSING PLANT

COPPOLA, A.

152

A RISK COMPARISON

CORYNEN, G.C.

259

"STOP": A FAST PROCEDURE FOR THE EXACT COMPUTATION OF THE
PERFORMANCE OF COMPLEX PROBABILISTIC SYSTEMS

COTGROVE, S.

662

RISK, VALUE CONFLICT AND POLITICAL LEGITIMACY

COWAN, C.E.

516

SOME IMPLICATIONS OF IN SITU URANIUM MINING TECHNOLOGY
DEVELOPMENT, EXECUTIVE SUMMARY

521

SOME IMPLICATIONS OF IN SITU URANIUM MINING TECHNOLOGY
DEVELOPMENT

CRANWELL, R.M.

126

AN APPLICATION OF GEOMETRIC PROBABILITY TO THE EXISTENCE OF
FAULTS IN ANISOTROPIC MEDIA

192
RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: THE DNET COMPUTER CODE USER'S MANUAL

690
PROBABILISTIC ASPECTS OF FAULTING IN ANISOTROPIC MEDIA

722
RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: SCENARIO DEVELOPMENT

CROFF, A.G.
264
ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT.
I. OVERALL ASSESSMENT

CROSETTI, P.A.
57
FAULT TREE ANALYSIS WITH PROBABILITY EVALUATION

CROSS, F.T.
506
EXPOSURE STANDARDS FOR URANIUM MINING

CRONE, B.
394
VOLCANIC HAZARD STUDIES

CRONE, B.M.
647
DISRUPTIVE EVENT ANALYSIS: VOLCANISM AND IGNEOUS INTRUSION

CUMMINGS, R.D.
325
PROPOSED WASTE ISOLATION PILOT PROJECT (WIPP) AND IMPACTS
IN THE STATE OF NEW MEXICO: A SOCIO-ECONOMIC ANALYSIS

D'ALESSANDRO, M.
236
RADIOACTIVE WASTE DISPOSAL INTO A PLASTIC CLAY FORMATION:
PROBABILISTIC ASSESSMENT OF THE GEOLOGICAL CONTAINMENT

469
PROBABILITY ANALYSIS OF GEOLOGICAL PROCESSES: A USEFUL TOOL
FOR THE SAFETY ASSESSMENT OF RADIOACTIVE WASTE DISPOSAL

DAVIS, W., JR.
238
CORRELATION OF RADIOACTIVE WASTE TREATMENT CCSTs AND THE
ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL
CYCLE - REPROCESSING OF HIGH-TEMPERATURE GAS-COOLED REACTOR
FUEL CONTAINING U-233 AND THORIUM

DENHAM, D.H.

296

RADIOLOGICAL EVALUATIONS FOR ADVANCED WASTE MANAGEMENT STUDIES

DENNIS, A.W

6

SEVERITIES OF TRANSPORTATION ACCIDENTS INVOLVING LARGE PACKAGES

DESROSIERS, A.E.

209

THE USE OF A RISK LIMIT AS AN ENVIRONMENTAL SAFETY STANDARD FOR RADIOACTIVE WASTE DISPOSAL SITES

DESTEESE, J.G.

7

NATIONAL WASTE TERMINAL STORAGE PROGRAM: POTENTIAL PROBLEMS IN THE WASTE TRANSPORTATION SYSTEM

532

ENERGY MATERIAL TRANSPORT, NOW THROUGH 2000, SYSTEM CHARACTERISTICS AND POTENTIAL PROBLEMS TASK 3- FINAL REPORT - PETROLEUM TRANSPORTATION.

535

IDENTIFICATION AND PRIORITIZATION OF POTENTIAL PROBLEMS IN NUCLEAR MATERIAL TRANSPORTATION, NOW THROUGH 2000

DEUTCH, J.M., CHMN.

260

REPORT TO THE PRESIDENT BY THE INTERAGENCY REVIEW GROUP ON NUCLEAR WASTE MANAGEMENT

DEXTER, A.H.

758

COMPONENT FAILURE-RATE DATA WITH POTENTIAL APPLICABILITY TO A NUCLEAR FUEL REPROCESSING PLANT

DILLON, R.T.

88

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE WASTE: THE SANDIA WASTE ISOLATION FLOW AND TRANSPORT (SWIFT) MODEL

DINNEEN, P.M.

740

AWAY-FROM-REACTOR STORAGE OF SPENT NUCLEAR FUEL: FACTORS AFFECTING DEMAND

DINUNNO, J.J.

60

ENVIRONMENTAL ASPECTS OF HIGH-LEVEL RADIOACTIVE WASTE
DISPOSAL IN DEEP GEOLOGIC FORMATIONS

DONATH, F.A.

744

PROBABILISTIC TREATMENT OF FAULTING IN GEOLOGIC MEDIA

DORNSIFE, W.P.

207

A PERSPECTIVE ON THE RELATIVE HAZARD OF LOW-LEVEL
RADIOACTIVE WASTE DISPOSAL

DOSCH, R.G.

422

ASSESSMENT OF POTENTIAL RADIONUCLIDE TRANSPORT IN
SITE-SPECIFIC GEOLOGIC FORMATIONS

DOTY, J.W.

369

ACCEPTABLE TRU PACKAGING FOR INTERIM STORAGE AND/OR
TERMINAL ISOLATION: FY-1977 FINAL REPORT

378

CONCEPTUAL TRU WASTE CONTAINER DESIGN SPECIFICATIONS

DROPPO, J.G.

517

AN ASSESSMENT OF THE RADON CONCENTRATIONS IN AIR CAUSED BY
EMISSIONS FROM MULTIPLE SOURCES IN A URANIUM MINING AND
MILLING REGION. A CASE STUDY OF THE AMERCSIA LAKE REGION OF
NEW MEXICO

DUCKWORTH, J.P.

381

THE HIGH-LEVEL RADIOACTIVE WASTE MANAGEMENT PROGRAM AT
NUCLEAR FUEL SERVICES

DUGUID, J.O.

167

ASSESSMENT OF DOE LOW-LEVEL RADIOACTIVE SOLID WASTE
DISPOSAL STORAGE ACTIVITIES: TASK 103

433

STATUS REPORT ON RADIOACTIVITY MOVEMENT FROM BURIAL GROUNDS
IN MELTON AND BETHEL VALLEYS

DUNSTER, H.J.

59

THE ASSESSMENT OF RISK - ITS VALUE AND LIMITATIONS

DURANT, W.S.

202

SAVANNAH RIVER LABORATORY DATA BANKS FOR RISK ASSESSMENT OF
FUEL REPROCESSING PLANTS

203

THE APPLICATION OF PROBABILISTIC RISK ASSESSMENT TO NUCLEAR
FUEL REPROCESSING AT THE SAVANNAH RIVER PLANT

205

RISK ANALYSIS FOR THE SAVANNAH RIVER PLANT FUEL SEPARATIONS
FACILITIES

E.A. AND T. CO., INC.

531

MONITORING INSTRUMENTATION SPENT FUEL MANAGEMENT PROGRAM

EATON, R.R.

120

SENSITIVITY OF CALCULATED PORE-FLUID PRESSURE TO REPOSITORY
FRACTURE GEOMETRY

EDITOR, NATIONAL TECHNICAL INFORMATION SERVICE

437

HAZARDOUS MATERIALS TRANSPORTATION: RADIOACTIVE MATERIALS
AND WASTES, 1964 - SEPTEMBER, 1981. (CITATIONS FROM THE
NTIS DATA BASE)

EL-BASSIONI, A.A.

178

A METHODOLOGY AND A PRELIMINARY DATA BASE FOR EXAMINING THE
HEALTH RISKS OF ELECTRICITY GENERATION FROM URANIUM AND
COAL FUELS

ELDER, H.K.

9

AN ANALYSIS OF THE RISK OF TRANSPORTING SPENT NUCLEAR FUEL
BY TRAIN

10

AN ASSESSMENT OF THE RISK OF TRANSPORTING SPENT NUCLEAR
FUEL BY TRUCK

61
RISK OF SHIPPING SPENT FUEL IN THE U.S.

530
THE RISK OF TRANSPORTING SPENT NUCLEAR FUEL BY TRUCK

ELLIOT, J.M.
529
ASSESSMENT OF INSTITUTIONAL AND TECHNICAL MEASURES TO
REDUCE THE RISK OF POTENTIAL ACCIDENTS AND SABOTAGE OF
NUCLEAR SPENT FUEL DURING TRANSPORT

ENGELBRECHT-HIGGANS, R.
528
ON THE RELATIONSHIP OF VARIOUS RELIABILITY MEASURES TO EACH
OTHER AND TO GAME THEORETICAL VALUES

ENSMINGER, D.A.
499
PRE-SEALING RISK ANALYSIS

633
ASPECTS OF NUCLEAR WASTE MANAGEMENT, VOL. 1.
PRE-EMPLACEMENT RISKS

ENVIRONMENT CANADA, ENVIRONMENTAL PROTECTION SERVICE
527
MONITORING PROGRAM DESIGN RECOMMENDATIONS FOR URANIUM
MINING AND MILLING

ERB, J.C.
214
AN ASSESSMENT OF THE ENVIRONMENTAL TRANSPORT OF RADIOIODINE
IN THE AIR-GRASS-COW-MILK PATHWAY USING REPORTED
ENVIRONMENTAL MONITORING DATA

ERDMANN, R.C.
62
PROBABILISTIC SAFETY ANALYSIS OF FUEL CYCLE

63
PRELIMINARY ACCIDENT RADIOLOGICAL RISK ASSESSMENT OF A
LARGE COMMERCIAL MOX FUEL FABRICATION PLANT

200
STATUS REPORT ON THE EPRI FUEL CYCLE ACCIDENT RISK
ASSESSMENT

347
PROBABILISTIC SAFETY ANALYSIS V. INTERIM REPORT

349
PROBABILISTIC SAFETY ANALYSIS. INTERIM REPORT 1

526
PROBABILISTIC SAFETY ANALYSIS IV

681
FUEL CYCLE RISK ASSESSMENT - PRELIMINARY DRAFT

ESSINGTON, E.H.
213
RETENTION OF LOW-LEVEL RADIOACTIVE WASTE MATERIAL BY SOIL

ESTES, B.F.
682
PROCEEDINGS: NUCLEAR CRITICALITY SAFETY NATIONAL TOPICAL
MEETING, APRIL 8-10, 1980, EL PASO, TEXAS

EVANS, A.G.
177
MANAGEMENT OF RADIOACTIVE WASTE GASES FROM THE NUCLEAR FUEL
CYCLE. VOL. 1. COMPARISON OF ALTERNATIVES

FEDERAL RADIATION COUNCIL
252
GUIDANCE FOR THE CONTROL OF RADIATION HAZARDS IN URANIUM
MINING

FIELDS, D.E.
544
COMPUTERIZED METHODOLOGY FOR EVALUATING THE LONG-RANGE
RADIOLOGICAL IMPACT OF SHALLOW-LAND BURIAL

FILTER, H.E.
373
DOW SYSTEM FOR SOLIDIFICATION OF LOW LEVEL RADIOACTIVE
WASTES FROM NUCLEAR POWER PLANTS

FINLAYSON, B.A.
459
PRELIMINARY INVESTIGATION INTO THE THEORY AND TECHNIQUES OF
MODELING THE NATURAL MOISTURE MOVEMENT IN UNSATURATED
SEDIMENTS

FINNEY, B.C.

73

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE - REPROCESSING LIGHT-WATER REACTOR FUEL

FINNIGAN, J.W.

280

U.S. DOMESTIC HIGH LEVEL WASTE MANAGEMENT SYSTEM

FLEHING, K.N.

354

HTGR ACCIDENT INITIATION AND PROGRESSION ANALYSIS STATUS REPORT. VOL. 2. AIPA RISK ASSESSMENT METHODOLOGY

FLOOR ENGINEERS AND CONSTRUCTORS, INC.

323

ICFP INJECTION WELL ALTERNATIVE PROJECT, IDAHO NATIONAL ENGINEERING LABORATORY. FINAL REPORT

FOLEY, J.T.

543

THE SANDIA TRANSPORTATION TECHNICAL ENVIRONMENTAL INFORMATION CENTER AND ITS APPLICATION TO TRANSPORTATION RISK ANALYSES.

FORD, BACON AND DAVIS UTAH, INC.

326

ENGINEERING ASSESSMENT OF INACTIVE URANIUM MILL TAILINGS

327

SUMMARY OF THE ENGINEERING ASSESSMENT OF INACTIVE URANIUM MILL TAILINGS, RIVERTON SITE, RIVERTON, WYOMING

328

ENGINEERING ASSESSMENT OF INACTIVE URANIUM MILL TAILINGS: MONUMENT VALLEY SITE, MONUMENT VALLEY, ARIZONA

FORT, C.W., JR.

593

RADIOACTIVE EMISSIONS FROM YELLOWCAKE PROCESSING STACKS AT URANIUM MILLS

FOWLER, T.W.

145

HEALTH IMPACT ASSESSMENT OF CARBON-14 EMISSIONS FROM NORMAL OPERATIONS OF URANIUM FUEL CYCLE FACILITIES

FRANKLIN, A.L.

8

EVALUATION OF IMPROVED POTENTIAL FOR SPENT FUEL CASK
HANDLING

45

TRECII: A COMPUTER PROGRAM FOR TRANSPORTATION RISK
ASSESSMENT

FRIED, S.

285

THE MIGRATION OF LONG-LIVED RADIOACTIVE PROCESSING WASTES
IN SELECTED ROCKS. ANNUAL REPORT TO THE OFFICE OF WASTE
HANDLING, PROJECT AN011A, FY 1977

FULLWOOD, R.

172

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT:
VI. SHORT-TERM RISK ANALYSIS OF REPROCESSING, REFABRICATION,
AND TRANSPORTATION. SUMMARY

FULLWOOD, R.R.

251

SHORT-TERM RISK OF ACTINIDE PARTITIONING

261

WORKING PAPER FOR A PROBABILITY/CONSEQUENCE ANALYSIS OF A
NUCLEAR FUELS RECOVERY AND RECYCLING CENTER

426

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT.
VI. SHORT-TERM RISK ANALYSIS OF REPROCESSING, REFABRICATION,
AND TRANSPORTATION: REFABRICATION, AND TRANSPORTATION:
APPENDIX

536

PRELIMINARY RISK ANALYSIS OF THE TRANSPORTATION OF NUCLEAR
WASTE

537

RADIOLOGICAL RISK ANALYSIS OF TRUCK AND RAIL TRANSPORTATION
OF NUCLEAR WASTE2 S

539

TRANSPORTATION OF SPENT FUEL BY BARGE AND BY RAIL: A
COMPARISON OF RISK

540

WORKING PAPER FOR A PROBABILISTIC RADIOLOGICAL SAFETY
EVALUATION OF A NUCLEAR WASTE REPOSITORY

541

WORKING PAPER FOR A RADIOLOGICAL ACCIDENT
PROBABILITY/CONSEQUENCE ANALYSIS OF A MIXED-OXIDE FUEL
FABRICATION PLANT

542

PRELIMINARY RISK ANALYSIS OF THE TRANSPORTATION OF NUCLEAR
WASTE

684

WORKING PAPER FOR A PROBABILITY/CONSEQUENCE ANALYSIS OF
TRANSPORTATION OF NUCLEAR WASTES

GALLUCCI, R.H.V.

27

A RISK ASSESSMENT FOR THE TRANSPORTATION OF RADIOACTIVE
ZECLITE LINERS

GARCIA, A.A.

581

WORKING PAPER FOR EVALUATION OF RISK FROM THE FRONT END OF
THE FUEL CYCLE

GARRICK, B.J.

724

COST-BENEFIT ESTIMATE OF TRANSPORTING SPENT NUCLEAR FUEL BY
SPECIAL TRAINS

GEFFEN, C.A.

