



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555  
OCT 12 1979

File No 3109

*See Pocket I  
for end. 109*

Docket File No. WM-7

MEMORANDUM FOR: James C. Malaro, Chief  
High-Level Waste Licensing Management Branch

FROM: Regis R. Boyle  
High-Level Waste Licensing Management Branch

SUBJECT: MINUTES OF NRC/DOE MEETING ON NRC HIGH-LEVEL WASTE  
MANAGEMENT PROGRAM

On Thursday, October 4, 1979, a meeting was held (at the DOE Auditorium) in Germantown with the U.S. Department of Energy (DOE), and their contractors. This meeting was the fourth in a series of meetings which were initiated on February 6, 1979. The purpose of this meeting was to provide the DOE staff and their contractors with a better understanding of the NRC High-Level Waste Program.

A copy of the meeting notice was placed in the NRC Public Document Room at 1717 H Street and was sent to those individuals who had requested that they be notified of NRC/DOE meetings on waste management matters.

During the course of the meeting, NRC provided an overview of the High-Level Waste Program. Presentations included the objectives of the program, its funding and organization, and the NRC regulatory approach. Also discussed were the scope and direction of the program and proposed schedules for publishing regulations and guides.

Attached is a complete set of the vu-graphs which were presented during the meeting. These vu-graphs are self-explanatory and provide reasonably thorough insights into the topics discussed during the meeting. Also attached is a copy of the attendance sheet.

The next meeting between DOE and the NRC has not yet been scheduled. When a topic and date have been selected, a notice of such a meeting will be placed in the Public Document Room.

*Regis R. Boyle*

Regis R. Boyle  
High-Level Waste Licensing  
Management Branch

Enclosure:  
As stated

# NRC BRIEFING TO DOE OCT 4, 1979

<u>Name</u>	<u>Organization</u>	<u>Phone #</u>
Carl Newton	DOE - HQ	353-4851
Emanuel Gordon	AIF	762-4826
Lars G. Larsson	Swedish embassy	298-3562
J. A. McBride	ER Johnson Assoc.	893-7378
M. A. GLORA	Battelle - ONWI	(614) 424-5810
D. B. Shipley	Battelle - ONWI	(614) 424-7732
H. P. Stephens	Sandia - NNWSI	FTS 475-9178
L. B. Myers	Battelle - ONWI	(614) 424-4327
J. T. D'Ambrosia	NRC	427-4173
D. T. Gournelos	NUS Corp	(301) 948-7010
D. R. TIE TJEN	KAISER ENGINEERS	296-5161
S. A. ZWICKLER	BURNS & ROE	201-265-8710
L. H. STENTON	Union Carbide Corp. - Nuclear Division UCC - ND	(615) 576-2551
L. S. HYBERG	LOWER ALLOWAY CREEK	(609) 645-1111
T. KABELLE	TASC	(617) 844-6850
D. Kell	Fla. Dept Environmental Reg	904-487-1981
D. FENRINGER	NRC	427-4177
L. Rossbach	NRC	427-4177
M. GRAYSON	NRC	427-4177
E. GOODMAN	DOE - PE (Forestal)	252-5615
JOHN Graham	ANS	521-8801
Jack Ito	NAI	427-4177
W. R. SCHMIDT	MSHA	2351337
Jack Peel	PR-42	353-4127
W. M. Hewitt	ONWI	614 424 5473
W. J. Dwyer	ONWI	614 424 4710
Janet L. Owen	Bechtel Natl	415-768-1940
G. Barry Bingham	Battelle/ONWI	614 424-4092

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BARRY NAFT	NUS CORP	301 948-7010
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R. T. PENNINGTON	GENERAL ELECTRIC	202-637-4447
PETER TAM	ACRS, US N.R.C.	202-634-1413
H.C. HUANG	WESTINGHOUSE	412-722-5123
CRAIG GROCHMAL	STOUT WHEELER	202 460-7415
JOHN A ADAM	NRC	301 427 4125
JOHN SURMEIER	NRC	301 427 4423
Roberto P. Acuna	MITRE	703 855 6713
GUY MARTIN, JR.	ENVIRONMENTAL	212 785 4374
EVERETT WICK	NRC	301 427 4177
ROBERT T. CLASKE	NRC STATE PROGRAMS	301 492 8171
Critic H. George	DOE-HQ	301 353 3014
CYRUS KLINGSBERG	DOE HQ	301 353 3915
DONALD L. VICTH	DOE-HQ	301-353-4285
MARTHA CROSLAND	DOE-OGC	202-252-6947
Barrett Fritz	Aerospace Corp	301-428-2720
D.S. Kell	Fla. Dept Environmental Reg.	904-987-1980
B.A. Racharat	CEC	202-862-9500
A.A. CAMACHO	DOE-HQ	301-353-4001
JOHN W. BARTLETT	TASC	617-944-6850
J. Tasse	Westinghouse	202-833-5060
Lyn McInlosh	ANR	202 296-4520
M. Cullingford	NRC	301 492 8377

<u>Name</u>	<u>Organization</u>	<u>Phone</u>
ARTHUR R TAMPLIN	NRDC	225-8210
Rob Woolley	DOE/ETW/P	353-3280
Leslie A. Casey	NRC/RES/PAS	492-8388
MALCOLM KNAPP	NRC/Waste Mgt Div	427-4177
MICHAEL KEARNEY	NRC/WM Div.	427-4423
LEWIS B. GANNON	DOE/CR-PPM	858-4703
JAMES A TURNER	DOE/CR-PPM	353-5241
J A SCHEPPNER	PENNA ELECT CO	
J MONAHAN	PENNA POWER & LGS	
B. O'BRIEN	PENNA HOUSE OF REP.	
CARLOS VELEZ	NRC/CON-BUD	492-7108
Mark Haisfield	NRC/CONTR	492-7251
Randal Scott	DOE/ETW	353-3584
VIRGIL PRICE	DOE/ETW	353 4267
DAVID M'GOFF	DOE/ETW	353-3031
Charley Haughney	NRC/Fuel Cycle	427-4205
Tom Clark	" "	"
Jim Landers	DOE/ETW	353-5090
Keith Klein	DOE/ETW	353-3227
Mark W. Frei	DOE/ETW	353-4004
J.O. NEFF	DOE/RLC	FTS 976 5918
JOHN J. SCHREIBER	DOE/RL	FTS 444-7550
Lillie Lysense	MARS	800-265-3410
Ted Tencer & Associates	NRC/WP	492-7615

<u>NAME</u>	<u>Organization</u>	<u>Phone</u>
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Thomas J. Nicholson	NRC/OTD	413-5976
Joe Work	DOE/ETW	353-3791
Pat Stevens	USGS	928-6976
Warren K. Ester	DOE/ETW	353 3188
ELI I GOODMAN	DOE/PE	252-5615
Jim Hooper	Antelope Runway	462 - 1340
Michael J. Roig	DOE/RLC	FTS 976-5650
David E. ...	...	...
Gail Hunt	" "	FTS 444 6211
George C Evans	Rockwell/BWIP	FTS -444-6643
Dave J. Squires	DOE-RL	FTS - 444-7240
Regis R. Boyle	NRC/WM	427-4173
Edward Regnier	NRC/WM	427-4173
E. B. Hawkins	NRC/WM	427-4173
D. B. Shipley	BMI/ONWI	FTS 976-7732
M. B. GLORA	BMI/ONWI	FTS 976-5816
L. B. Myers	BMI/ONWI	FTS 976-4327
W. E. NEWCOMB	BMI/ONWI	FTS 976-7685
H. C. HUANG	Westinghouse	412-722-5123