17

AN ANALYSIS OF THE RISK OF TRANSPORTING URANIUM ORE
CONCENTRATES BY TRUCK

28

AN ASSESSMENT OF THE RISK OF TRANSPORTING URANIUM
HEXAFLUORIDE BY TRUCK AND TRAIN

551

RISKS OF SHIPPING URANIUM HEXAFLUORIDE BY TRUCK AND TRAIN

GEIGER, J.F.

686

ASSESSMENT OF HANFORD BURIAL GROUNDS AND INTERIM TRU STORAGE

GENERAL ELECTRIC

552

DESCRIPTION OF GE SHIPPING CASKS #DOT-SF-5369 AND
DOT-SF-5169

685

ENVIRONMENTAL REPORT. GENERAL ELECTRIC NUCLEAR FACILITY,
WILMINGTON, NORTH CAROLINA

GEOTECHNICAL ENGINEERS, INC.

500

STATE-OF-THE-ART FOR EVALUATING THE POTENTIAL EFFECTS OF
EROSION AND DEPOSITION ON A RADIOACTIVE WASTE REPOSITORY

GERA, F.

168

GEOCHEMICAL BEHAVIOR OF LONG-LIVED RADIOACTIVE WASTES

434

CONSIDERATIONS IN THE LONG-TERM MANAGEMENT OF HIGH-LEVEL
RADIOACTIVE WASTES

GIRARDI, F.

64

LONG-TERM RISK ASSESSMENT OF RADIOACTIVE WASTE DISPOSAL IN
GEOLOGICAL FORMATIONS

353

LONG-TERM RISK ASSESSMENT OF RADIOACTIVE WASTE DISPOSAL IN
GEOLOGICAL FORMATIONS

710

RISK ANALYSIS OF GEOLOGICAL DISPOSAL OF RADIOACTIVE WASTES

GOLDBERG, S.M.

707

AN ASSESSMENT METHODOLOGY OF ENVIRONMENTAL RISKS ASSOCIATED
WITH RADIOACTIVE WASTE MANAGEMENT

GREENBERG, J.

46

APPLICATION OF ALARA PRINCIPLES TO THE SHIPMENT OF SPENT
NUCLEAR FUEL

121

WASTE ISOLATION SAFETY ASSESSMENT PROGRAM SCENARIO ANALYSIS
METHODS FOR USE IN ASSESSING THE SAFETY OF THE GEOLOGIC
ISOLATION OF NUCLEAR WASTE

550
APPLICATION OF ALARA PRINCIPLES TO SHIPMENT OF SPENT
NUCLEAR FUEL

GRIESMEYER, J.M.

667
ON THE DEVELOPMENT OF QUANTITATIVE RISK ACCEPTANCE CRITERIA

742
RISK MANAGEMENT AND DECISION RULES FOR LIGHT WATER REACTORS

GRIFFIN, J.F.

15
SAFETY ANALYSIS REPORT FOR PACKAGING (SARP): ATMX-500
RAILCAR NUCLEAR PACKAGING

GRIFFITHS, R.F.

661
INTRODUCTION: THE NATURE OF RISK ASSESSMENT

GRUEHN, H.

135
RISK INVOLVED IN THE STORAGE OF RADIOACTIVE WASTES FROM
NUCLEAR POWER PLANTS

HADLOCK, C.R.

69
ON ASSESSING THE LONG-TERM INTEGRITY OF NUCLEAR WASTE
REPOSITORIES

HAGE, W.

708
CHEMICAL SEPARATION AND NUCLEAR TRANSMUTATION OF BY-PRODUCT
ACTINIDES

HALL, R.J.

13
ASSESSMENT OF ENVIRONMENTAL IMPACT OF PROPOSED RULE MAKING
AFFECTING THE CONDITIONS OF TRANSPORT OF RADIOACTIVE
MATERIALS ON AIRCRAFT

16
AN ASSESSMENT OF RISK OF TRANSPORTING PLUTONIUM DIOXIDE AND
LIQUID PLUTONIUM NITRATE BY TRAIN

HAMMOND, J.E.

546
DESIGN CRITERIA TRANSURANIC DRY WASTE BURIAL CONTAINERS
STEEL AND REINFORCED CONCRETE

HAMSTRA, J.

127

THE WATERPROOF GEOMETRY OF SALT DOMES, AN IMPORTANT SAFETY ASPECT FOR THEIR EXPLOITATION FOR ULTIMATE DISPOSAL OF HIGH-LEVEL WASTE

341

TEMPERATURE CALCULATIONS ON DIFFERENT CONFIGURATIONS FOR DISPOSAL OF HIGH-LEVEL REPROCESSING WASTE IN A SALT DOME MODEL

HANCHEY, L.A.

461

URANIUM MILL TAILINGS AND RADON

HANELIUS, A

613

STUDY ON SEPARATE SPENT FUEL STORAGE FACILITY

HANSON, G.L.

547

SAFETY ASSESSMENT DOCUMENT PWR CORE 2 PROJECT

HARTWIG, S.

14

RISK ASSESSMENT FOR THE TRANSPORTATION OF POC2, UF6, AND SPENT FUEL ON ROADS IN THE FEDERAL REPUBLIC OF GERMANY

HARVEY, T.F.

474

DISRUPTIVE EVENT UNCERTAINTIES IN A PERTURBATION APPROACH TO NUCLEAR WASTE REPOSITORY RISK ANALYSIS

HAUG, H.O.

65

SOME ASPECTS AND LONG-TERM PROBLEMS OF HIGH-LEVEL AND ACTINIDE-CONTAMINATED SPENT FUEL REPROCESSING WASTES FROM THE U-PU AND TH-U FUEL CYCLES

HAYWOOD, F.F.

424

ASSESSMENT OF RADIOLOGICAL IMPACT OF THE INACTIVE URANIUM-MILL TAILINGS PILE AT SALT LAKE CITY, UTAH

432

ASSESSMENT OF THE RADIOLOGICAL IMPACT OF THE INACTIVE URANIUM-MILL TAILINGS AT GRAND JUNCTION, COLORADO

549
MEASUREMENTS OF RADON DAUGHTER CONCENTRATIONS IN STRUCTURES
BUILT ON OR NEAR URANIUM MINE TAILINGS

HEABERLIN, S.W.

11
PLUTONIUM TRANSPORT PACKAGE CLOSURE SURVEY

12
CONSEQUENCES OF POSTULATED LOSSES OF LWR SPENT FUEL AND
PLUTONIUM SHIPPING PACKAGES AT SEA

HECKMAN, R.A.

402
PROBABILISTIC SAFETY ANALYSIS FOR SOLIDIFIED HIGH-LEVEL
NUCLEAR WASTE MANAGEMENT SYSTEMS: A STATUS REPORT

466
SYSTEMS ANALYSIS STUDY FOR WASTE MANAGEMENT CRITERIA

473
SITE SUSTAINABILITY CRITERIA FOR SOLIDIFIED HIGH LEVEL WASTE
REPOSITORIES

476
DETERMINATION OF PERFORMANCE CRITERIA FOR HIGH-LEVEL
SOLIDIFIED NUCLEAR WASTE

477
ABSTRACTS: NRC WASTE MANAGEMENT PROGRAM REPORTS

501
DEVELOPING CRITERIA FOR THE MANAGEMENT OF NUCLEAR WASTES

511
DETERMINATION OF PERFORMANCE CRITERIA FOR HIGH-LEVEL
SOLIDIFIED NUCLEAR WASTE FROM THE COMMERCIAL NUCLEAR FUEL
CYCLE: A PROBABILISTIC SAFETY ANALYSIS

596
DECOMMISSIONING OF SURFACE FACILITIES ASSOCIATED WITH
REPOSITORIES FOR THE DEEP GEOLOGICAL DISPOSAL OF HIGH-LEVEL
NUCLEAR WASTE

HEISING, C.D.

726
APPLYING BAYESIAN DECISION THEORY TO ASSESS REPROCESSING
ECONOMIC AND SOCIAL COST-BENEFITS

HELTON, J.

228

GEOLOGIC WASTE DISPOSAL AND A MODEL FOR THE SURFACE
MOVEMENT OF RADIONUCLIDES

HELTON, J.C.

84

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: MODEL DESCRIPTION AND USER MANUAL FOR PATHWAYS MODEL

720

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: SENSITIVITY ANALYSIS OF THE ENVIRONMENTAL TRANSPORT
MODEL

721

RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: ASYMPTOTIC PROPERTIES OF THE ENVIRONMENTAL TRANSPORT
MODEL

HENSLEY, G.

258

SAFETY AND RELIABILITY ASSESSMENT FOR MAJOR HAZARD PLANTS

HEUZE, F.E.

171

ON THE GEOTECHNICAL MODELING OF HIGH-LEVEL NUCLEAR WASTE
DISPOSAL BY ROCK MELTING

HILL, M.D.

235

THE EFFECT OF VARIATIONS IN PARAMETER VALUES ON THE
PREDICTED RADIOLOGICAL CONSEQUENCES OF GEOLOGIC DISPOSAL OF
HIGH-LEVEL WASTE

249

STATUS REPORT FOR THE UNITED KINGDOM

738

RADIOLOGICAL PROTECTION CRITERIA RISK ASSESSMENTS FOR WASTE
DISPOSAL OPTIONS

HODGE, C.V.

699

TRANSPORTATION ACCIDENT RISKS IN THE NUCLEAR POWER INDUSTRY
1975-2020

HODGES, M.E.

333

SAFETY EVALUATION OF A CONCEPTUAL FUEL RECYCLE COMPLEX

HOFFMAN, F.O.

66

COMPUTER CODES FOR THE ASSESSMENT OF RADIONUCLIDES RELEASED TO THE ENVIRONMENT

407

TERRESTRIAL EXPOSURE PATHWAYS: POTENTIAL EXPOSURES OF MAN FROM THE ENVIRONMENTAL TRANSPORT OF WASTE NUCLIDES

HOLCOMB, W.F.

185

A REVIEW OF RADIATION EXPOSURE ESTIMATES FROM NORMAL OPERATION IN THE MANAGEMENT AND DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTES AND SPENT FUEL

271

RADIATION EXPOSURES FROM SOLIDIFICATION PROCESSES FOR HIGH-LEVEL RADIOACTIVE LIQUID WASTES

HORTON, K.K.

324

AREA 5 RADIOACTIVE WASTE MANAGEMENT SITE SAFETY ASSESSMENT DOCUMENT

HORION, N.R.

739

ANALYTICAL METHODS FOR EVALUATING THE RADIOLOGICAL ASPECTS OF THE GENERAL ELECTRIC BOILING WATER REACTOR

HUNTER, T.O.

234

THE PERSPECTIVE OF WASTE ISOLATION RESEARCH ISSUES AND ASSESSMENT OF CONSEQUENCES FOR RADIONUCLIDE RELEASE

ILARI, O.

560

AN INTERNATIONAL VIEW OF SPENT FUEL STORAGE AS ONE ASPECT OF FUEL CYCLE SAFETY

IMAN, R.L.

67

AN APPROACH TO SENSITIVITY ANALYSIS OF COMPUTER MODELS: PT. 1. INTRODUCTION, INPUT VARIABLE SELECTION AND PRELIMINARY VARIABLE ASSESSMENT

68
AN APPROACH TO SENSITIVITY ANALYSIS OF COMPUTER MODELS: PT.
2. RANKING OF INPUT VARIABLES, RESPONSE SURFACE VALIDATION,
DISTRIBUTION EFFECTS AND TECHNIQUE SYNOPSIS

173
RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: SENSITIVITY ANALYSIS TECHNIQUES

714
RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: SMALL SAMPLE SENSITIVITY ANALYSIS TECHNIQUES FOR
COMPUTER MODELS, WITH AN APPLICATION TO RISK ASSESSMENT

719
RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE
WASTE: A DISTRIBUTION-FREE APPROACH TO INDUCING RANK
CORRELATION AMONG INPUT VARIABLES FOR SIMULATION STUDIES

728
STEPWISE REGRESSION WITH PRESS AND RANK REGRESSION (PROGRAM
USER'S GUIDE)

729
LATIN HYPERCUBE SAMPLING (PROGRAM USER'S GUIDE)

745
THE USE OF RANK TRANSFORM IN REGRESSION

INDUSI, J.P.

558
GUIDELINES TO RELATIVE HAZARDS OF RADIOACTIVE SHIPMENTS

INHABER, H.

72
RISKS AND CONSEQUENCES IN ENERGY PRODUCTION

377
RISK OF ENERGY PRODUCTION, 3RD ED

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS

83
PRA PROCEDURES GUIDE, A GUIDE TO THE PERFORMANCE OF
PROBABILISTIC RISK ASSESSMENTS FOR NUCLEAR POWER PLANTS.
REVIEW DRAFT

INTERNATIONAL NUCLEAR FUEL CYCLE EVALUATION

356
STATUS OF TECHNOLOGIES RELATED TO RADIOACTIVE WASTE
MANAGEMENT AND DISPOSAL

357
RELEASE CONSEQUENCE ANALYSIS FOR A HYPOTHETICAL GEOLOGIC
RADIOACTIVE WASTE REPOSITORY IN SALT

IYER, P.S.

559
AVERAGE ANNUAL DOSES, LIFETIME DOSES AND ASSOCIATED RISK OF
CANCER DEATH FOR RADIATION WORKERS IN VARIOUS FUEL
FABRICATION FACILITIES IN INDIA

JAMALI, K.M.

113
QUANTIFICATION OF DEPENDENT FAILURES OF HIGH-POPULATION
COMPONENTS OF A FAULT TREE

JET PROPULSION LABORATORY

372
AN ANALYSIS OF THE BACK END OF THE NUCLEAR FUEL CYCLE WITH
EMPHASIS ON HIGH-LEVEL WASTE MANAGEMENT. VOL. 1

JOHNSON, J.

250
RISKS OF PLUTONIUM FUEL FACILITY DAMAGE FROM HIGH WINDS

JOHNSON, J.F.

561
RISKS OF SHIPPING URANIUM HEXAFLUORIDE BY TRUCK AND TRAIN

608
RISKS OF SHIPPING PLUTONIUM BY TRUCK, TRAIN AND CARGO
AIRCRAFT

JOINT STUDY GROUP: U.S. NRC, U.S. DOT

215
REVIEW AND ASSESSMENT OF PACKAGE REQUIREMENTS (YELLOWCAKE)
AND EMERGENCY RESPONSE TO TRANSPORTATION ACCIDENTS

JOKSIMOVIC, V.

71
USE OF PRA IN EVALUATING SAFETY OF NUCLEAR POWER

JUNKINS, R.L.

29
THE CONSEQUENCES OF ACCIDENTAL RELEASE OF RADIOACTIVE
CERIUM DURING SHIPMENT. REV. 1

KAERNBRAENSLESAEKERHET

360
HANDLING OF SPENT NUCLEAR FUEL AND FINAL STORAGE OF
VITRIFIED HIGH LEVEL REPROCESSING WASTE

361
HANDLING OF SPENT NUCLEAR FUEL AND FINAL STORAGE OF
VITRIFIED HIGH-LEVEL REPROCESSING WASTE

KAPLAN AND ASSOCIATES, INC.

491
NOTES ON THE LLL/NRC WASTE DISPOSAL STUDY. 1. ANALYTICAL
FRAMEWORK

492
NOTES ON THE LLL/NRC WASTE DISPOSAL STUDY. 2. PROBABILISTIC
ARITHMETIC

493
NOTES FOR A WORKSHOP ON RISK ANALYSIS AND DECISION UNDER
UNCERTAINTY. THE PRACTICAL USE OF PROBABILISTIC AND
BAYESIAN METHODOLOGY IN REAL LIFE RISK ASSESSMENT AND
DECISION PROBLEMS

KAPLAN, S.

70
ON THE USE OF A BAYESIAN REASONING IN SAFETY AND
RELIABILITY DECISIONS - THREE EXAMPLES

490
NOTES ON THE NEXT GENERATION MACROMODEL: A UNIFIED
COMPUTATIONS SYSTEM FOR PREDICTING POST SEALING WASTE
DEPOSITORY PERFORMANCE

KASZETA, F.E.

233
THE COMPLEX RELATIONSHIP BETWEEN GROUNDWATER VELOCITY AND
CONCENTRATION OF RADIOACTIVE CONTAMINANTS

KAUFMAN, A.M.

106
A REPOSITORY POST-SEALING RISK ANALYSIS USING MACRO

512
CALCULATED RADIONUCLIDE MIGRATION FROM A GEOLOGIC HIGH
LEVEL WASTE REPOSITORY

KENNEDY, W.E., JR.

212
ACCEPTABLE RESIDUAL RADIOACTIVE CONTAMINATION LEVELS FOR
SITES OF DECOMMISSIONED NUCLEAR FACILITIES

KENTON, E.

438

ACCIDENT RISKS IN NUCLEAR FACILITIES. 1981-MARCH 1982.
(CITATIONS FROM THE NTIS DATA BASE)

KILBURN LTD.

358

AN ASSESSMENT OF THE LONG TERM SUITABILITY OF PRESENT AND
PROPOSED METHODS FOR THE MANAGEMENT OF URANIUM MILL TAILINGS

KILLOUGH, G.G.

189

A METHODOLOGY FOR CALCULATING RADIATION DOSES FROM
RADIOACTIVITY RELEASED TO THE ENVIRONMENT

KIREHIDJIAN, A.S.

229

A STOCHASTIC MODEL OF RADIONUCLIDE MIGRATION FROM NATURAL
AND ENGINEERED REPOSITORIES

KIRKLAND, J.

562

ACCIDENT SEVERITIES EXPERIENCED BY RADIOACTIVE MATERIAL
PACKAGS TRANSPORTED BY WATER. DRAFT REPORT

KIRNER, N.P.

208

WASTE MANAGEMENT OF URANIUM MINING AND MILLING OPERATIONS

KJELLBERT, N.A.

462

PROBABILISTIC SHORT-TERM RISK MODELING FOR BACK-END FUEL
CYCLE AND WASTE MANAGEMENT FACILITIES

KOPLIK, C.M.

269

STATUS REPORT ON RISK ASSESSMENT FOR NUCLEAR WASTE DISPOSAL

494

SUPPLEMENTARY ANALYSIS OF NUCLEAR WASTE MANAGEMENT OPTIONS

KREJSA, P.

248

STATUS AND PROGRAMME OF THE AUSTRIAN ACTIVITIES FOR FINAL
DISPOSAL OF RADIOACTIVE WASTES IN GEOLOGICAL FORMATIONS

KUEHN, K.

709

DISPOSAL IN SALT FORMATIONS

LAMBERT, H.E.

472

SYSTEMS SAFETY ANALYSIS AND FAULT TREE ANALYSIS

LARIVIERE, J.R.

284

CONCEPTUAL DESIGN CONSIDERATIONS FOR THE STORAGE OF
SOLIDIFIED HIGH-LEVEL WASTE IN CANISTERS AT A COMMERCIAL
FUEL REPROCESSING PLANT

406

RETRIEVABLE SURFACE STORAGE: INTERIM STORAGE OF SOLIDIFIED
HIGH-LEVEL WASTE

LAWRENCE LIVERMORE NATIONAL LABORATORY

741

EARTHQUAKE SAFETY OF NUCLEAR POWER PLANTS

LAWROSKI, NH.

102

WHAT WOULD HAPPEN IF HIGH-LEVEL NUCLEAR WASTES WERE STORED
NEAR THE SURFACE OF THE EARTH

LAWROSKI, S.

748

PRODUCTION OF REFINED UF-6 FROM ORE CONCENTRATES BY
FLUIDIZATION AND FRACTIONAL DISTILLATION TECHNIQUES

LEE, W.W.L.

463

BASALT WASTE ISOLATION DISRUPTIVE EVENTS ANALYSIS

LEE, Y.T.

482

PROBABILITY INTERVALS FOR THE TOP EVENT UNAVAILABILITY OF
FAULT TREES

LEHMANN, P.H.

599

A RELIABILITY-RISK MODELLING OF NUCLEAR RAD-WASTE FACILITIES

LEIMKUHLER, F.F.

31

STATISTICAL ANALYSIS OF THE FREQUENCY AND SEVERITY OF
ACCIDENTS TO POTENTIAL HIGHWAY CARRIERS OF HIGHLY
RADIOACTIVE MATERIALS

LERCH, R.E.

128

TREATMENT AND IMMOBILIZATION OF INTERMEDIATE-LEVEL
RADIOACTIVE WASTE

LESTER, D.

696

SYSTEM ANALYSIS OF SHALLOW LAND BURIAL. VOL. 1. CODE MANUAL

697

SYSTEM ANALYSIS OF SHALLOW LAND BURIAL. VOL. 2. TECHNICAL
BACKGROUND

698

SYSTEM ANALYSIS OF SHALLOW LAND BURIAL. VOL. 3. APPENDICES

LEVENSON, M.

564

REALISTIC ESTIMATES OF THE CONSEQUENCES OF NUCLEAR ACCIDENTS

743

REALISTIC RISK ESTIMATES

LEVERENZ, F.L.

563

SPASH, A COMPUTER CODE FOR MONTE CARLO SYSTEM EVALUATION

LEVI, H.W.

400

MODELING SAFETY PLANNING IN THE BACK-END FUEL CYCLE CONCEPT

412

THE "PROJECT-SAFETY-STUDIES ENISORGUNG" IN THE FEDERAL
REPUBLIC OF GERMANY

LEWIS, H.W., CHMR.

553

RISK ASSESSMENT REVIEW GROUP REPORT TO THE U.S. NUCLEAR
REGULATORY COMMISSION

LINDER, P.

103

RISK COMPARISON OF ALTERNATIVES OF THE BACK END OF THE FUEL
CYCLE AT A PRE-PROJECT STAGE

LIPPEK, H.E.

30

LEGAL, INSTITUTIONAL AND POLITICAL ISSUES IN TRANSPORTATION
OF NUCLEAR MATERIALS AT THE BACK END OF THE LWR NUCLEAR
FUEL CYCLE

LITCHFIELD, J.W.

283

A DECISION MODEL INCORPORATING UTILITY THEORY AND MEASURES
OF SOCIAL VALUES APPLIED TO NUCLEAR WASTE MANAGEMENT

LITTLE, C.A.

232

THE PRESTO LOW-LEVEL WASTE TRANSPORT AND RISK ASSESSMENT
CODE

LLOYD, R.C.

442

ANALYSIS OF CRITICALITY SAFETY

LOGAN, S.E.

104

LONG-TERM RISK ANALYSIS OF ACTINIDE PARTITIONING AND
TRANSMUTATION

105

SELECTION OF SIGNIFICANT ELEMENTS AND RADIONUCLIDES FOR
WASTE MANAGEMENT ASSESSMENT

169

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT.
VII. LONG-TERM RISK ANALYSIS OF THE GEOLOGIC REPOSITORY

246

GEOLOGIC MODELING IN RISK ASSESSMENT METHODOLOGY FOR
RADIOACTIVE WASTE MANAGEMENT

247

STATUS REPORT ON RADIOACTIVE WASTE RISK ASSESSMENT
METHODOLOGY DEVELOPMENT SUPPORTED BY THE U.S. ENVIRONMENTAL
PROTECTION AGENCY

427

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM. FINAL REPORT.
VII. LONG-TERM RISK ANALYSIS OF THE GEOLOGIC REPOSITORY:
APPENDIX

672

DEVELOPMENT AND APPLICATION OF A RISK ASSESSMENT METHOD FOR
RADIOACTIVE WASTE MANAGEMENT, VOL. I. GENERIC DESCRIPTION OF
AMRAW-A MODEL

673

DEVELOPMENT AND APPLICATION OF A RISK ASSESSMENT METHOD FOR
RADIOACTIVE WASTE MANAGEMENT, VOL. II. IMPLEMENTATION FOR
TERMINAL STORAGE IN REFERENCE REPOSITORY AND OTHER
APPLICATIONS

674
DEVELOPMENT AND APPLICATION OF A RISK ASSESSMENT METHOD FOR
RADIOACTIVE WASTE MANAGEMENT, VOL. III. ECONOMIC ANALYSIS;
DESCRIPTION AND IMPLEMENTATION OF AMRAM-B MODEL

675
DEVELOPMENT AND APPLICATION OF A RISK ASSESSMENT METHOD FOR
RADIOACTIVE WASTE MANAGEMENT, VOL. IV. AMRAM COMPUTER CODE
USERS MANUAL

LOMBARD, J.
305
A MULTI-ATTRIBUTE ANALYSIS OF RADIATION PROTECTION CHOICES.
A METHODOLOGICAL APPROACH IN THE CASE OF RADIOACTIVE
RELEASES FROM U.S. NUCLEAR PLANTS.

LYON, R.B.
718
RISK ASSESSMENT FOR RADIOACTIVE WASTE DISPOSAL

MAASS, K.E.
754
PROJEKT SICHERHEITSTUDEN ENTSORGUNG (PSE), PROJECT SAFETY
STUDIES OF THE BACK END OF THE FUEL CYCLE, INTERIM SUMMARY
REPORT

MAGNO, P.J.
166
STUDIES OF INGESTION DOSE PATHWAYS FROM THE NUCLEAR FUEL
SERVICES FUEL REPROCESSING PLANT

MALLAY, J.F.
106
NRC-INDUSTRY COOPERATIVE EFFORT SETS STAGE FOR
PROBABILISTIC RISK ASSESSMENT STUDIES

MANRY, C.W.
109
LONG-TERM LOW LEVEL WASTE MANAGEMENT: AN INTEGRATED
ENVIRONMENTAL PROGRAM

MARTIN, J.E.
584
PROPOSED FEDERAL RADIATION GUIDANCE FOR RADIOACTIVE WASTES

MARTINSON, M.J.
746
OCCUPATIONAL HEALTH AND SAFETY IN UNDERGROUND MINES

MAY, R.A.

573

ANALYSIS AND MODEL TESTING OF A SUPER TIGER (TM) TYPE B
WASTE TRANSPORT SYSTEM IN ACCIDENT ENVIRONMENTS

MAYER, D.W.

201

MULTIDIMENSIONAL ANALYSIS OF RADON DIFFUSION THROUGH
URANIUM MILL TAILINGS AND COVER SYSTEMS

MAZUMDAR, M.

345

METHODOLOGY DEVELOPMENT FOR STATISTICAL EVALUATION OF
REACTOR SAFETY ANALYSIS

MAZUMDAR, M.

515

REVIEW OF THE METHODOLOGY FOR STATISTICAL EVALUATION OF
REACTOR SAFETY ANALYSIS

MCCLAIN, W.C.

435

PROJECT SALT VAULT: A DEMONSTRATION OF THE DISPOSAL OF
HIGH-ACTIVITY SOLIDIFIED WASTE IN UNDERGROUND SALT MINES

MCCLURE, J.D.

577

THE ENVIRONMENTAL EFFECTS ASSOCIATED WITH THE
TRANSPORTATION OF RADIOACTIVE MATERIAL

579

THE PROBABILITY OF SPENT FUEL TRANSPORTATION ACCIDENTS

580

A REVIEW OF U.S. ACCIDENT/INCIDENT EXPERIENCE INVOLVING THE
TRANSPORTATION OF RADIOACTIVE MATERIAL (RAM) 1971-1980

MCSWEENEY, T.I.

32

AN ASSESSMENT OF THE RISK OF TRANSPORTING PLUTONIUM OXIDE
AND LIQUID PLUTONIUM NITRATE BY TRUCK

34

AN ASSESSMENT OF THE RISK OF TRANSPORTING PLUTONIUM DIOXIDE
BY CARGO AIRCRAFT

MELLINGER, P.J.

100

KR-85 MANAGEMENT TRADE-OFFS: RADIOLOGICAL CONSEQUENCES

441

KR-85 MANAGEMENT TRADE-OFFS: A PERSPECTIVE TO TOTAL
RADIATION DOSE COMMITMENT

MELVIN, J.P.

458

COST/RISK/BENEFIT ANALYSIS REPORT ON THE DECONTAMINATION
AND DECOMMISSIONING OF Z-PLANT

MENDEL, J.E.

582

ANNUAL REPORT ON THE CHARACTERISTICS OF HIGH-LEVEL WASTE
GLASSES

MEIZGER, J.C.

575

TRANSPORT, HANDLING, AND INTERIM STORAGE OF
INTERMEDIATE-LEVEL TRANSURANIC WASTE AT THE INEL

MEYER, G.L.

585

MODELING AND ANALYSES TO SUPPORT EPA'S LOW-LEVEL
RADIOACTIVE WASTE STANDARDS

586

OVERVIEW OF EPA'S HEALTH RISK ASSESSMENT MODEL FOR THE
SHALLOW LAND DISPOSAL OF LLW.

MEYER, H.R.

594

NONPROLIFERATION ALTERNATIVE SYSTEMS ASSESSMENT PROGRAM
(NASAP) - PRELIMINARY ENVIRONMENTAL ASSESSMENT OF
THORIUM/URANIUM FUEL CYCLE SYSTEMS

MILLER, B.

571

INDEX OF RISK EXPOSURE AND RISK ACCEPTANCE CRITERIA

MILLS, W.A.

210

RADON - AN ENVIRONMENTAL POLLUTANT?

MISHIMA, J.

33

SOME EXPERIMENTAL MEASUREMENTS OF AIRBORNE URANIUM
(REPRESENTING PLUTONIUM) IN TRANSPORTATION ACCIDENTS

294
PLUTONIUM RELEASE STUDIES. IV. FRACTIONAL RELEASE FROM
HEATING PLUTONIUM NITRATE SOLUTION IN A FLOWING AIR STREAM

443
AN INCREMENT OF ANALYSIS. ESTIMATED AIRBORNE RELEASE OF
PLUTONIUM FROM THE EXXON NUCLEAR MIXED OXIDE FUEL PLANT AT
RICHLAND, WASHINGTON AS A RESULT OF POSTULATED DAMAGE FROM
SEVERE WIND AND EARTHQUAKE HAZARD

447
AN INCREMENT OF ANALYSIS--ESTIMATED AIRBORNE RELEASE OF
PLUTONIUM FROM THE 102 BUILDING AT THE GENERAL ELECTRIC
VALLECITOS NUCLEAR CENTER, VALLECITOS, CALIFORNIA, AS A
RESULT OF POSTULATED DAMAGE FROM SEVERE WIND AND EARTHQUAKE
HAZARD

676
INCREMENT OF ANALYSIS. AN ESTIMATE OF AIRBORNE RELEASE OF
PLUTONIUM FROM BABCOCK AND WILCOX PLANT AS A RESULT OF
SEVERE WIND HAZARD AND EARTHQUAKE

677
SOURCE TERM AND RADIATION DOSE ESTIMATES FOR POSTULATED
DAMAGE TO THE 102 BUILDING AT THE GENERAL ELECTRIC
VALLECITOS NUCLEAR CENTER

678
AN INCREMENT OF ANALYSIS. ESTIMATED AIRBORNE RELEASE OF
PLUTONIUM FROM WESTINGHOUSE CHESWICK SITE AS A RESULT OF
POSTULATED DAMAGE FROM SEVERE WIND AND SEISMIC HAZARD

MITRE CORP.

572
PROCEEDINGS OF QUANTITATIVE ENVIRONMENTAL COMPARISON OF
COAL AND NUCLEAR ELECTRIC GENERATION AND THEIR ASSOCIATED
FUEL CYCLES WORKSHOP. VOL. 2

MOFFITT, R.L.