# Auxiliary Roster for Oct 4

Briefing of DOE by NRC

E. J. Henneley SAV. Riv. PTS 239-2828

R. G. GARVIN SAV. Riv. Lab. 239-3790

T. B. HINDMAN DCETSR 239-2566

R. D. WALTON DOE - ETW/P FTS 253-3388

R. M. KETCHEL G. E. 637-4527

BETTY JARVIS EPA FTS 755-0770

MOHAN THADANI TEKNIKRON 734-0800

EDWARD O'DONNELL NRC 443-5976

LUCILE THOMPSON OTA 224-5694

Bill Barnard DTP 224-8701

STEPHEN F. SCHAEVENS NRC 429-4199

Ruth Budnick NRC / Research 427-4338

PETER ANGELINI ORNL FTS 624-4565

KARL NOTZ ORNL FTS 624-6632

JOSEPH D. NAUMANN NRC 948-2010

PETER B. MYERS NAS/NRC 389-6431

CLYDE JUPITER NRC / RES 301-427-4362

Robin Hutchinson NBS 301-921-2396

DAVID M. ROYER NRC / WASTE Form 301-427-4177

Gary Robbins NRC / Waste Mang 301-427-4177

Albert McGee MITRE 703-827-6000

Joseph A. Lieberman Nuclear Safety Assoc. 301-986-1310

George Sauter NRC 634-1457

MAURICE HALLADAY L, N, R, A, T 862-8400

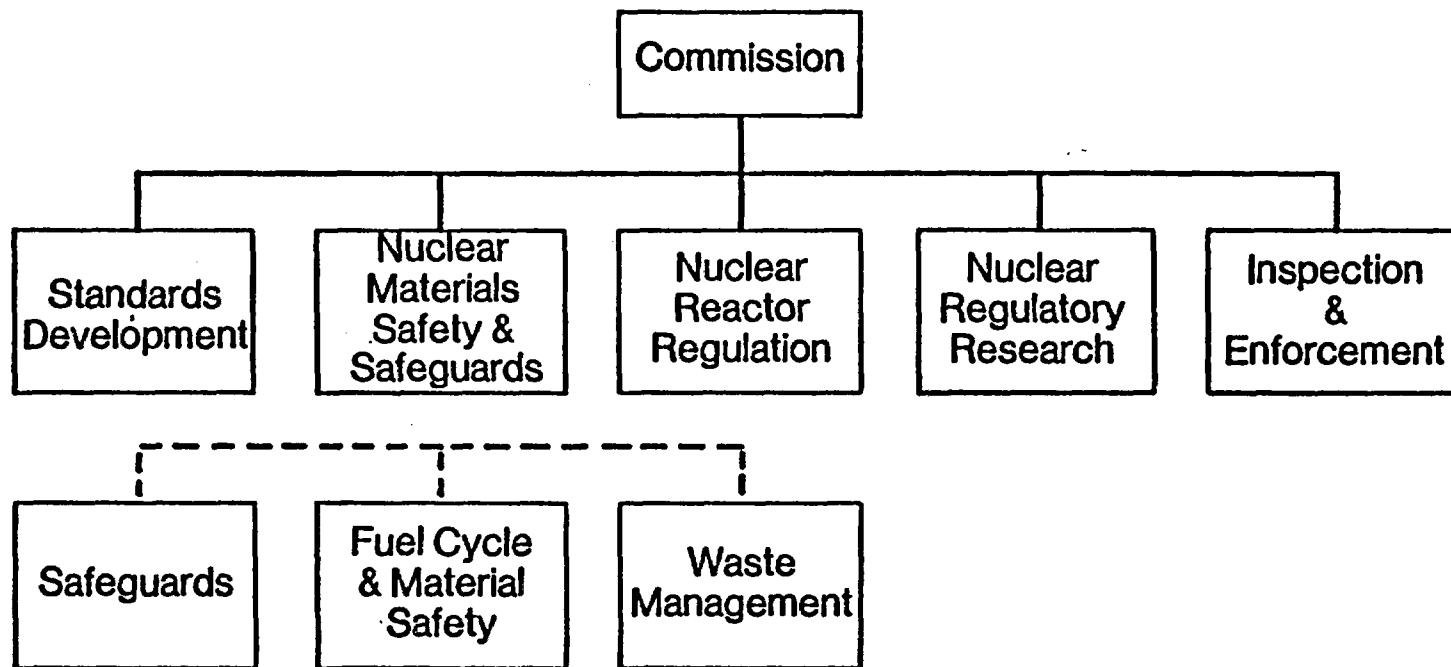
JOHN W. ROWEN DOE / NBS (301) 353-5691

# NRC BRIEFING TO DOE ON NRC HLW PROGRAM

- Overview
- Regulatory Framework
  - Developing a Regulatory Framework
  - License Procedures and Process
  - Technical Standards
- Technical Program
  - Role Objective and Scope
  - LLL Programs
  - Sandia Program
  - Other Research Programs

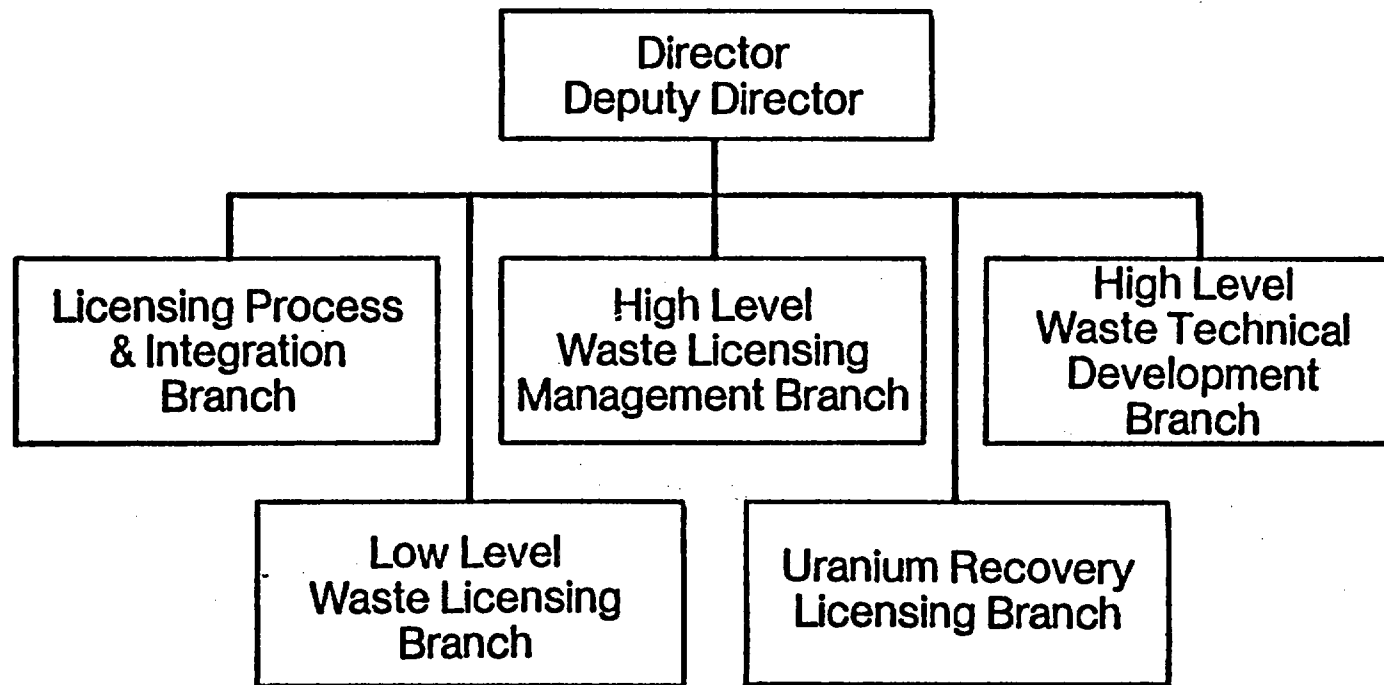
*Send to Meane  
to Meane for  
Boyle - 10/12/79*