565
SAFETY ANALYSIS REPORT: HANDLING AND STORAGE OF IRRADIATED
N REACTOR FUEL IN 105 KW FUEL STORAGE FACILITY

MOMONI, M.H.

211
RADIOLOGICAL IMPACT OF URANIUM TAILINGS AND ALTERNATIVES
FOR THEIR MANAGEMENT

MOORE, R.H.

566

STATISTICS AND RISK ANALYSIS--GETTING THE ACIS TOGETHER

MULLER, A.B.

92

GEOCHEMICAL PARAMETERS USED IN THE BEDDED SALT REFERENCE
REPOSITORY RISK ASSESSMENT METHODOLOGY

737

THE INFLUENCE AND MODELING OF WASTE NUCLIDE AQUEOUS
SPECIATION ON GEOSPHERE RETARDATION PROCESSES RELEVANT TO
RISK ASSESSMENT

MURPHY, E.S.

153

SAFETY ANALYSIS OF THE TRANSPORTATION OF HIGH-LEVEL
RADIOACTIVE WASTE

MYERS, D.K.

569

SOME HEALTH ASPECTS OF CANADIAN URANIUM MINING

NAGAKURA, T.

589

SAFETY ANALYSIS ON TRANSPORTATION OF RADIOACTIVE MATERIALS
BY TRUCK IN JAPAN

NATIONAL ACADEMY OF SCIENCES

471

INTERIM STORAGE OF SOLIDIFIED HIGH-LEVEL RADIOACTIVE WASTES

545

RISKS ASSOCIATED WITH NUCLEAR POWER: A CRITICAL REVIEW OF
THE LITERATURE, SUMMARY AND SYNTHESIS CHAPTER

NEILSEN, C.W.

35

SAFETY ANALYSIS REPORT FOR PACKAGING KRYPTON SHIPPING
CONTAINER USA/5958/BL(ERDA-ID)

NELSON, I.C.

590

NEAR SURFACE SPENT FUEL STORAGE-ENVIRONMENTAL ISSUES

NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT

308

GEOTECHNICAL CONSIDERATIONS FOR RADIOLOGICAL HAZARD
ASSESSMENT OF WIPP: A REPORT OF A MEETING HELD ON JANUARY
17-18, 1980

NUCLEAR SAFETY STAFF

688

EPRI NUCLEAR FUEL-CYCLE ACCIDENT RISK ASSESSMENT

NUCLEAR SERVICES CORP.

139

RISK ANALYSIS METHODOLOGY AND DATA: STUDY OF ALTERNATIVES
FOR LONG-TERM MANAGEMENT OF HANFORD DEFENSE HIGH-LEVEL
RADIOACTIVE WASTE

NUTTALL, H.E.

119

A COMBINED FRACTURE/POROUS MEDIA FOR CONTAINMENT TRANSPORT
OF RADIOACTIVE IONS

O'BRIEN, N.

736

ENVIRONMENTAL PROTECTION IN UNDERGROUND URANIUM MINING

O'DONNELL, F.R.

588

OCCUPATIONAL SAFETY DATA AND CASUALTY RATES FOR THE URANIUM
FUEL CYCLE

OAK RIDGE GASEOUS DIFFUSION PLANT

364

TORNADO RISKS AND DESIGN WINDSPEEDS FOR THE OAK RIDGE PLANT
SITE

OAK RIDGE NATIONAL LABORATORY

436

SITING OF FUEL REPROCESSING PLANTS AND WASTE MANAGEMENT
FACILITIES

ODELL, B.N.

478

SAFETY ANALYSIS (SA) OF THE DECONTAMINATION FACILITY,
BUILDING 419, AT THE LAWRENCE LIVERMORE NATIONAL LABORATORY

479

SAFETY ASSESSMENT DOCUMENT FOR THE ENVIRONMENTAL TEST
COMPLEX (BUILDING 634) AT SITE 300

OKRENT, D.

570

AN APPROACH TO SOCIETAL RISK ACCEPTANCE CRITERIA AND RISK
MANAGEMENT

OKRENT, D., (ED.)

481

RISK-BENEFIT METHODOLOGY AND APPLICATION: SOME PAPERS
PRESENTED AT THE ENGINEERING FOUNDATION WORKSHOP, SEPTEMBER
22-26, 1975, ASILOMAR, CALIFORNIA

ORLOWSKI, W.

665

RISKS, REGULATION RESPONSIBILITIES AND CCSIS IN NUCLEAR
WASTE MANAGEMENT: A PRELIMINARY SURVEY IN THE EUROPEAN
COMMUNITY

ORTH, D.A.

340

PERFORMANCE OF SAND FILTERS FOR THE SEPARATIONS AREAS AT
THE SAVANNAH RIVER LABORATORY

OTT, K.O.

290

RISK-ASSESSMENT METHODOLOGY FOR FAST BREEDER REACTORS

OTTS, J.V.

36

SPECIAL CLOSURE FOR RADIOACTIVE SHIPPING CONTAINERS

OWAY, R.J.

99

RISK ESTIMATION, EVALUATION, AND MANAGEMENT

ODDIZ, A.

225

A MULTI-ATTRIBUTE APPROACH TO THE REALIZATION OF
RADIOLOGICAL PROTECTION

OWEN, G.N.

362

CONSIDERATIONS FOR DEVELOPING SEISMIC DESIGN CRITERIA FOR
NUCLEAR WASTE STORAGE REPOSITORIES

OZTUNALI, O.I.

587

DATA BASE FOR RADIOACTIVE WASTE MANAGEMENT. VOL. 3. IMPACTS
ANALYSIS METHODOLOGY REPORT

PAPP, R.

98

A NEW CONCEPT IN RISK ANALYSIS FOR NUCLEAR FACILITIES

PARRY, G.W.

97

CHARACTERIZATION AND EVALUATION OF UNCERTAINTY IN
PROBABILISTIC RISK ANALYSIS

PARSONS, BRINCKERHOFF, QUADE AND DOUGLAS, INC.

163

WASTE ISOLATION FACILITY DESCRIPTION: BEDDED SALT

PARZYCK, D.C.

603

INTEGRATED ASSESSMENT OF THE IMPACTS ASSOCIATED WITH
URANIUM MINING AND MILLING

PASCHOA, A.S.

604

RA-226 COLLECTIVE DOSIMETRY FOR SURFACE WATERS IN THE
URANIUM MINING REGION OF POCOS DE CALDAS

PATTERSON, B.D.

605

NUCLEAR WASTE MANAGEMENT: STORAGE AND DISPOSAL ASPECTS

PATTERSON, W.

606

PORTER WITH NUCLEAR RESERVATIONS

PECHIN, W.H.

150

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE
ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL
CYCLE FOR USE IN ESTABLISHING "AS LOW AS PRACTICABLE"
GUIDES--FABRICATION OF LIGHT-WATER REACTOR FUEL FROM
ENRICHED URANIUM DIOXIDE

PELLO, P.J.

96

A RISK ASSESSMENT METHOD FOR NUCLEAR FUEL CYCLE OPERATIONS

300

MFault: A COMPUTER PROGRAM FOR ANALYZING FAULT TREES

691

RISK ASSESSMENT METHODS FOR NUCLEAR WASTE MANAGEMENT SYSTEMS

PEPPING, R.E.

87

RISK ANALYSIS METHODOLOGY FOR SPENT FUEL REPOSITORIES IN
BEDDED SALT: REFERENCE REPOSITORY DEFINITION AND
CONTRIBUTIONS FROM HANDLING ACTIVITIES

PERETZ, F.J.

428

KRYPTON-85 HYDROFRACTURE ENGINEERING FEASIBILITY AND SAFETY
EVALUATION

PERKINS, W.C.

204

IDENTIFICATION OF POTENTIAL SAFETY-RELATED INCIDENTS
APPLICABLE TO A BREEDER FUEL REPROCESSING PLANT

273

A PRELIMINARY HAZARDS ANALYSIS OF A BREEDER FUEL
REPROCESSING FACILITY

330

POTENTIAL SAFETY-RELATED INCIDENTS WITH POSSIBLE
APPLICABILITY TO A NUCLEAR FUEL REPROCESSING PLANT

PETERSON, K.R.

475

METEOROLOGY AND DEMOGRAPHY MODELS FOR RISK ASSESSMENT OF
ACCIDENTAL ATMOSPHERIC RELEASE OF NUCLEAR WASTE, PHASE 2
METHODOLOGY

PETERSON, P.L.

37

CONCEPTUAL DESIGN OF A SHIPPING CONTAINER FOR TRANSPORTING
HIGH-LEVEL WASTE BY RAILROAD

PETERSON, R.T.

38

SAFETY ANALYSIS REPORT FOR PACKAGING: NEUTRON SHIPPING CASK,
MODEL 4T

PETRIE, G.M.

446

ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISCLATION SYSTEMS.
GEOLOGIC SIMULATION MODEL FOR A HYPOTHETICAL SITE IN THE
COLUMBIA PLATEAU

PHILLIPS, E.

47

RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT : FINAL
PHASE 02 REPORT ON ACCIDENT REVIEW

PHILLIPS, S.J.

230

MONITORING AND CHARACTERIZATION OF RADICNUCLIDE TRANSPORT
IN THE HYDROLOGIC SYSTEM

282
MONITORING AND CHARACTERIZATION OF RADIONUCLIDE TRANSPORT
IN THE HYDROGEOLOGICAL SYSTEM .

PIGFORD, T.H.

602
GEOLOGICAL DISPOSAL OF RADIOACTIVE WASTE - HIGH-LEVEL WASTE
IN DEEP GEOLOGIC FORMATIONS IS LESS OF A HAZARD THAN NEAR
SURFACE URANIUM ORES OR URANIUM MILL TAILINGS

POCHIN, E.E.

440
WHY BE QUANTITATIVE ABOUT RADIATION RISK ESTIMATES?

666
RISK ASSESSMENT FOR RADIATION PROTECTION PURPOSES

POE, W.L.

335
RISK OF EARTHQUAKE DAMAGE TO WASTE MANAGEMENT FACILITIES

337
ENVIRONMENTAL ANALYSIS BURIAL OF OFFSITE LOW-LEVEL WASTE AT
SRP. I. UNCLASSIFIED NAVAL WASTE

POPE, R.B.

601
ENVIRONMENTAL EFFECTS OF TRANSPORTING RADIOACTIVE MATERIALS
IN NUCLEAR WASTE MANAGEMENT SYSTEMS

PRATI, H.R.

157
EARTHQUAKE RELATED DISPLACEMENT FIELDS NEAR UNDERGROUND
FACILITIES

PRICE, M.S.T., ED.

334
SAFETY ASSESSMENT FOR DRAGON FUEL ELEMENT PRODUCTION. PT.
2. HAZARDS ANALYSIS, OPERATING LIMITATIONS, STANDING ORDERS
AND EMERGENCY DRILL

PRITZKER, A.

95
APPLICATION OF SIMPLIFIED RELIABILITY METHODS FOR RISK
ASSESSMENT OF NUCLEAR WASTE REPOSITORIES

PROSKE, R.

94
CONTRIBUTIONS TO THE RISK ANALYSIS OF A REPOSITORY FOR
HIGH-LEVEL RADIOACTIVE WASTES IN GEOLOGIC FORMATIONS

244
PREVIOUS RESULTS OF RISK ANALYSIS OF REPOSITORIES FOR
RADIOACTIVE WASTES IN GEOLOGIC SALT FORMATIONS IN THE
FEDERAL REPUBLIC OF GERMANY

245
STATUS AND FUTURE DEVELOPMENTS OF RISK ANALYSIS FOR
REPOSITORIES OF RADIOACTIVE WASTES IN SALT FORMATIONS IN
THE FEDERAL REPUBLIC OF GERMANY

PROUT, W.E.

596
MANAGEMENT OF RADIOACTIVE WASTE GASES FROM THE NUCLEAR FUEL
CYCLE. VOL. 2. EVALUATION OF STORAGE/DISPOSAL ALTERNATIVES

PROWSE, D.R.

243
SAFETY ANALYSIS OF THE PROPOSED CANADIAN GEOLOGIC NUCLEAR
WASTE REPOSITORY

600
TRANSPORTATION OF NUCLEAR FUEL

PUT, M.

242
MATHEMATICAL MODELING OF RADIONUCLIDE MIGRATION IN A
HOMOGENEOUS CLAY FORMATION, RISK ANALYSIS AND GEOLOGIC
MODELLING IN RELATION TO THE DISPOSAL OF RADIOACTIVE WASTES
INTO GEOLOGICAL FORMATIONS.

QUINN, D.J.

607
AN ASSESSMENT OF THE RISKS ASSOCIATED WITH CONTINUED
STORAGE OF HIGH-LEVEL WASTE IN SINGLE-SHELL TANKS AT HANFORD

RADFORD, E.P.

375
IMPACTS ON HUMAN HEALTH FROM COAL AND NUCLEAR FUEL CYCLES
AND OTHER TECHNOLOGIES ASSOCIATED WITH ELECTRIC POWER
GENERATION AND TRANSMISSION

RAO, R.K.

752
NON-RADIOLOGICAL IMPACTS OF TRANSPORTING RADIOACTIVE
MATERIAL

REACTORS SAFETY COMMISSION

82
FUNDAMENTAL RELIABILITY OF THE WASTE TREATMENT AND STORAGE
CENTRE FROM THE SAFETY ENGINEERING ASPECTS

REESE, R.T.

538

RELATIVE CONSEQUENCES OF TRANSPORTING HAZARDOUS MATERIALS

615

A METHOD TO DEVELOP DATA SUPPORTING CONSEQUENCE ANALYSIS OF
TRANSPORTING NUCLEAR MATERIALS IN THE UNITED STATES

REEVES, M.

91

USER'S MANUAL FOR THE SANDIA WASTE-ISOLATION FLOW AND
TRANSPORT MODEL (SWIFT) 4.81

RHOADS, R.E.

39

AN OVERVIEW OF TRANSPORTATION IN THE NUCLEAR FUEL CYCLE

40

RISK ASSESSMENT OF ENERGY MATERIAL TRANSPORTATION SYSTEMS

41

A SAFETY AND ECONOMIC STUDY OF SPECIAL TRAINS FOR SHIPMENT
OF SPENT FUEL

42

RISK IN TRANSPORTING MATERIALS FOR VARIOUS ENERGY INDUSTRIES

612

TRANSPORTATION RISKS IN THE NUCLEAR FUEL CYCLE

RHYNE, W.R.

667

A SCOPING STUDY OF SPENT FUEL CASK TRANSPORTATION ACCIDENTS

RIDER, J.L.

574

A MODEL TO ESTIMATE RADIATION DOSE COMMITMENTS TO THE WORLD
POPULATION FROM THE ATMOSPHERIC RELEASE OF RADIONUCLIDES.
(LWR DEVELOPMENT PROGRAM)

RINGDAL, F.

376

SEISMOTECTONIC RISK MODELLING FOR NUCLEAR WASTE DISPOSAL IN
SWEDISH BEDROCK

RIPPON, S.

186

THE WINDSCALE REPORT - A REVIEW

RITCHIE, L.I.

732

WEATHER SEQUENCE SAMPLING FOR RISK CALCULATIONS

RITZMAN, R.L.

609

PROBABILISTIC SAFETY EVALUATION FOR A MIXED OXIDE FUEL
FABRICATION PLANT, DRAFT

ROCKWELL INTERNATIONAL CORP., ENERGY SYSTEMS GROUP

449

NUCLEAR WASTE REPOSITORY IN BASALT PROJECT B-301
PRECONCEPTUAL DESIGN REPORT

RODDY, J.W.

239

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE
ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL
CYCLE - FABRICATION OF HIGH-TEMPERATURE GAS-COOLED REACTOR
FUEL CONTAINING URANIUM-233 AND THORIUM

287

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE
ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL
CYCLE - CONVERSION OF RECYCLE URANIUM TO UF-6

ROLANDSON, S.

611

SAFETY ASPECTS OF THE DESIGN OF A SWEDISH SPENT FUEL
STORAGE FACILITY

RONEN, Y.

227

SENSITIVITY AND UNCERTAINTY ANALYSIS OF A SIMPLE NEAR-FIELD
GRANITE NUCLEAR WASTE REPOSITORY

ROSINGER, E.L.J.

717

GARD: A COMPUTER PROGRAM FOR THE GEOCHEMICAL ASSESSMENT OF
RADIONUCLIDE DISPOSAL

ROSS, B.I.

485

ASPECTS OF NUCLEAR WASTE MANAGEMENT, VOL. 2. POST-
EMPLACEMENT HAZARDS

634

ASPECTS OF NUCLEAR WASTE MANAGEMENT, VOL. 2.
POST-EMPLACEMENT HAZARDS

- ROSS, W.A.
398
ANNUAL REPORT ON THE CHARACTERIZATION OF HIGH-LEVEL WASTE GLASSES
- ROWE, W.D.
610
DISTINCTIONS BETWEEN RISK ANALYSIS AND RISK ASSESSMENT
- RUCH, W.C.
749
PRODUCTION OF PURE URANIUM HEXAFLUORIDE FROM ORE CONCENTRATES
- RUETH, N.
129
WRAPPING UP THE NUCLEAR FUEL CYCLE, PT. 1. REPROCESSING NUCLEAR POWER'S SPENT FUEL
- RUNKLE, G.E.
85
RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE WASTE: DOSIMETRY AND HEALTH EFFECTS
- 191
RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE WASTE: THE DOSIMETRY AND HEALTH EFFECTS COMPUTER CODE USER'S MANUAL
- RYON, A.D.
75
CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL CYCLE FOR USE IN ESTABLISHING 'AS LOW AS PRACTICABLE' GUIDES - APPENDIX A. PREPARATION OF COST ESTIMATES FOR VOLUME 1, MILLING OF URANIUM ORES
- SALEM, S.L.
346
A COMPUTER-ORIENTED APPROACH TO FAULT-TREE CONSTRUCTION
- 616
ISSUES AND PROBLEMS IN INFERRING A LEVEL OF ACCEPTABLE RISK
- SALVATORI, R.
93
SYSTEMATIC APPROACH TO SAFETY DESIGN AND EVALUATION

SANDOVAL, R.P.

631

AN EXPERIMENTAL SOURCE TERM DATA BASE FOR ASSESSING THE
SAFETY OF SPENT FUEL TRANSPORTATION

632

A PROGRAM TO ASSESS THE EFFECTS OF EXTRAORDINARY
ENVIRONMENTS ON RADIOACTIVE MATERIAL SHIPPING SYSTEMS

SARGENT, I.H.

76

USE OF RISK ASSESSMENT IN EVALUATING ISFSI DESIGN CRITERIA

SAVANNAH RIVER LABORATORY

336

ENVIRONMENTAL INFORMATION DOCUMENT DEFENSE WASTE PROCESSING
FACILITY. SUPPLEMENT. DEFENSE WASTE PROCESSING FACILITY
ENVIRONMENTAL DOCUMENTATION: BRIEFING

SAVANNAH RIVER PLANT

350

ALTERNATIVES FOR LONG-TERM MANAGEMENT OF DEFENSE HIGH-LEVEL
RADIOACTIVE WASTE

SCHINDLER, R.E.

630

FINAL SAFETY ANALYSIS REPORT FOR THE FOURTH CALCINED SOLIDS
STORAGE FACILITY

SCHNEIDER, K.

629

TRANSPORTATION OF VITRIFIED HIGH-LEVEL RADIOACTIVE WASTE BY
RAIL - FAULT TREE ANALYSIS AND ACCIDENTAL RELEASE

SCHNEIDER, K.J.

18

TRANSPORTATION CONSIDERATIONS RELATED TO WASTE FORMS AND
CANISTERS FOR DEFENSE TRU WASTES

43

ENVIRONMENTAL IMPACT OF PLUTONIUM TRANSPORT IN THE EVENT OF
ACCIDENTS WITHIN THE EUROPEAN COMMUNITY - ESTIMATION OF
POTENTIAL RELEASES

627

DESCRIPTIONS OF REFERENCE LWR FACILITIES FOR ANALYSIS OF
NUCLEAR FUEL CYCLES

SCHNEIDER, S.H.

628

COMPARATIVE RISK ASSESSMENT OF ENERGY SYSTEMS

SCHREIBER, R.E.

733

TECHNICAL SUPPORT FOR IMPROVING THE LICENSING REGULATORY
BASE FOR SELECTED FACILITIES ASSOCIATED WITH THE FRONT END
OF THE FUEL CYCLE

SCHREURS, S.

81

OVERVIEW OF THE U.S. NUCLEAR REGULATORY COMMISSION
HIGH-LEVEL WASTE MANAGEMENT REPOSITORY ASSESSMENT METHODS
AND ANALYSIS MODELS

SCHWARTZ, F.W.

193

A DETERMINISTIC-PROBABILISTIC MODEL FOR CONTAMINANT
TRANSPORT. USER MANUAL

713

SCENARIO DEVELOPMENT AND EVALUATION RELATED TO THE RISK
ASSESSMENT OF HIGH LEVEL RADIOACTIVE WASTE REPOSITORIES.
FINAL REPORT, JUNE 1979-1980

SCHWENDIMAN, L.C.

756

AIRBORNE RELEASE OF PARTICLES IN OVERHEATING INCIDENTS
INVOLVING PLUTONIUM METAL AND COMPOUNDS

SCIENCE APPLICATIONS, INC.

224

PREPROPOSAL TO ESTIMATE THE RISKS IN THE LWR FUEL CYCLE

SCOTT, B.L.

646

SUMMARY OF FY-1978 CONSULTATION INPUT FOR SCENARIO
METHODOLOGY DEVELOPMENT

SEARS, M.B.

74

CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE
ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL
CYCLE FOR USE IN ESTABLISHING "AS LOW AS PRACTICABLE"
GUIDES - MINING OF URANIUM ORES

77
CORRELATION OF RADIOACTIVE WASTE TREATMENT COSTS AND THE
ENVIRONMENTAL IMPACT OF WASTE EFFLUENTS IN THE NUCLEAR FUEL
CYCLE - CONVERSION OF YELLOW CAKE TO URANIUM HEXAFLUORIDE,
PT. 1. THE FLUORINATION-FRACTIONATION PROCESS

SELFELDT, W.B.
289
CHARACTERIZATION OF PARTICULATE PLUTONIUM RELEASED IN FUEL
CYCLE OPERATIONS

SEITZ, M.G.
223
MIGRATORY PROPERTIES OF SOME NUCLEAR WASTE ELEMENTS IN
GEOLOGIC MEDIA

SELBY, J.M.
614
CONSIDERATIONS IN THE ASSESSMENT OF THE CONSEQUENCES OF
EFFLUENTS FROM MIXED OXIDE FUEL FABRICATION PLANTS

SEXTON, R.A.
669
SUMMARY OF THE DEVELOPMENT OF A COST/RISK/BENEFIT ANALYSIS
FOR THE DECONTAMINATION AND DECOMMISSIONING OF THE HANFORD
Z-PLANT

SEYBOLD, G.D.
301
RAFT: A COMPUTER PROGRAM FOR FAULT TREE RISK CALCULATIONS

SHAPPERT, L.B.
625
SPENT AND FRESH FUEL SHIPPING CASK CONSIDERATIONS

626
PROBABILITY AND CONSEQUENCES OF TRANSPORTATION ACCIDENTS
INVOLVING RADIOACTIVE MATERIAL SHIPMENTS IN THE NUCLEAR
FUEL CYCLE

SHARMA, D.D.
650
MINIMUM RISK BASED SELECTION OF WASTE FUEL DUMPING SITE

SHEFELBINE, H.C.
460
WIPP CONCEPTUAL DESIGN REPORT, ADDENDUM G, ACCIDENT
ANALYSIS FOR WASTE ISOLATION PILOT PLANT

SHEPHERD, E.W.

624

NUCLEAR MATERIAL SHIPMENT STUDY

SHINOHARA, Y.

217

FUZZY SET THEORETIC APPROACH TO SYSTEMS ANALYSIS

SHIPLER, D.B.

467

APPROACH TO RADIOLOGICAL ASSESSMENT FOR COMMERCIAL WASTE
MANAGEMENT

SHULTZ, M.V.

623

SAFETY ANALYSIS REPORT - HANDLING AND STORAGE OF IRRADIATED
N REACTOR FUEL IN 105-KW FUEL STORAGE FACILITY

SIDOALL, E.

689

RISK, FEAR AND PUBLIC SAFETY

SILVEIRA, D.J.

408

ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISCLATION SYSTEMS.
A SHORT DESCRIPTION OF THE AEGIS APPROACH

SISLER, J.A.

645

A DOE PROGRAM FOR TRANSPORTATION R & D: A PROGRESS REPORT

SMITH, A.E.

413

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT.
V. PRECONCEPTUAL DESIGNS AND COSTS OF PARTITIONING
FACILITIES AND SHIPPING CASKS (SUMMARY REPORT)

SMITH, C.F.

110

PERSPECTIVES AND RECONCILIATION OF VIEWPOINTS ON RISK
ASSESSMENT ISSUES

222

A HAZARD INDEX FOR UNDERGROUND TOXIC MATERIAL

SMITH, D.R.

620

ANALYSIS OF THE RADIOLOGICAL RISKS OF TRANSPORTING SPENT
FUEL AND RADIOACTIVE WASTES BY TRUCK AND BY ORDINARY AND
SPECIAL TRAINS

621

ANALYSIS OF ALTERNATIVE TRANSPORTATION METHODS FOR
RADIOACTIVE MATERIALS SHIPMENTS INCLUDING THE USE OF
SPECIAL TRAINS FOR SPENT FUEL AND WASTES

SMITH, T.H.

112

RISK EVALUATIONS OF TRANSURANIC WASTE AT THE IDAHO NATIONAL
ENGINEERING LABORATORY

297

PROBABILISTIC RISK ANALYSIS OF NUCLEAR SYSTEMS

343

TRANSURANIC WASTE PROGRAM AT EG&G IDAHO, INC. ANNUAL
TECHNICAL REPORT

554

A RISK-BASED FAULT TREE ANALYSIS METHOD FOR IDENTIFICATION,
PRELIMINARY EVALUATION, AND SCREENING OF POTENTIAL
ACCIDENTAL RELEASE SEQUENCES IN NUCLEAR FUEL CYCLE
OPERATIONS

703

A METHODOLOGY FOR RISK ANALYSIS OF NUCLEAR WASTE MANAGEMENT
SYSTEMS

SGLDA1, J.K.

298

METHODOLOGY FOR CALCULATION OF RADIATION DOSES IN THE
ENVIRONS FROM NUCLEAR FUEL CYCLE FACILITIES

SGUSSELIER, Y.

617

EVOLUTION OF THE CONCEPT OF RISK IN RADIOACTIVE MATERIALS
TRANSPORT

618

METHODOLOGICAL APPROACH TO SAFETY ANALYSIS IN
TRANSPORTATION OF RADIOACTIVE MATERIALS AND APPLICATION TO
ACTUAL CASES

SOUTHERN INTERSTATE NUCLEAR BOARD

19

TRANSPORTATION OF NUCLEAR SPENT FUEL, 2ND REV. ED.

SPETZLER, C.S.

187

PROBABILITY ENCODING IN DECISION ANALYSIS

SPRUNG, J.L.

723

INVESTIGATION OF THE ADEQUACY OF THE METEOROLOGICAL
TRANSPORT MODEL DEVELOPED FOR THE REACTOR SAFETY STUDY

STAFF, BASALT WASTE ISOLATION PROJECT

419

BASALT WASTE ISOLATION PROJECT REFERENCE CONDITIONS FOR
LONG-TERM RISK ASSESSMENT CALCULATIONS

STEVENS, C.A.

122

RISK ASSESSMENT METHODOLOGY DEVELOPMENT FOR WASTE ISOLATION
IN GEOLOGIC MEDIA. TECHNICAL REVIEW OF DOCUMENTS
NUREG/CR-0394, NUREG/CR-0424, AND NUREG/CR-0458

123

RISK ASSESSMENT METHODOLOGY DEVELOPMENT FOR WASTE ISOLATION
IN GEOLOGIC MEDIA. TECHNICAL REVIEW OF NUREG/CR-1262,
NUREG/CR-1376, NUREG/CR-1377, NUREG/CR-1397, AND
NUREG/CR-1608

576

WORKING PAPER FOR A PROBABILISTIC SAFETY EVALUATION FOR A
RADIOACTIVE WASTE REPOSITORY. DRAFT

751

RISK ASSESSMENT METHODOLOGY DEVELOPMENT FOR WASTE ISOLATION
IN GEOLOGIC MEDIA, TECHNICAL REVIEW OF NUREG/CR-1636, VOLS.
1, 2 & 3.

STEWART, K.B.

619

RAIL ACCIDENT STATISTICS PERTINENT TO THE SHIPMENT OF
RADIOACTIVE MATERIALS

SIDORCK, R.

265

PSE - RELEASE SCENARIO ANALYSIS

STOTTLEMYRE, J.A.

411

ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISOLATION SYSTEMS.
PERSPECTIVES ON THE GEOLOGICAL AND HYDROLOGICAL ASPECTS OF
LONG-TERM RELEASE SCENARIO ANALYSES

735

ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISOLATION SYSTEMS.
A CONCEPTUAL SIMULATION MODEL FOR RELEASE SCENARIO ANALYSIS
OF A HYPOTHETICAL SITE IN COLUMBIA PLATEAU BASALT

STRENGE, D.L.

302

REVIEW OF CALCULATIONAL MODELS AND COMPUTER CODES FOR
ENVIRONMENTAL DOSE ASSESSMENT OF RADIOACTIVE RELEASES

SUTTER, S.L.

668

DEPLETED URANIUM DIOXIDE POWDER FLOW THROUGH VERY SMALL
OPENINGS

SWIFT, J.J.

272

POTENTIAL RADIOLOGICAL IMPACT OF AIRBORNE RELEASES AND
DIRECT GAMMA RADIATION TO INDIVIDUALS LIVING NEAR INACTIVE
URANIUM MILL TAILINGS PILES

TAIG, A.R.

20

RADIOACTIVE MATERIALS PACKAGES AND THE BRITISH RAILWAY
ACCIDENT ENVIRONMENT

TANGUY, P.

221

NUCLEAR SAFETY IN FRANCE

TASK COMMITTEE ON NUCLEAR EFFECTS OF THE COMMITTEE ON AIR, NOISE,

468

NUCLEAR WASTE MANAGEMENT

TAYLOR, J.M.

652

RADIRAP II - A COMPUTERIZED MODEL FOR RISK ANALYSIS OF
TRANSPORTATION OF RADIOACTIVE MATERIAL

TAYLOR, J.R.

181

A BACKGROUND RISK ANALYSIS, VOLS. 1-4

TEDDER, D.W.

415

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT.
II. PARTITIONING PROCESSES FOR THE LWR FUEL REPROCESSING
AND REFABRICATION PLANT WASTES

TEKNEKRON, INC.

484

HIGH LEVEL WASTE REPOSITORY SITE SUITABILITY CRITERIA.
ENVIRONMENTAL IMPACT STATEMENT METHODOLOGY

TEPP, H.G.

174

STUDIES AND RESEARCH CONCERNING BNFP, SPENT FUEL
DISASSEMBLY AND CANNING PROGRAM AT BARNWELL NUCLEAR FUEL
PLANT (BNFP) PRELIMINARY PROCESS ASSESSMENT STUDIES

TERA CORP.