# NUCLEAR REGULATORY COMMISSION

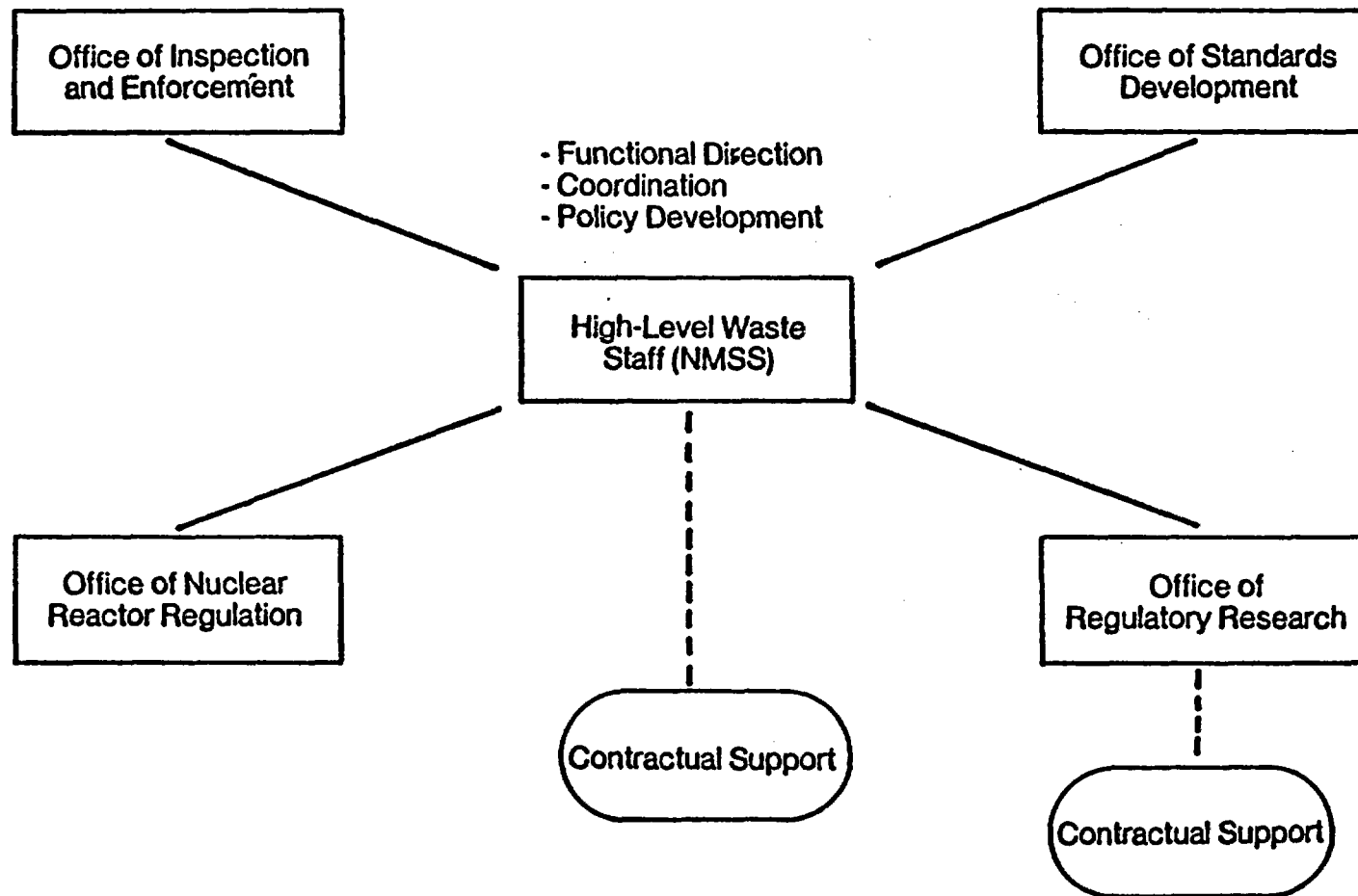




# **DIVISION OF WASTE MANAGEMENT**



# HLW PROGRAM ORGANIZATION



PROJECTED RESOURCE REQUIREMENTS  
FOR NRC HLW PROGRAM

	<u>FY79</u>		<u>FY80</u>		<u>FY81</u>		<u>FY82</u>		<u>FY83</u>	
<u>OFFICE</u>	<u>MY</u>	<u>\$K</u>	<u>MY</u>	<u>\$K</u>	<u>MY</u>	<u>\$K</u>	<u>MY</u>	<u>\$K</u>	<u>MY</u>	<u>\$K</u>
RES	4	1.3	6	4.7	6	7.1	6	8.4	6	7.8
I&E	0	--	0	--	0	--	1	--	1	--
SD	5	--	12	.7	11	.5	11	.4	10	.5
NMSS	29	6.7	49	7.3	62	13.1	71	16.3	65	17.4
NRR	12	--	10	--	12	--	5	--	5	--
ADM	0	0	0	.1	0	.5	0	.8	0	.8
	—	—	—	—	—	—	—	—	—	—
TOTAL	50	8.0	77	12.8	91	21.2	94	25.9	87	26.5

# **PROGRAM OBJECTIVES**

- Develop Regulations (10 CFR 60)
  - Prepare Regulatory Guidance
  - Develop License Review Capability
    - Assessment Capability
    - Internal Review Procedures
  - Develop Inspection & Enforcement Capability
  - Assess DOE Technical Program
  - Conduct Licensing Reviews
-

COLLECT AND STUDY AVAILABLE INFORMATION  
FROM ALL SOURCES TO:

- UNDERSTAND REPOSITORY SYSTEM
- IDENTIFY FACTORS AND PROCESSES IMPORTANT TO SAFETY
- DETERMINE STATE OF KNOWLEDGE AND IDENTIFY NATURE  
AND EXTENT OF UNCERTAINTIES
- IDENTIFY FACTORS AND PROCESSES WHICH CAN BE AFFECTED  
(MITIGATED, ENHANCED OR COMPENSATED FOR) THROUGH  
REGULATORY CONSTRAINTS

DETERMINE:

- PERFORMANCE STANDARDS APPROPRIATE FOR A HLW REPOSITORY
- APPROPRIATE REGULATORY CONSTRAINTS
- WHAT FINDING NEED TO BE MADE AND WHEN
- INFORMATION NEEDED TO MAKE FINDINGS

**DEVELOP PROPOSED REGULATIONS WHICH INCLUDE:**

- **PERFORMANCE CRITERIA**
- **REGULATORY CONSTRAINTS**
- **LICENSING PROCESS**
- **INFORMATION REQUIREMENTS**

SUBJECT PROPOSED REGULATIONS TO CRITICAL REVIEW

OBTAIN ADDITIONAL INFORMATION AND INSIGHTS FROM:

- COMMENTS ON PROPOSED REGULATIONS
- NRC FUNDED CONTRACTUAL EFFORTS
- INDEPENDENT REVIEW OF DOE AND OTHER HLW PROGRAMS

RESTRUCTURE AS NEEDED:

- REGULATIONS
- NRC FUNDED CONTRACTUAL EFFORTS



PREPARE AND PUBLISH

- FINAL REGULATIONS
- SPECIFIC GUIDANCE ON HOW REGS CAN BE MET  
(REG GUIDES, STAFF POSITIONS)
- LICENSE REVIEW PROCEDURES

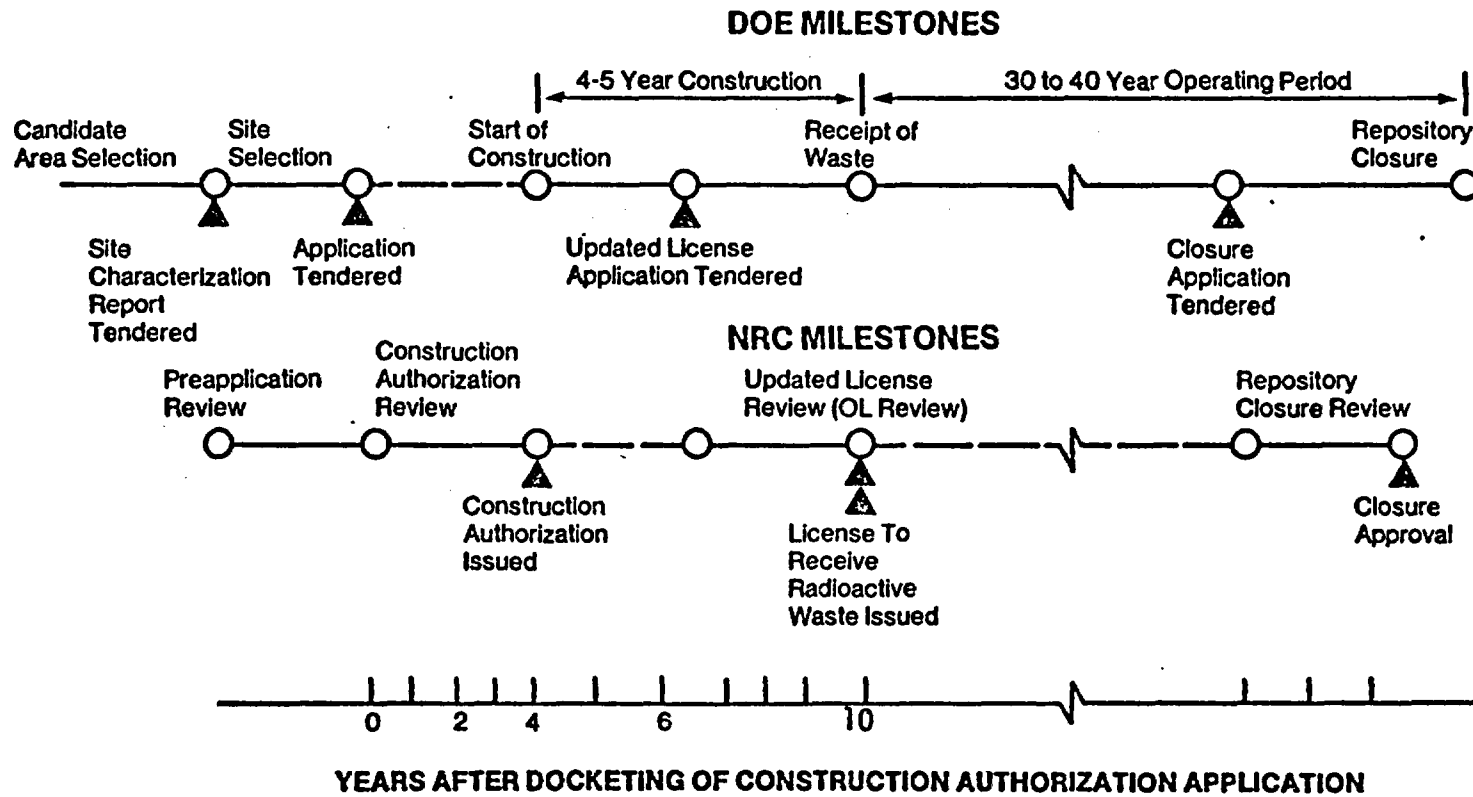
# REGULATION (10CFR 60) DEVELOPMENT SCHEDULE

	<u>Administrative Requirements</u>	<u>Technical Requirements</u>
<b>Commission Policy Statement</b>		
• Publish Draft	Nov. 17, 1978	—
<b>Regulation</b>		
• Staff Working Draft to States	Nov. 9, 1978	—
• Advance Notice of Rulemaking	—	LATE 1979
• Publish Proposed Rule	FALL 1979	MID 1980
• Publish Final Rule	SPRING 1980	MID 1981

**LICENSING PROCEDURES DESIGNED TO:**

- **PROVIDE FOR CONSERVATIVE, STEPWISE APPROACH TO REPOSITORY DEVELOPMENT**
- **ENCOURAGE BROAD BASED SITE CHARACTERIZATION AND SELECTION PROGRAM**
- **ALLOW EARLY DATA GATHERING AND TESTING AT DEPTH**
- **ASSURE EARLY STATE AND PUBLIC INVOLVEMENT**
- **MINIMIZE CHANCE OF FAILURE TO MAKE TIMELY LICENSING DECISION BECAUSE OF LACK OF INFORMATION**

# PROPOSED LICENSING PROCESS FOR HLW REPOSITORY



NRC/DOE Information Exchange Meeting

October 4, 1979

"Regulatory Approach"

P. A. Comella

Office of Standards Development

10 CFR PART 60

. DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTES IN  
GEOLOGIC REPOSITORIES