486

DRAFT ENVIRONMENTAL IMPACT STATEMENT, HIGH-LEVEL WASTE
REPOSITORY SITE SUITABILITY CRITERIA

495

SEISMIC RISK ANALYSIS FOR THE BABCOCK AND WILCOX FACILITY,
LEECHBURG, PENNSYLVANIA

496

SEISMIC RISK ANALYSIS FOR THE ATOMICS INTERNATIONAL NUCLEAR
MATERIALS DEVELOPMENT FACILITY, SANTA SUSANA, CALIFORNIA

497

SEISMIC RISK ANALYSIS FOR THE WESTINGHOUSE ELECTRIC
FACILITY, CHESWICK, PENNSYLVANIA

TEXAS TECH. UNIV.

365

TORNADO RISK AND DESIGN WINDSPEEDS FOR THE PADUCAH PLANT
SITE

TIERNEY, M.S.

241

ESTIMATING PROBABILITIES OF DISPOSAL SYSTEM FAILURE - A
STATUS REPORT

664

STATE POLICIES AND REQUIREMENTS FOR MANAGEMENT OF URANIUM
MINING AND MILLING IN NEW MEXICO. VOLUME III. ADVERSE
EFFECTS OF URANIUM MINING AND MILLING ON THE PHYSICAL
ENVIRONMENT

TOFFER, H.

644

CRITICALITY CONTROL AND LONG TERM STORAGE OF SPENT FUEL

TOPP, S.V.

332

ALTERNATIVES FOR LONG-TERM MANAGEMENT OF DEFENSE
RADIOACTIVE HIGH-LEVEL WASTE AT THE SAVANNAH RIVER PLANT

TOWLER, U.A., JR.

231

ALTERNATIVES FOR LONG-TERM MANAGEMENT OF TRANSURANIC WASTE
AT THE SAVANNAH RIVER PLANT

TRACY, J.V.

190

USERS GUIDE AND DOCUMENTATION FOR ADSORPTION AND DECAY
MODIFICATIONS TO THE USGS SOLUTE TRANSPORT MODEL

TREVORROW, L.E

130

TECHNOLOGY ASSESSMENT AND NUCLEAR WASTE MANAGEMENT

TSE, A.N.

220

RADIATION PROTECTION PRINCIPLES UNDERLYING THE IAEA
TRANSPORT REGULATIONS AND TRANSPORT EXPERIENCE UNDER NORMAL
AND ACCIDENT CONDITIONS

TVETEN, U.

21

RADIOACTIVE WASTE TRANSPORTATION RISK

U.S. AEC

22

ENVIRONMENTAL SURVEY OF TRANSPORTATION OF RADIOACTIVE
MATERIALS TO AND FROM NUCLEAR POWER PLANTS

642

PROCEDURES FOR PICKING UP AND RECEIVING PACKAGES OF
RADIOACTIVE MATERIAL

U.S. ATOMIC ENERGY COMMISSION

514

SAFETY OF NUCLEAR POWER REACTORS AND RELATED FACILITIES

U.S. DEPARTMENT OF ENERGY, ASSISTANT SECRETARY FOR NUCLEAR ENERGY

635

PRELIMINARY SAFETY AND ENVIRONMENTAL INFORMATION DOCUMENT.
VOL. VII. FUEL-CYCLE FACILITIES

U.S. DOE

274

SUPPLEMENTAL ALTERNATIVES FOR LONG-TERM MANAGEMENT OF
DEFENSE TRANSURANIC WASTE AT THE SAVANNAH RIVER PLANT,
AIKEN, SOUTH CAROLINA

310
ENVIRONMENTAL DEVELOPMENT PLAN: DEFENSE WASTE MANAGEMENT

322
SHIPMENTS OF NUCLEAR FUEL AND WASTE: ARE THEY REALLY SAFE?

339
ALTERNATIVES FOR LONG-TERM MANAGEMENT OF DEFENSE
TRANSURANIC WASTE AT THE SAVANNAH RIVER PLANT, AIKEN, SOUTH
CAROLINA

U.S. DOE, ASSISTANT SECRETARY FOR ENERGY TECHNOLOGY AND DIRECTOR
159
PRELIMINARY ESTIMATES OF THE CHARGE FOR SPENT-FUEL STORAGE
AND DISPOSAL SERVICES

U.S. DOE, ASSISTANT SECRETARY FOR NUCLEAR ENERGY, OFFICE OF NUCLE
160
FINAL ENVIRONMENTAL IMPACT STATEMENT. MANAGEMENT OF
COMMERCIALLY GENERATED RADIOACTIVE WASTE. VOL. 1

161
FINAL ENVIRONMENTAL IMPACT STATEMENT. MANAGEMENT OF
COMMERCIALLY GENERATED RADIOACTIVE WASTE. VOL. 2 APPENDICES

U.S. DOE, ASSISTANT SECRETARY FOR NUCLEAR ENERGY, ASSISTANT SECRE
276
ENVIRONMENTAL DEVELOPMENT PLAN. LWR COMMERCIAL WASTE
MANAGEMENT

U.S. DOE, ASSISTANT SECRETARY FOR DEFENSE PROGRAMS, OFFICE OF DEF
277
DEFENSE WASTE PROCESSING FACILITY, SAVANNAH RIVER PLANT,
AIKEN, S.C. FINAL ENVIRONMENTAL IMPACT STATEMENT

U.S. DOE, ASSISTANT SECRETARY FOR DEFENSE PROGRAMS
278
WASTE ISOLATION PILOT PLANT. FINAL ENVIRONMENTAL IMPACT
STATEMENT. VOL. 1

U.S. DOE, ASSISTANT SECRETARY OF DEFENCE PROGRAMS
279
WASTE ISOLATION PILOT PLANT. FINAL ENVIRONMENTAL IMPACT
STATEMENT. VOL. 2

U.S. DOE, ASSISTANT SECRETARY FOR ENVIRONMENTAL PROTECTION, SAFET
311
ENVIRONMENT, SAFETY, HEALTH AT DOE FACILITIES. ANNUAL
REPORT, FISCAL YEAR 1980

- U.S. DOE, DIVISION OF ENVIRONMENTAL CONTROL TECHNOLOGY
321
EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT SHIPPING
HIGH-LEVEL NUCLEAR WASTES
- U.S. DOE, NATIONAL WASTE TERMINAL STORAGE PROGRAM
275
PUBLIC DRAFT, NATIONAL PLAN FOR SITING HIGH-LEVEL
RADIOACTIVE WASTE REPOSITORIES AND ENVIRONMENTAL ASSESSMENT
- U.S. DOE, OFFICE OF NUCLEAR WASTE MANAGEMENT
320
ENVIRONMENTAL AND OTHER EVALUATIONS OF ALTERNATIVES FOR
LONG-TERM MANAGEMENT OF STORED INEL TRANSURANIC WASTE
- U.S. DOT
636
A REVIEW OF THE DEPARTMENT OF TRANSPORTATION (DOT)
REGULATIONS FOR TRANSPORTATION OF RADIOACTIVE MATERIAL
- U.S. EPA
524
BACKGROUND REPORT: CONSIDERATIONS OF ENVIRONMENTAL
PROTECTION CRITERIA FOR RADIOACTIVE WASTE
- 638
TRANSPORTATION ACCIDENT RISKS IN THE NUCLEAR POWER INDUSTRY
1975-2020
- U.S. EPA, OFFICE OF RADIATION PROGRAMS
155
40 CFR 190, ENVIRONMENTAL RADIATION PROTECTION REQUIREMENTS
FOR NORMAL OPERATIONS OF ACTIVITIES IN THE URANIUM FUEL
CYCLE. VOL. 1. FINAL ENVIRONMENTAL STATEMENT
- 156
40 CFR 190, ENVIRONMENTAL RADIATION PROTECTION REQUIREMENTS
FOR NORMAL OPERATIONS OF ACTIVITIES IN THE URANIUM FUEL
CYCLE. VOL. 2. FINAL ENVIRONMENTAL STATEMENT
- 270
ENVIRONMENTAL ANALYSIS OF THE URANIUM FUEL CYCLE, PT. IV.
SUPPLEMENTARY ANALYSIS - 1976
- 555
ENVIRONMENTAL ANALYSIS OF THE URANIUM FUEL CYCLE, PT. 1.
FUEL SUPPLY

556

ENVIRONMENTAL ANALYSIS OF THE URANIUM FUEL CYCLE, PT. 2.
NUCLEAR POWER REACTORS

557

ENVIRONMENTAL ANALYSIS OF THE URANIUM FUEL CYCLE, PT. 3.
NUCLEAR FUEL REPROCESSING

U.S. ERDA

140

ALTERNATIVES FOR LONG-TERM MANAGEMENT OF DEFENSE HIGH-LEVEL
RADIOACTIVE WASTE: IDAHO CHEMICAL PROCESSING PLANT, IDAHO
FALLS, IDAHO

194

MANAGEMENT OF INTERMEDIATE LEVEL RADIOACTIVE WASTE, OAK
RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE. FINAL
ENVIRONMENTAL IMPACT STATEMENT

268

ALTERNATIVES FOR LONG-TERM DEFENSE HIGH-LEVEL RADIOACTIVE
WASTE. HANFORD RESERVATIONS, RICHLAND, WASHINGTON

351

LIGHT WATER REACTOR FUEL REPROCESSING AND RECYCLING

637

TRANSPORTATION OF HIGH LEVEL NUCLEAR WASTES

679

FINAL ENVIRONMENTAL STATEMENT. PORTSMOUTH GASEOUS DIFFUSION
PLANT EXPANSION, PIKETON, OHIO. VOL. 1. TEXT

680

FINAL ENVIRONMENTAL IMPACT STATEMENT. PORTSMOUTH GASEOUS
DIFFUSION PLANT EXPANSION, PIKETON, OHIO. VOL. 2. APPENDICES

694

DRAFT ENVIRONMENTAL STATEMENT. PORTSMOUTH GASEOUS DIFFUSION
PLANT EXPANSION, PIKETON, OHIO

759

PORTSMOUTH GASEOUS DIFFUSION PLANT SITE, PIKETON, OHIO.
FINAL ENVIRONMENTAL IMPACT STATEMENT. VOL. 1

760

EXPANSION OF U.S. URANIUM ENRICHMENT CAPACITY. FINAL
ENVIRONMENTAL STATEMENT

U.S. NRC

23

ENVIRONMENTAL SURVEY OF TRANSPORTATION OF RADIOACTIVE MATERIALS TO AND FROM NUCLEAR POWER PLANTS. SUPPL. 1

24

POTENTIAL RELEASE OF CESIUM FROM IRRADIATED FUEL IN A TRANSPORTATION ACCIDENT. SUPPL. 2 TO WASH-1238, ENVIRONMENTAL SURVEY OF TRANSPORTATION OF RADIOACTIVE MATERIALS TO AND FROM NUCLEAR POWER PLANTS

25

FINAL ENVIRONMENTAL STATEMENT ON THE TRANSPORTATION OF RADIOACTIVE MATERIALS BY AIR AND OTHER MODES

388

FINAL GENERIC ENVIRONMENTAL STATEMENT ON THE USE OF RECYCLE PLUTONIUM IN MIXED OXIDE FUEL IN LIGHT WATER COOLED REACTORS

639

EFFECTS OF NATURAL PHENOMENA ON THE BABCOCK AND WILCOX CO. PLUTONIUM FABRICATION PLANT AT THE PARKS TOWNSHIP SITE, LEECHBURG, PENNSYLVANIA

640

EFFECTS OF NATURAL PHENOMENA ON THE WESTINGHOUSE ELECTRIC CORPORATION PLUTONIUM FUELS DEVELOPMENT LABORATORY AT CHESWICK, PENNSYLVANIA

641

BEAR CREEK PROJECT (CONVERSE COUNTY, WYOMING), DRAFT ENVIRONMENTAL STATEMENT

671

PLAN FOR DEVELOPING A SAFETY GOAL

692

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE OPERATION OF THE HUMECA URANIUM MILL, RIO ALGOM CORPORATION

693

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE SEQUOYAH URANIUM HEXAFLUORIDE PLANT, KERR-MCGEE NUCLEAR CORPORATION

U.S. NRC, ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

439

REVIEW AND EVALUATION OF THE NUCLEAR REGULATORY COMMISSION SAFETY RESEARCH PROGRAM FOR FISCAL YEAR 1961: REPORT TO THE CONGRESS OF THE UNITED STATES OF AMERICA

- U.S. NRC, OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
267
DRAFT ENVIRONMENTAL STATEMENT RELATED TO THE OPERATION OF
SAND ROCK MILL PROJECT, DOCKET NO. 40-8743, CONOCO, INC.
- U.S. NRC, OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS, OFFIC
595
COMPLIANCE DETERMINATION PROCEDURES FOR ENVIRONMENTAL
RADIATION PROTECTION STANDARDS FOR URANIUM RECOVERY
FACILITIES 40 CFR PART 190
- U.S. NRC, OFFICE OF STANDARDS DEVELOPMENT
180
DRAFT ENVIRONMENTAL STATEMENT ON THE TRANSFORMATION OF
RADIOACTIVE MATERIAL BY AIR AND OTHER MODES, DOCKET NO.
PR-71,73 (40 FR 23768)
- 448
CALCULATIONS OF RELEASES OF RADIOACTIVE MATERIALS IN
GASEOUS AND LIQUID EFFLUENTS FROM LIGHT-WATER-COOLED POWER
REACTORS
- U.S. NUCLEAR REGULATORY COMMISSION, OFFICE OF NUCLEAR MATERIAL SA
405
FINAL GENERIC ENVIRONMENTAL IMPACT STATEMENT ON URANIUM
MILLING AND MINING, PROJECT M-25, VOL. 1, SUMMARY AND TEXT,
VOL. 2, APPENDICES A-F, VOL. 3, APPENDICES G-V
- UPPULURI, V.R.R.
429
RARE EVENTS: A STATE OF THE ART
- 643
RISK ANALYSIS AND RELIABILITY
- VAN ERP, J.B., (ED.)
663
EXECUTIVE SEMINAR ON THE FUTURE ROLE OF RISK ASSESSMENT AND
RELIABILITY ENGINEERING IN NUCLEAR REGULATION
- VAN OTTERLOO, R.W.
660
RISK ANALYSIS OF THE ROAD TRANSPORT OF RADIOACTIVE WASTE IN
THE NETHERLANDS
- 705
RISK ANALYSIS OF THE FUEL CYCLE IN THE NETHERLANDS

VANIMAN, D.

368

GEOLOGY AND PETROLOGY OF THE BASALTS OF CRATER FLAT:
APPLICATIONS TO VOLCANIC RISK ASSESSMENT FOR THE NEVADA
NUCLEAR WASTE STORAGE INVESTIGATIONS

VAURIO, J.K.

658

LETTER TO THE EDITORS - FIDUCIAL ESTIMATION OF
PROBABILITIES FOR RELIABILITY AND RISK ASSESSMENT

VESELY, W.E.

670

SOME NOTABLE PROBABILITY AND STATISTICS PROBLEMS
ENCOUNTERED IN RISK ANALYSIS APPLICATIONS

VIEBROCK, J.M.

659

VOLUME IV. SAFETY ANALYSIS REPORT SUPPLEMENT FOR
CONSOLIDATED FUEL ROD STORAGE AT AN INDEPENDENT SPENT FUEL
STORAGE INSTALLATION

VINCK, W.

240

COMPARATIVE RISK - BENEFIT - COST EFFECTIVENESS IN NUCLEAR
AND ALTERNATIVE POWER SOURCES: METHODOLOGY, PERSPECTIVE,
LIMITATIONS

VOGT, S.

114

SENSITIVITY ANALYSIS OF THE METEOROLOGICAL MODEL APPLIED IN
THE GERMAN RISK STUDY

VOHARA, K.G.

706

A PERSPECTIVE ON THE RADIATION PROTECTION PROBLEM AND RISK
ANALYSIS FOR THE NUCLEAR ERA

VOSS, J.W.

592

SAFETY INDICES AND THEIR APPLICATION TO NUCLEAR WASTE
MANAGEMENT SAFETY ASSESSMENT

WACHTER, J.W.

414

ACTINIDE PARTITIONING-TRANSMUTATION PROGRAM FINAL REPORT,
III. TRANSMUTATION STUDIES

WAGNER, D.P.

734

FLOOD RISK ANALYSIS METHODOLOGY DEVELOPMENT PROJECT FINAL
REPORT

WALKER, J.F.

657

THE LONG-TERM STORAGE OF IRRADIATED CANDU FUEL UNDER WATER

WALL, I.B.

219

PROBABILISTIC ASSESSMENT OF AIRCRAFT RISK FOR NUCLEAR POWER
PLANTS

WALLACE, R.W.

444

TOPICAL REPORT ON RELEASE SCENARIO ANALYSIS OF LONG-TERM
MANAGEMENT OF HIGH-LEVEL DEFENSE WASTE AT THE HANFORD SITE

WANG, J.S.Y.

124

REGIONAL THERMOHYDROLOGICAL EFFECTS OF AN UNDERGROUND
REPOSITORY FOR NUCLEAR WASTES IN HARD ROCK

WARNECKE, E. E.

117

EVALUATION OF PRODUCT SPECIFICATIONS WITH A SAFETY ANALYSIS
FOR A DISPOSAL MINE

WATSON, S.R.

306

FROM ACCEPTABLE RISK TO REGULATIONS

487

INDEX OF HAZARD FOR RADIOACTIVE WASTE (REVISED). INTERIM
TECHNICAL REPORT PR 78-10-80R

WEHNER, G.

656

SAFETY PHILOSOPHY AND ACCEPTABLE RISK

WEISBECKER, L.W.

188

PROPOSED OUTLINE OF SAFETY ANALYSIS REPORT FOR FACILITIES
FOR GEOLOGIC ISOLATION OF RADIOACTIVE WASTES

WICK, O.J.

133

COMPARISON OF POTENTIAL RADIOLOGICAL CONSEQUENCES FROM A
SPENT-FUEL REPOSITORY AND NATURAL URANIUM DEPOSITS

WIGHT, L.H.

396

ASSESSMENT OF EFFECTIVENESS OF GEOLOGIC ISCLATION SYSTEMS.
THE FEASIBILITY OF COMPUTER INTERROGATION OF EXPERTS FOR
WISAP

WILD, R.E.

653

DATA BASE FOR RADIOACTIVE WASTE MANAGEMENT. VOL. 2, WASTE
SOURCE OPTIONS REPORT

WILLIAMS, L.D.

655

RISK OF TRANSPORTING PLUTONIUM DIOXIDE AND LIQUID PLUTONIUM
NITRATE BY TRUCK AND RAIL

WILLIAMS, R.F.

753

TECHNICAL ASSESSMENT OF BARNWELL NUCLEAR FUELS PLANT, FINAL
REPORT

WILMOT, E.L.

654

REPORT ON A WORKSHOP ON TRANSPORTATION ACCIDENT SCENARIOS
INVOLVING SPENT FUEL, MAY 6-8, 1980

WINGENDER, H.J.

218

RISK ANALYSIS OF RADIOACTIVE WASTE MANAGEMENT SYSTEMS IN
GERMANY

352

SYSTEM STUDY. RADIOACTIVE WASTES IN THE FEDERAL REPUBLIC OF
GERMANY. SRA 5: METHODOLOGY AND APPLICATION OF
PROBABILISTIC RISK ANALYSIS

WOOD, D.E.

111

WHAT IS RISK ASSESSMENT

262

AVAILABILITY ANALYSIS OF FREON ABSORPTION SYSTEM FOR
TREATING EFFLUENTS FROM REPROCESSORS

363

PRELIMINARY RISK ANALYSIS OF A SPENT FUEL RECEIVING AND
STORAGE FACILITY USING THE GO METHODOLOGY

367
RISK ANALYSIS OF A SPENT FUEL RECEIVING AND STORAGE
FACILITY USING THE GO METHODOLOGY

WRIGHT, L.H.
648
ANALYSIS OF THE SEISMIC HAZARD TO AN UNDERGROUND WASTE
REPOSITORY

YADIGARGLU, G.
26
SPENT FUEL TRANSPORTATION ON HIGHWAYS - THE RADIOACTIVE
DOSE TO THE TRAFFIC

YEH, G. T.
164
A SYSTEMATIC APPROACH FOR ASSESSMENT OF ALTERNATIVE NUCLEAR
WASTE MANAGEMENT STRATEGIES

YOSHIMURA, H.R.
465
CRASH TESTING OF SPENT-NUCLEAR FUEL SHIPPING SYSTEMS

ZEN, E.
216
NUCLEAR WASTE IN A REPOSITORY: AMOUNT AS A FACTOR IN RISK
DURATION

4.3 FUEL CYCLE ELEMENT INDEX

METHODS

8	9	10	12	13	16	25
26	27	28	32	34	40	42
45	48	49	50	51	53	57
59	61	62	64	66	67	68
69	70	71	72	78	83	84
85	86	87	88	89	91	93
94	96	97	98	99	101	106
110	111	113	114	115	116	117
119	120	121	122	123	124	136
146	153	164	165	173	178	181
187	189	190	191	192	193	203
204	214	217	221	222	224	225
226	227	232	233	234	240	246
248	250	254	258	259	260	261
262	264	265	279	283	289	290
291	293	296	297	298	299	300
301	302	305	306	307	317	318
319	329	342	345	346	347	350
352	353	354	363	364	365	367
376	388	390	392	393	396	399
408	410	413	423	429	431	439
440	441	444	446	459	462	472
473	474	475	476	478	479	480
481	482	484	485	487	489	490
491	492	493	494	496	497	501
502	504	510	514	515	526	528
530	532	538	540	541	544	551
553	554	558	559	561	563	567
570	571	572	574	578	586	587
589	592	594	596	598	599	602
608	612	615	618	634	637	639
640	643	646	647	658	661	662
663	666	670	672	674	675	682
690	691	696	702	703	707	709
713	714	715	716	717	718	719
720	721	722	723	724	725	726
727	728	729	732	734	735	737
738	739	741	742	743	744	745
751	754	757				

URANIUM MINING

39	178	200	208	210	211	252
266	267	358	405	468	470	506
516	517	520	521	523	526	527
545	549	569	581	588	602	603
604	606	627	635	641	664	666
681	688	692	700	730	731	736

URANIUM MILLING

39	74	75	134	155	156	200
201	208	210	211	260	266	267
270	272	326	327	328	358	405
407	424	432	461	470	507	517
520	526	527	545	549	555	581
588	593	595	602	603	606	627
635	641	664	666	681	688	692
731						

URANIUM REFINING AND CONVERSION

39	77	155	156	178	179	266
287	407	470	545	555	588	627
635	666	668	693	733	748	749

URANIUM ENRICHMENT

39	155	156	172	178	266	270
364	365	388	407	470	545	555
588	627	635	666	679	680	682
694	705					

FUEL FABRICATION

39	150	155	156	178	179	212
239	266	334	407	470	496	545
555	559	588	627	635	666	685
705	733					

FUEL REFABRICATION

39	63	76	79	146	172	175
178	200	212	226	239	250	251
264	266	270	317	318	319	333
338	351	374	388	399	413	415
426	442	443	447	467	495	496
497	504	508	510	526	541	609
614	627	635	639	640	666	668
669	676	677	678	681	688	704
708	754					

FUEL REPROCESSING

39	73	79	82	96	100	103
117	129	130	145	155	156	166
172	175	178	179	195	196	200
202	203	204	205	212	238	251
261	262	264	266	270	271	273
276	281	291	294	313	317	318
319	330	333	335	336	340	344
351	352	373	388	399	407	413
414	415	426	427	428	436	441
442	455	467	468	470	471	475
489	507	526	545	557	627	635
655	666	668	669	681	688	704
708	726	753	754	756		

HL & TRU WASTE STORAGE

21	82	90	102	103	112	122
123	139	140	167	178	179	185
195	196	197	200	218	231	244
260	266	268	274	276	281	282
283	284	291	292	296	304	310
312	313	314	316	317	318	319
320	331	332	335	337	339	342
343	352	360	369	378	380	382
384	388	389	393	399	402	406
436	444	455	467	471	476	477
485	489	502	524	533	545	546
575	582	584	605	606	607	630
633	634	635	665	666	681	686

SF, HL & TRU WASTE DISPOSAL

39	50	51	52	53	54	55
60	64	65	66	67	68	69
78	79	80	81	84	85	86
87	88	89	90	91	92	94
95	102	103	104	105	107	108
112	117	119	120	121	124	125
126	127	130	131	132	133	135
136	137	138	139	140	154	157
158	159	160	161	162	163	164
165	168	169	170	171	173	177
179	185	188	190	191	192	193
195	196	198	199	200	213	216
222	223	227	228	229	230	231
233	234	235	236	237	241	242
243	244	245	246	247	248	249
253	254	255	256	257	264	265
266	268	269	271	275	276	277
278	279	280	282	285	288	296
297	308	309	310	312	313	315
316	317	318	319	325	337	341
343	350	353	356	357	360	361
362	368	369	372	376	378	381
382	384	388	389	393	394	395
396	398	400	401	402	408	410
411	412	415	416	417	418	419
420	421	422	425	426	427	433
434	435	436	445	446	449	459
460	463	466	467	468	469	473
474	475	476	477	484	485	486
487	489	490	491	492	494	499
500	501	507	511	512	513	524
526	531	540	545	546	576	582
584	592	596	598	602	605	606
607	635	646	647	648	650	665
666	672	673	674	675	681	688
690	691	703	707	708	709	710
713	714	715	716	717	718	719
720	721	722	725	727	735	737
738	744	750	751	754	755	757

SPENT FUEL STORAGE

2	46	78	82	103	135	137
138	159	174	177	178	179	185
195	197	266	276	283	291	312
313	314	316	317	318	319	335
355	360	363	367	373	388	399
402	407	442	451	453	456	467
470	477	503	507	545	547	550
560	565	590	605	606	611	613
623	635	644	657	659	666	681
682	705	740	754			

LL & IL WASTE STORAGE/DISPOSAL

39	54	56	65	66	82	86
87	89	90	91	101	107	109
112	121	122	123	128	133	164
165	167	179	190	194	195	196
197	198	199	200	207	209	213
222	232	260	266	276	277	278
279	282	283	291	297	304	312
313	314	316	317	318	319	323
324	337	350	358	368	373	374
388	391	394	410	411	412	415
418	419	420	421	422	425	433
446	449	455	459	460	467	468
469	470	475	477	487	490	491
492	499	500	501	505	507	509
513	524	526	544	575	576	584
585	586	587	607	633	634	635
646	647	648	653	660	665	666
681	686	688	691	696	697	698
701	710	715	716	718	719	720
721	722	725	727	735	737	738
744	751	755	757			

TRANSPORTATION

2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	32	33	34	35	36
37	38	39	40	41	42	43
44	45	46	47	61	70	79
102	103	130	137	139	140	147
148	153	172	177	178	179	180
194	195	197	200	215	220	244
251	260	264	267	277	278	280
297	307	312	313	315	316	317
318	319	321	322	337	350	360
361	378	385	388	390	399	413
435	436	437	438	452	465	467
470	475	476	489	501	503	511
522	526	530	532	534	535	536
537	538	539	542	543	550	551
552	555	558	561	562	565	573
575	577	579	580	587	588	589
590	600	601	608	612	615	617
618	619	620	621	624	625	626
629	631	632	635	636	637	638
641	642	645	650	652	654	655
656	660	666	667	668	679	681
682	684	685	688	699	705	724
752	754					

OTHER

2	13	18	19	25	27	38
39	41	46	48	72	89	107
110	114	133	145	152	155	156
177	178	186	189	214	219	221
222	224	240	250	277	278	279
289	306	311	315	323	334	336
337	343	347	348	349	354	374
375	377	399	414	416	428	440
448	458	464	489	505	508	514
529	545	550	556	564	566	571
572	578	588	598	599	610	616
617	628	635	643	650	661	662
665	669	670	671	682	687	689
702	706	708	723	734	739	741
742	743	750	756			

4.4 RISK ELEMENT INDEX

SYSTEMS DESCRIPTION

2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	21	22	23
24	25	26	27	28	29	30
32	34	35	36	37	38	39
40	41	42	43	44	46	48
50	52	60	61	62	64	65
69	73	74	75	76	77	79
80	82	83	85	86	87	88
89	90	92	93	94	96	99
102	106	109	110	112	120	121
122	127	128	129	130	131	132
133	135	137	138	139	140	150
153	155	156	158	159	160	161
162	163	164	167	170	172	174
175	177	178	180	186	188	191
192	193	194	195	196	197	198
200	203	204	205	207	208	215
216	217	218	220	221	223	224
225	226	231	238	239	240	243
244	245	247	252	253	256	258
260	261	262	264	267	268	269
270	271	274	275	276	277	278
279	280	281	282	283	284	285
287	288	291	292	297	299	300
301	302	304	305	307	308	309
310	312	313	314	315	316	320
321	322	323	324	325	326	327
328	329	330	331	332	333	334
335	336	337	338	339	341	342
343	344	345	347	348	350	351
352	353	354	355	356	358	360
361	362	364	365	367	368	369
372	373	374	375	376	377	378
380	381	382	384	388	389	390
391	392	393	394	395	396	398
399	400	401	405	406	407	408
410	412	413	414	415	416	418
419	421	423	425	427	428	429
431	432	434	435	436	437	438
439	441	442	443	445	446	447
448	449	452	453	456	458	459
460	462	463	464	465	466	468
469	471	472	473	475	476	477
478	479	481	484	485	486	489
490	491	492	493	494	495	497
499	500	501	502	503	504	505
507	509	510	511	512	513	514
516	517	520	521	522	523	524
527	529	530	531	532	533	534

SYSTEMS DESCRIPTION (Continued)

535	536	537	538	540	541	546
547	550	551	552	553	554	555
556	557	560	561	562	565	566
567	570	571	572	573	574	575
576	577	578	581	582	584	585
587	588	589	590	592	593	594
595	596	598	599	600	601	602
603	605	606	607	608	609	610
611	612	613	614	615	616	617
618	620	621	623	625	626	627
629	630	631	633	635	636	637
638	639	640	641	642	644	650
653	655	657	659	661	662	664
667	669	672	673	674	675	676
677	678	679	680	681	682	684
685	686	690	691	692	693	694
696	697	698	699	701	702	703
704	705	706	707	708	709	710
713	714	715	716	717	718	720
721	722	723	724	725	726	727
728	729	733	735	736	738	739
740	742	743	744	746	747	748
749	750	751	753	754	755	756
757						

SCENARIO ANALYSIS

2	3	4	5	6	8	9
10	12	13	15	16	17	18
19	20	21	22	24	25	27
28	29	30	32	34	37	38
39	40	41	42	43	44	46
51	53	57	61	62	64	65
68	69	73	75	76	78	79
81	83	87	89	93	94	96
99	101	102	103	104	106	112
117	119	120	121	122	123	125
127	130	132	133	135	138	139
140	145	146	150	153	160	161
164	165	169	171	172	174	175
180	181	189	191	194	200	203
204	209	218	221	223	224	226
229	231	232	237	238	239	243
245	246	247	253	254	255	259
261	264	265	267	268	269	273
274	276	278	279	287	290	292
297	302	307	308	309	312	315

SCENARIO ANALYSIS (Continued)