## 10 CFR PART 60 RULEMAKING

### . STAGES:

#### . PROCEDURAL REQUIREMENTS

TO BE PROPOSED: FALL, 1979

#### . TECHNICAL REQUIREMENTS

ANPR: FALL, 1979

PROPOSED & DRAFT EIS: SPRING, 1980

## 10 CFR PART 60 LICENSING PROCEDURE

- STEPWISE APPROACH: 4 STEPS
- REFLECTS INCREASED CONFIDENCE WITH EACH STEP
- PROVIDES EARLY AND CONTINUED PUBLIC PARTICIPATION WITH EACH STEP
- AFFORDS APPROPRIATE CONSIDERATION OF ALTERNATIVES



STEP 1: INFORMAL REVIEW OF DOE'S PLANS FOR SITE CHARACTERIZATION

- . DOE PLANS FOR SITE CHARACTERIZATION OF A NUMBER OF SITES IN APPROPRIATE MEDIA
- . NRC STAFF ANALYSIS
- . STATE AND PUBLIC COMMENT ON DOE REPORT AND STAFF ANALYSIS
- . OPINION OF THE DIRECTOR, NMSS

## STEP 2: SITE CHARACTERIZATION AND AUTHORIZATION OF CONSTRUCTION

- . EXPLORATION AND IN-SITU TESTING AT DEPTH OF REPOSITORY
- . MULTIPLE SITE CHARACTERIZATION
- . DOE SEMI-ANNUAL REPORTS ON PROGRESS OF SITE CHARACTERIZATION
- . FORMAL LICENSING PROCEEDING AT CONSTRUCTION AUTHORIZATION STAGE

STEP 3: FURTHER REVIEW OF APPLICATION PRIOR TO RECEIPT OF WASTES  
AT THE REPOSITORY

- . CONSTRUCTION SUBSTANTIALLY COMPLETE
- . SAFETY FINDING: ISSUANCE OF LICENSE WILL NOT CONSTITUTE AN  
UNREASONABLE RISK TO PUBLIC HEALTH AND SAFETY

STEP 4: APPLICATION TO CLOSE WITH FINAL REVIEW OF REPOSITORY  
ACTIVITIES AND POSSIBLE LICENSE TERMINATION

- 40 - 50 YEARS TO UNDERSTAND REPOSITORY PERFORMANCE BEFORE  
DECISION TO CLOSE MADE

## 10 CFR PART 60 TECHNICAL CRITERIA

- . TAILORED TO EACH STEP OF LICENSING PROCEDURE
- . INFORMATION AND DATA REQUIREMENTS
- . PERFORMANCE OBJECTIVES
- . GOOD AND BAD SITE FEATURES

### "STRAWMAN" TECHNICAL CRITERIA

- FOCUS DISCUSSION
- IDENTIFY RESEARCH NEEDS
- PROVIDE GUIDANCE TO DOE

EPA

SETS STANDARDS

NRC

REGULATOR

DOE

DEVELOPMENT

HOW WILL NRC CARRY OUT ITS RESPONSIBILITY?

1. SHALL MEET EPA STANDARDS (AD-HOC LICENSING)
2. GENERAL REGULATION (QUALITATIVE)
3. NUMERICAL PERFORMANCE (QUANTITATIVE)



### FACTORS CONSIDERED

1. RISK DECAYS WITH TIME
2. RISK EXTENDS FAR INTO FUTURE
3. R & D MODE
4. VERIFICATION IMPOSSIBLE

QUESTIONS TO ANSWER

1. IS THE REQUIREMENT NECESSARY?
2. IS IT ACHIEVABLE?

CRITERIA REVIEW

USGS

EPA

BUREAU OF MINES

MSHA

NRC CONTRACTORS

PEER REVIEW

NAS

KEYSTONE

CONTRACTOR PANEL

### REGULATORY APPROACH

- o CONSERVATIVE, STEPWISE APPROACH
- o EMPHASIZE DATA GATHERING AND TESTING
- o BOUNDING ASSUMPTIONS TO REDUCE UNCERTAINTIES
- o APPROACH RECOMMENDED BY NAS PANEL ON  
IMPLEMENTATION OF LONG-TERM ENVIRONMENTAL  
RADIATION STANDARDS

### TWO STAGE APPROACH

- o MINIMUM PERFORMANCE STANDARDS
- o REASONABLE ALTERNATIVES

### GUIDING PRINCIPLES

1. BE SPECIFIC AS POSSIBLE
2. VIEW REPOSITORY AS A CIVIL STRUCTURE
3. ENGINEERED SYSTEM IS PRIMARY BARRIER
4. RETRIEVABLE WASTE AS CONTINGENCY MEASURE
5. DEFINE ALARA

## ALTERNATIVE APPROACHES

### REGULATE

1. NEAR FIELD RELEASE AND TRANSIT TIME
2. SPECIFY CHARACTERISTICS OF BARRIERS
3. PERFORMANCE REQUIREMENT FOR MAJOR COMPONENTS