316	317	318	319	320	321	323
325	326	327	328	330	334	335
337	338	339	342	344	347	348
350	352	353	354	355	356	357
358	361	362	367	380	390	392
393	395	399	401	402	407	408
410	411	412	417	420	421	422
425	427	431	432	434	435	437
438	441	443	444	446	447	451
452	453	456	458	460	462	463
464	465	466	469	472	473	474
475	476	479	480	481	484	485
486	487	489	490	494	495	497
499	501	502	507	510	512	513
514	522	527	530	534	536	537
538	540	541	542	544	547	550
551	554	555	556	558	560	561
562	565	571	572	573	574	576
577	578	587	589	590	592	594
596	600	601	602	607	608	609
611	613	614	615	618	620	621
623	625	626	628	629	630	632
635	637	639	640	641	646	647
654	655	656	659	660	663	664
667	672	673	675	676	677	678
679	681	689	690	693	694	696
697	698	703	705	707	709	710
713	715	716	717	718	720	721
722	723	724	725	727	731	733
735	737	739	741	742	743	746
751	753	754	755	757		

PROBABILISTIC MODELING

5	6	8	9	10	11	13
14	16	17	20	21	22	24
25	27	28	32	34	40	41
42	43	45	46	47	50	53
54	56	57	59	61	62	63
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87	89	90	93	94	96	97
98	99	103	104	106	107	108
110	111	113	115	116	117	121
122	123	125	126	130	139	140
148	153	169	172	175	178	180
181	187	188	189	194	200	201
203	204	205	209	217	218	219
220	224	225	226	227	228	229
231	234	236	241	242	244	245
246	247	248	250	251	253	254
257	258	259	261	262	264	265
267	268	269	273	277	283	290
297	299	300	301	305	306	307
312	316	325	329	335	338	344
345	346	347	348	349	350	352
353	354	361	363	364	365	367
375	376	377	380	392	393	394
396	401	402	405	416	417	423
425	426	427	429	431	437	438
440	441	443	451	461	462	463
464	469	472	473	474	475	476
478	480	481	482	484	485	486
487	489	490	492	493	495	496
497	499	501	502	504	507	510
511	512	514	515	522	526	528
530	534	536	537	539	540	541
542	544	550	551	553	554	558
559	561	562	563	571	572	576
577	578	579	589	590	596	599
600	601	607	608	609	614	618
620	621	626	629	630	637	638
639	640	641	643	647	648	650
654	655	658	659	660	663	666
667	670	672	673	675	679	684
685	688	690	691	693	697	698
699	703	705	707	709	713	714
715	716	719	720	721	722	724
726	727	730	731	734	735	741
742	744	745	751	755	757	

IN-PLANT CONSEQUENCES

8	9	10	12	13	16	17
21	22	25	27	28	29	32
34	35	43	45	46	47	53
54	59	60	61	62	63	71
72	76	78	79	87	89	96
98	99	100	102	103	106	107
110	111	117	139	146	148	150
172	174	188	194	200	202	203
205	207	224	226	231	251	252
257	264	267	268	273	274	283
290	291	298	301	302	305	306
311	312	316	320	322	330	334
335	337	338	339	347	348	349
352	354	355	361	367	375	377
380	393	399	405	426	431	438
440	441	443	447	451	452	453
456	458	462	465	467	476	478
479	481	484	485	489	490	493
495	501	502	506	507	510	511
514	515	523	526	530	534	536
537	539	540	541	544	550	551
554	555	556	558	559	561	564
569	571	572	573	577	585	586
590	601	603	608	609	611	613
614	620	621	626	628	629	630
631	633	634	637	641	642	659
660	663	672	673	674	675	681
682	691	693	696	697	701	703
704	705	706	709	718	724	730
733	734	736	739	741	746	747
752	753					

EX-PLANT CONSEQUENCES

9	10	12	13	16	17	21
22	24	25	26	27	28	29
32	34	35	40	42	45	46
49	50	51	52	53	54	55
56	59	60	61	62	63	64
66	68	69	70	71	72	73
74	75	76	77	78	79	80
81	83	84	85	86	87	88
89	90	91	92	94	95	96
98	99	100	102	103	104	105
106	107	108	109	110	111	117
119	122	123	124	125	126	127
129	131	133	134	135	136	139
140	145	146	148	150	152	154
155	156	159	160	161	164	165

EX-PLANT CONSEQUENCES (Continued)

166	167	168	169	170	171	172
173	174	175	177	178	180	185
188	189	190	191	192	193	194
200	201	203	205	207	208	209
210	211	212	213	214	216	218
219	220	222	223	224	225	226
228	229	230	231	232	233	234
235	236	237	238	239	241	242
243	244	245	246	247	248	249
250	251	253	254	255	257	258
261	262	264	265	267	268	269
270	271	272	273	274	275	277
278	279	282	283	285	287	289
290	291	292	293	294	296	297
298	301	302	305	306	307	308
310	311	312	315	316	317	318
319	320	322	324	325	326	327
328	330	332	335	337	338	339
340	344	347	348	349	351	352
353	354	355	357	358	361	363
364	365	367	375	377	385	388
391	393	394	395	399	400	401
402	405	407	408	410	412	417
421	422	423	424	425	426	427
431	432	433	434	437	438	440
441	443	444	446	447	448	458
459	461	462	464	465	466	467
468	469	470	473	475	476	478
479	481	484	485	487	489	490
493	494	497	499	501	508	511
512	514	515	517	520	522	523
526	527	530	532	534	537	538
539	540	541	545	547	550	551
554	555	556	557	558	561	564
565	567	569	571	572	574	576
581	585	586	587	589	590	599
600	602	603	604	607	608	609
614	621	623	626	628	629	630
632	633	634	638	639	640	641
647	648	652	660	663	666	667
668	672	673	674	675	676	677
678	679	681	682	684	685	688
689	691	693	696	697	699	700
702	703	704	705	706	707	709
713	715	716	717	718	720	721
722	723	724	725	726	727	730
731	732	733	734	737	738	739
741	742	751	752	754	755	756
757						

HUMAN FACTORS

8	9	10	16	22	25	28
32	34	51	52	53	56	60
61	67	68	69	70	73	79
83	84	85	87	89	96	99
102	104	106	108	122	123	124
125	128	133	153	160	161	162
166	168	169	175	181	187	188
203	205	231	232	238	239	246
257	262	264	269	273	283	311
330	334	347	356	367	410	420
425	466	467	468	480	530	536
539	540	551	561	571	608	659
663	672	673	675	703	707	730
735	736	751	756			

EXTERNAL EVENTS

21	25	51	52	60	62	63
67	69	74	78	79	81	83
87	89	90	91	96	102	103
104	106	109	112	117	120	122
123	124	132	136	139	140	146
153	157	160	161	169	170	171
173	174	175	178	181	188	190
192	193	194	195	199	205	219
224	229	231	232	233	235	236
237	241	242	243	246	248	249
250	253	254	257	264	268	269
274	277	279	292	293	308	309
312	315	316	317	318	319	320
324	325	326	327	328	330	335
337	338	339	344	347	348	350
355	357	358	361	362	363	364
365	367	368	376	385	393	394
395	408	410	411	412	417	419
420	425	431	434	443	446	447
452	458	459	463	467	468	469
473	474	476	479	485	487	489
493	495	496	497	500	501	503
504	510	511	512	513	520	526
540	541	547	565	571	576	578
590	600	601	607	609	614	629
630	632	634	639	640	641	646
647	648	663	672	673	674	675
676	677	678	679	684	696	697
698	704	707	709	713	718	727
732	734	735	737	741	744	754

UNCERTAINTY/SENSITIVITY ANALYSIS

2	5	6	8	9	10	13
16	17	25	27	28	32	34
37	41	42	43	54	61	67
68	79	83	86	87	90	94
96	97	104	106	114	115	116
122	123	132	159	169	172	173
177	180	181	187	219	224	225
227	228	229	232	234	235	236
238	239	240	248	250	251	255
262	264	269	272	279	283	290
305	307	317	318	319	345	347
348	349	367	385	388	392	417
441	446	451	462	472	473	474
480	481	482	485	487	489	490
493	495	497	504	511	515	527
530	540	541	551	561	569	571
599	600	607	608	630	633	634
639	640	663	666	667	672	673
675	696	697	698	714	715	716
719	720	721	725	727	728	729
732	743	745	751	752	755	757

DATA

2	3	4	5	6	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	27	28	29	30	31
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76	77	83	85	87	89	92
102	105	109	112	117	131	133
134	137	139	140	145	147	148
150	154	155	156	159	166	167
171	173	174	175	179	180	185
189	195	196	198	199	200	201
202	203	204	205	207	208	209
210	211	212	213	214	215	216
223	226	230	235	238	239	252
257	258	260	262	266	267	268
269	270	271	272	273	278	279
281	285	287	289	291	293	294
296	297	300	307	311	312	315
316	317	318	319	320	322	323
324	325	336	337	338	344	348
349	350	356	358	361	367	368
373	375	380	381	389	390	391
393	395	398	401	405	407	408

DATA (Continued)

411	413	419	421	422	425	427
433	434	435	436	441	442	443
446	447	449	453	455	456	460
475	476	479	484	485	486	487
489	495	499	502	503	504	509
510	512	513	517	520	522	526
527	530	534	536	538	540	541
543	547	549	550	551	555	557
558	559	560	561	562	569	571
576	577	579	580	581	582	587
588	589	590	595	600	601	603
608	609	612	614	615	619	620
621	624	625	626	630	636	637
638	639	640	641	648	650	653
654	655	656	664	667	668	672
673	675	676	677	678	679	680
681	684	685	689	692	693	694
696	697	698	699	706	730	731
734	736	741	745	746	752	753

RESULTS

2	3	4	5	6	8	9
10	11	12	13	14	15	16
17	20	21	22	23	24	25
26	27	28	29	30	32	33
34	35	37	38	39	40	41
42	43	46	47	52	61	63
70	74	76	77	78	79	85
87	89	96	99	102	103	104
112	139	140	145	150	154	166
169	172	173	174	175	180	194
201	216	217	230	231	251	252
257	264	269	274	281	285	291
307	312	320	322	330	337	338
339	343	352	355	357	361	364
365	367	375	380	385	392	393
398	405	425	435	443	447	451
452	453	455	456	458	476	485
489	495	502	504	507	510	522
526	527	530	534	537	538	540
541	547	550	551	555	559	561
562	565	569	571	573	577	587
589	590	592	598	600	601	602
603	607	608	609	611	614	619
620	621	623	625	626	628	630
631	634	637	638	639	640	641
645	648	654	655	656	659	661
662	665	667	669	671	672	673
674	676	677	678	679	681	684
687	688	690	697	699	703	706
734	754					

4.5 RISK CATEGORY INDEX

OPERATION RADIATION ACCIDENT WORKER

13	22	23	24	25	33	35
53	63	78	79	87	100	103
129	130	139	148	159	160	161
172	174	180	194	200	205	218
219	226	231	251	264	267	274
291	312	316	320	322	330	335
338	339	347	348	352	367	380
385	388	393	426	441	443	447
451	453	456	467	470	476	510
537	538	539	540	542	558	564
589	590	601	613	616	618	621
623	626	628	633	637	641	652
656	659	660	666	701	703	705
730	733	746	747			

OPERATION RADIATION ACCIDENT PUBLIC

9	10	12	13	16	17	21
22	23	24	25	26	27	28
29	30	32	33	34	35	40
42	43	45	51	52	53	55
56	61	63	64	69	73	76
78	79	85	87	88	89	90
92	100	102	103	104	112	114
122	123	124	129	130	133	139
140	145	148	152	155	156	159
160	161	165	169	172	173	174
175	180	189	191	194	200	205
215	216	218	219	222	226	228
231	232	251	261	264	265	267
274	277	278	285	291	292	298
307	312	316	326	327	328	330
335	337	338	339	340	344	347
348	352	353	357	362	363	367
380	385	388	393	400	405	425
426	433	438	441	443	447	451
452	461	467	470	475	476	485
489	502	510	522	530	534	537
538	539	540	541	542	547	551
558	561	564	565	576	577	587
589	590	600	601	607	608	609
611	613	614	616	618	620	621
623	626	628	630	632	633	634
637	638	639	640	641	652	654
656	659	660	666	667	672	673
674	675	679	684	685	688	697
699	703	705	725	727	730	731
733	754	755				

OPERATION RADIATION ROUTINE WORKER

8	13	22	23	25	46	53
79	83	84	87	100	102	126
129	130	133	139	159	160	161
172	194	200	205	218	226	231
234	237	251	252	264	267	274
291	310	312	316	320	322	337
339	355	388	393	399	405	426
441	467	470	506	523	540	550
555	556	559	569	587	589	590
603	611	616	621	637	641	652
656	666	700	701	705	706	730
733	746	747	753			

OPERATION RADIATION ROUTINE PUBLIC

13	22	23	25	26	46	52
53	69	73	74	76	77	78
79	83	84	85	100	102	104
124	125	129	130	133	134	139
140	145	150	155	156	159	160
161	166	167	169	172	174	175
179	180	185	189	191	194	200
201	205	207	208	209	210	211
213	214	216	218	222	223	226
228	231	232	234	235	237	238
239	246	251	264	265	267	269
270	271	273	274	277	278	287
291	292	298	310	312	316	320
322	326	327	328	332	337	339
340	353	355	357	362	363	388
391	393	399	400	405	407	412
424	425	426	433	438	441	461
466	467	470	476	502	507	512
517	520	527	540	541	545	550
555	556	557	567	569	574	581
587	589	600	602	603	604	609
614	616	620	621	637	641	652
656	666	679	688	702	705	706
707	727	730	731	733	755	

OPERATION NON-RADIATION ACCIDENT WORKER

25	79	83	139	148	172	200
218	251	264	267	322	330	339
388	426	523	588	603	616	628
641	700	747	752			

OPERATION NON-RADIATION ACCIDENT PUBLIC

25	79	83	139	148	172	200
218	251	264	267	277	278	322
330	388	405	426	616	628	641
679	752					

OPERATION NON-RADIATION ROUTINE WORKER

79	139	172	200	251	264	320
339	388	426	523	616	700	747
752						

OPERATION NON-RADIATION ROUTINE PUBLIC

74	79	139	172	179	200	251
264	277	278	388	405	426	545
600	616	679	752			

DECOMMISSIONING RADIATION ACCIDENT WORKER

229	231	312	316	391	467	540
616						

DECOMMISSIONING RADIATION ACCIDENT PUBLIC

155	231	292	298	312	316	326
327	328	362	391	395	400	425
427	432	433	434	446	458	461
467	469	540	616	727	731	

DECOMMISSIONING RADIATION ROUTINE WORKER

231	312	316	391	458	467	616
669						

DECOMMISSIONING RADIATION ROUTINE PUBLIC

131	133	179	201	207	208	209
210	211	212	213	231	272	276
292	298	312	316	326	327	328
362	391	395	400	405	424	425
427	432	433	434	446	461	467
469	616	727	731			

DECOMMISSIONING NON-RADIATION ACCIDENT WORKER

407	616
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DECOMMISSIONING NDN-RADIATION ACCIDENT PUBLIC

179	229	410	545	616
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DECOMMISSIONING NON-RADIATION ROUTINE WORKER

18	616
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DECOMMISSIONING NON-RADIATION ROUTINE PUBLIC

616

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16. ABSTRACT (200 words or less) <p>The U.S. Nuclear Regulatory Commission has initiated the Fuel Cycle Risk Assessment Program to provide risk assessment methods for assistance in the regulatory process for nuclear fuel cycle facilities other than reactors. Both the once-through cycle and plutonium recycle are being considered. A previous report generated by this program defines and described fuel cycle facilities, or elements, considered in the program. This report, the second from the program, describes the survey and computer compilation of fuel cycle risk-related literature. Sources of available information on the design, safety, and risk associated with the defined set of fuel cycle elements were searched and documents obtained were catalogued and characterized with respect to fuel cycle elements and specific risk/safety information. Both U.S. and foreign surveys were conducted. Battelle's computer-based BASIS information management system was used to facilitate the establishment of the literature compilation. A complete listing of the literature compilation and several useful indexes are included. Future updates of the literature compilation will be published periodically.</p>			
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