TARGET

1. ENGINEERS
2. SCIENTISTS

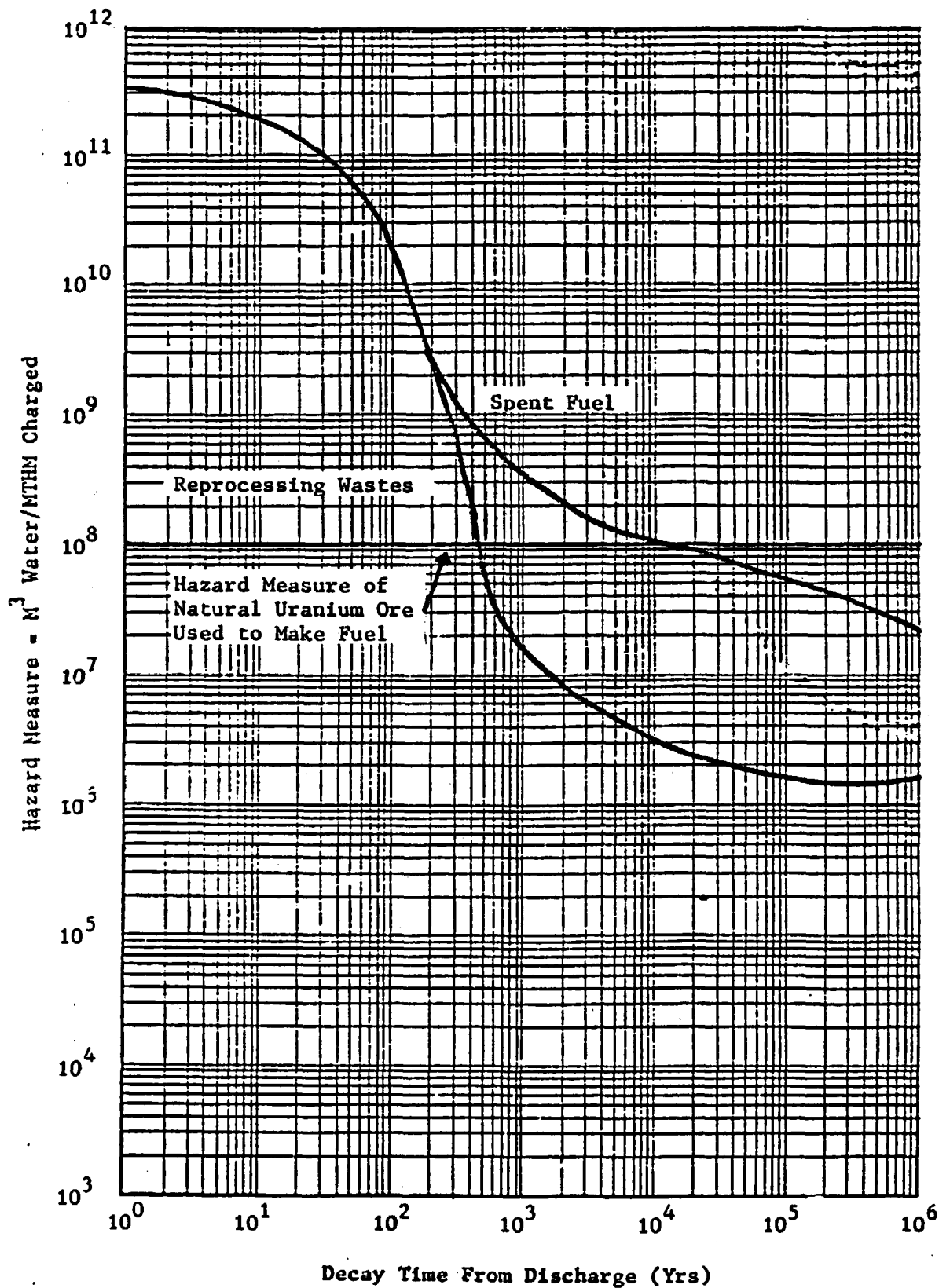
## ENGINEERED ISOLATION

1. WASTE PACKAGE
2. CIVIL STRUCTURE

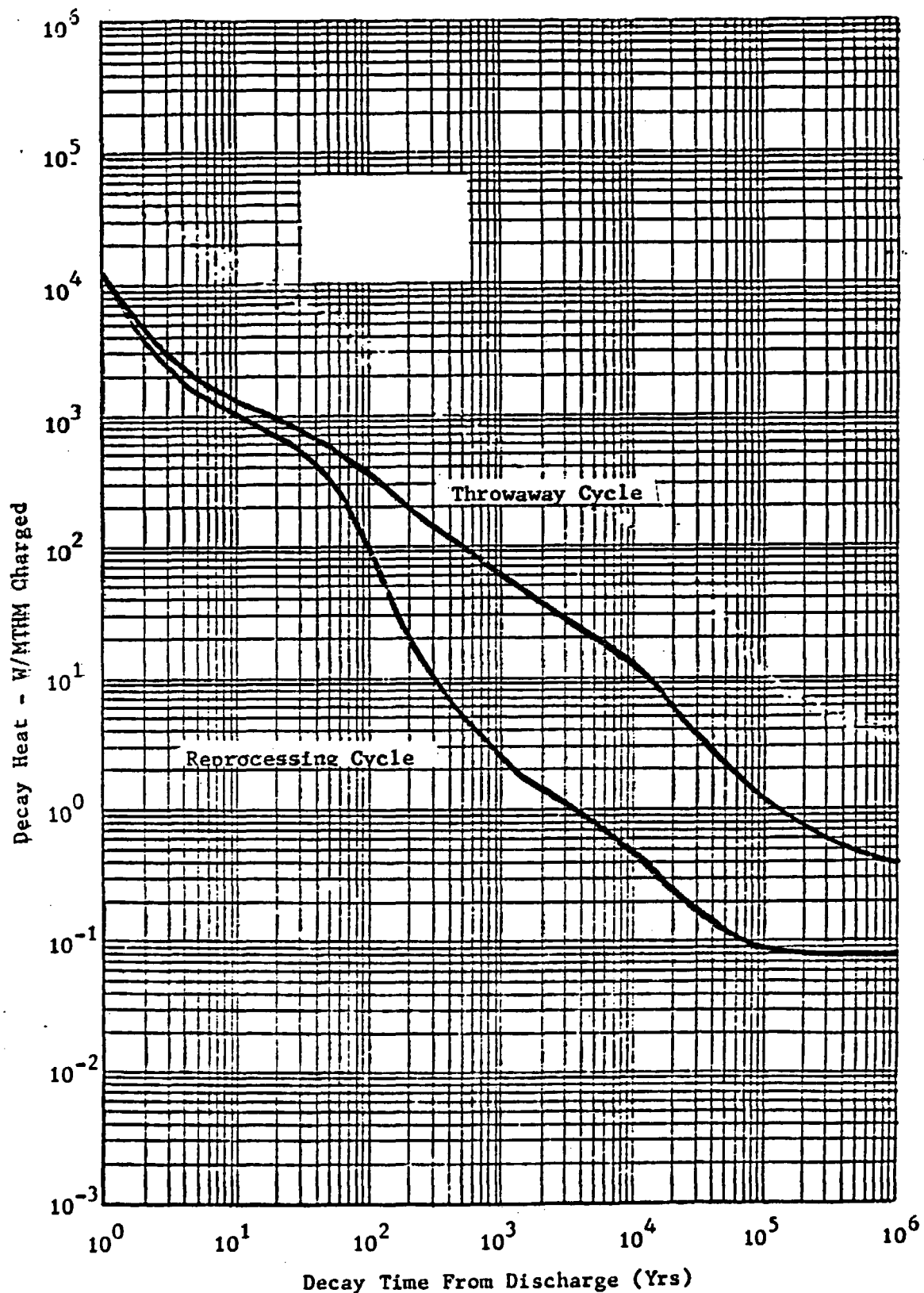


### LONG-TERM PERFORMANCE OBJECTIVES

1. 1000 YEAR PACKAGE
2. OPTION TO RETRIEVE WASTE FOR  
50 YEARS AFTER OPERATION
3. REPOSITORY DESIGN
4. GEOLOGIC SYSTEM



HAZARD MEASURE OF SPENT FUEL AND REPROCESSING WASTES

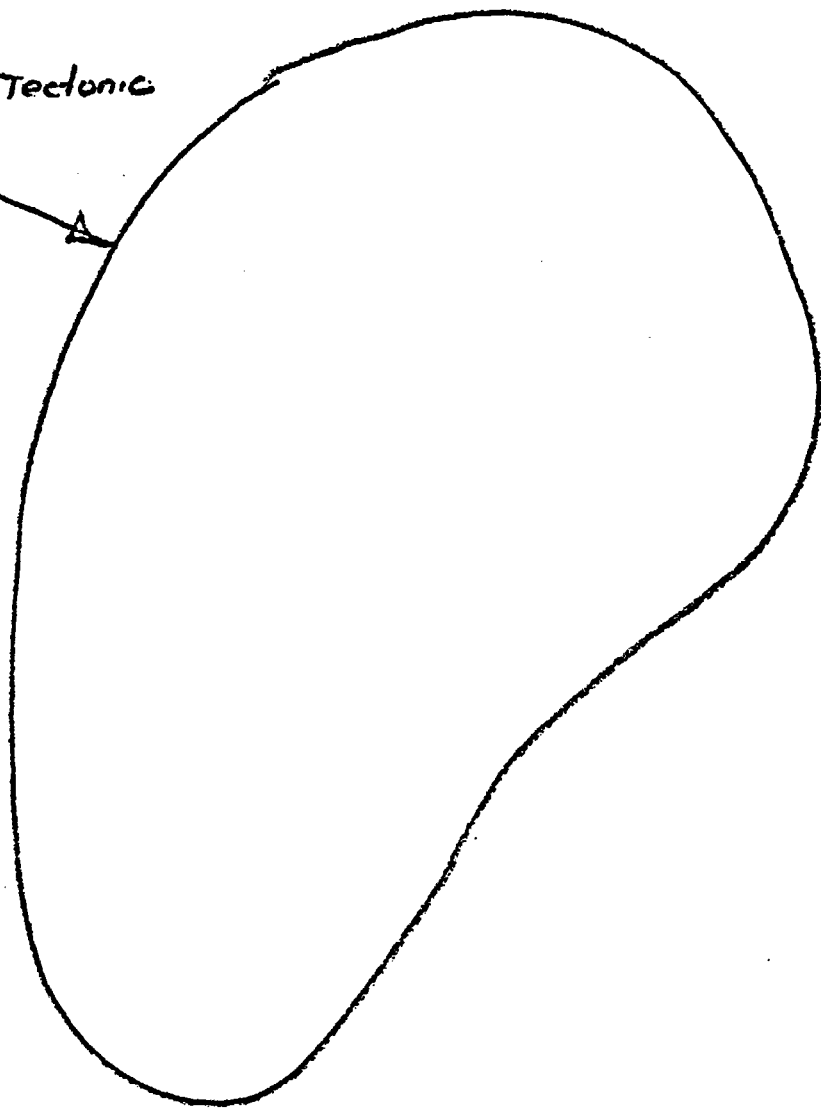


DECAY HEAT GENERATION - THROWAWAY VERSUS REPROCESSING CYCLES

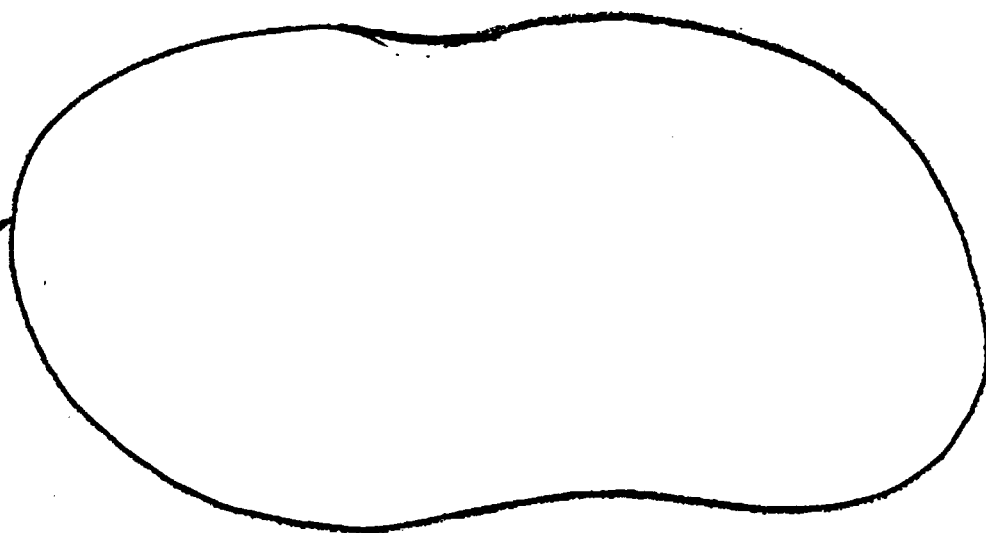
SITING CRITERIA  
TECHNICAL CONSIDERATIONS

1. LIMITATIONS IN SCIENTIFIC KNOWLEDGE  
(BOUND SCIENTIFIC UNCERTAINTY)
2. NEED FOR EXTRAPOLATION OF PAST GEOLOGIC HISTORY  
(DEFINE SCOPE OF INVESTIGATIONS)
3. NEED TO TEST CRITERIA (MODELS) AGAINST EPA STANDARD  
(GOOD PRACTICE TO COMPENSATE FOR MODEL LIMITATIONS)

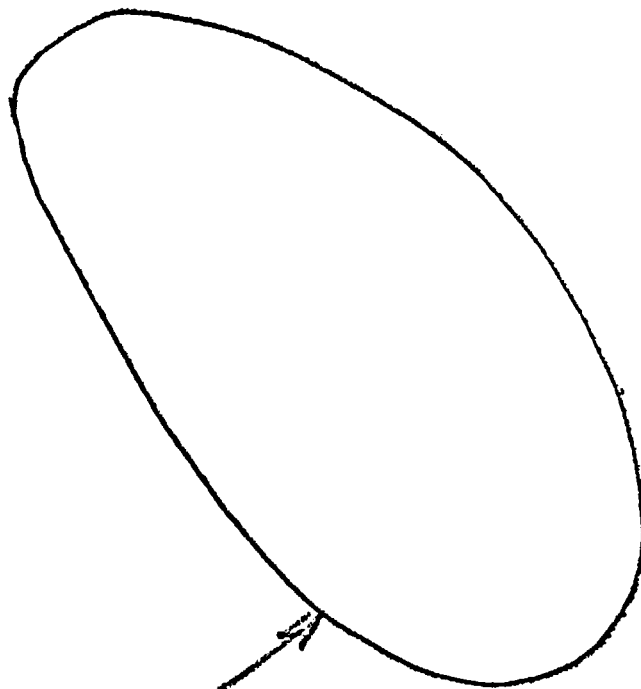
Geologic + Tectonic  
System.



Hydrologic  
System

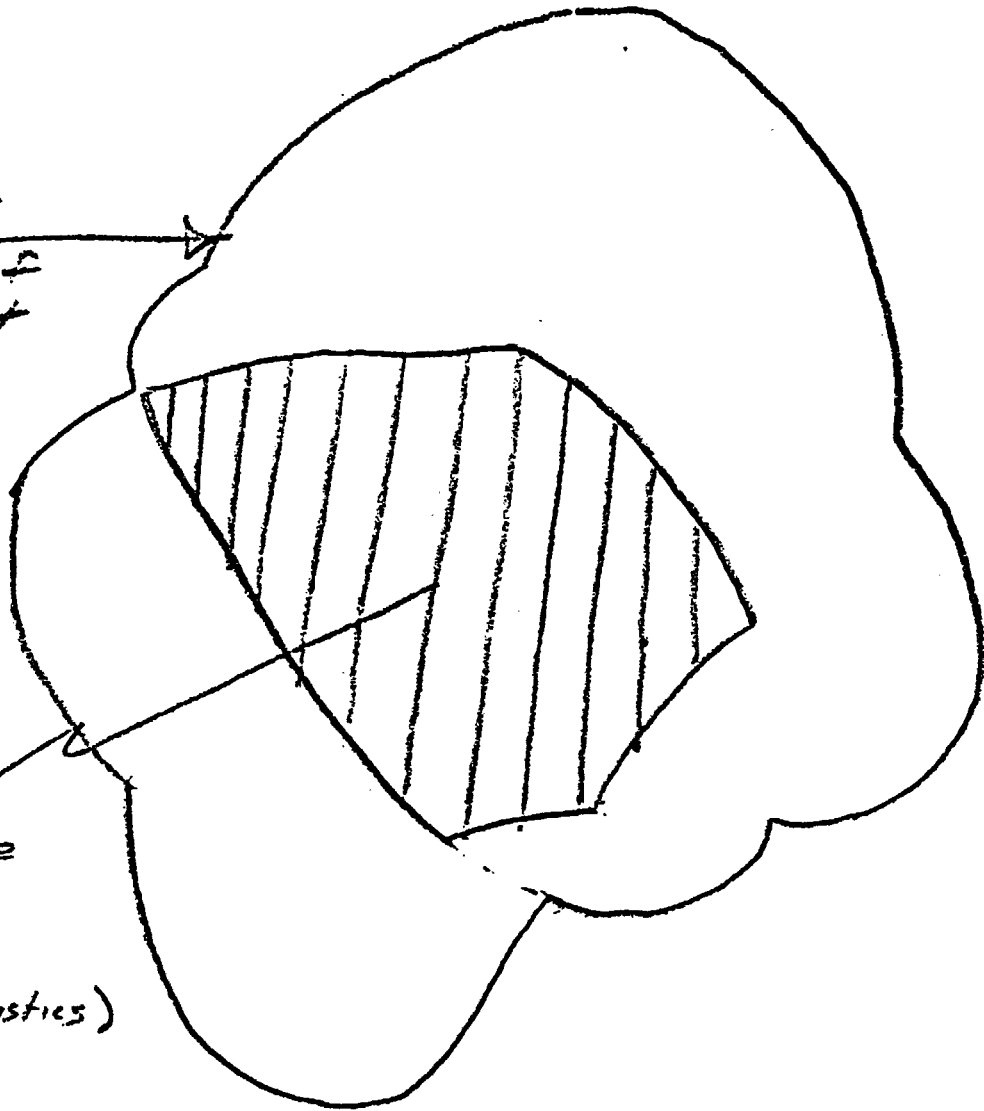


Human  
System  
as low population



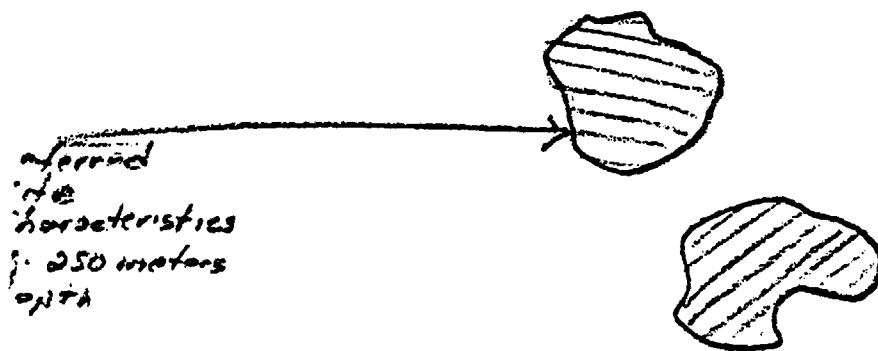
DOE's  
Area of  
Interest

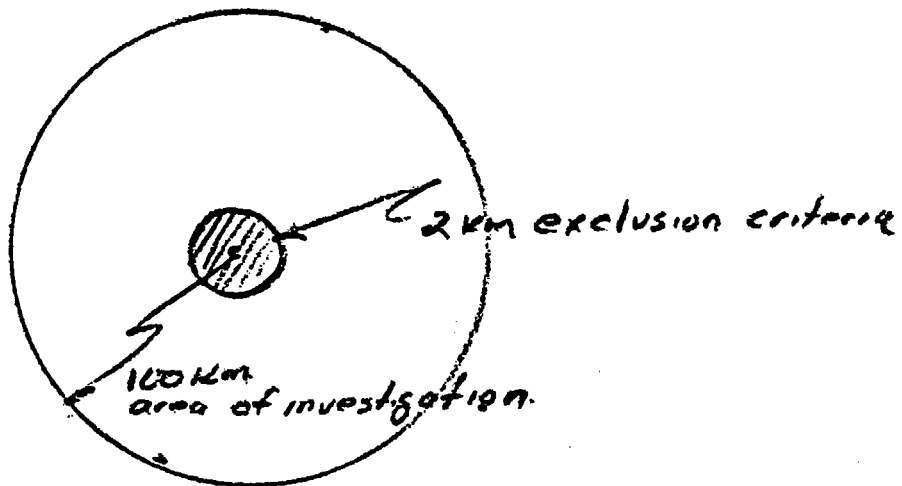
Candidate  
area  
(preferred  
string  
characteristics)





## Choosing sites





## PREFERRED SITING CHARACTERISTICS

### APPLICATIONS:

0 CHOOSING CANDIDATE AREA

0 CHOOSING SITES IN CANDIDATE AREA

## PREFERRED SITING CHARACTERISTICS - CHOICE OF CANDIDATE AREA

### SUBELEMENTS:

#### AVOID ADVERSE CONDITIONS

- o ADVERSE HUMAN ACTIVITIES - MINING
- o ADVERSE GEOLOGIC CONDITIONS - DISSOLUTIONING
- o ADVERSE TECTONIC CONDITIONS - FAULTING
- o ADVERSE HYDROLOGIC CONDITIONS - FLOODING

## PREFERRED SITING CHARACTERISTICS - CHOICE OF SITE IN CANDIDATE AREA

### SUBELEMENTS:

- o LOW PROBABILITY OF ADVERSE EVENTS
- o MINIMUM DEPTH OF 250 METERS
- o EFFECTIVE SEALING OF ROCK UNITS
- o LONG-TERM STABILITY (QUATERNARY PERIOD)

## PREFERRED SITING CHARACTERISTICS - NATURAL AND REDUNDANT BARRIERS (GEOLOGIC/HYDROLOGIC SYSTEM)

### SUBELEMENTS:

- o REDUNDANT INHIBITING CHARACTERISTICS
- o ZONAL AND AREAL EXTENT
- o ABILITY TO WITHSTAND OR COMPENSATE FOR FUTURE CHANGE
- o DIVERSITY OF GEOLOGIC REPOSITORIES TO INHIBIT MIGRATION
- o DIVERSITY OF HYDROLOGIC PROPERTIES TO INHIBIT MIGRATION

## EXCLUSION CRITERIA (2KM CONTROL ZONE)

### CRITERIA:

- o REASONABLE INVESTIGATIONS AND EVALUATIONS
- o INCREASE CONFIDENCE
- o COMPENSATE FOR LIMITATIONS IN THE STATE-OF-THE-ART
- o PROTECT PRIMARY BARRIER
- o REGULATORY COMMON SENSE

### WHAT SHOULD LEVEL OF SPECIFICITY BE?

- o PAST, PRESENT, FUTURE
  - o REASONABLE POTENTIAL
  - o SIGNIFICANT (RESOURCES)
  - o ACTIVE (DIAPERISM)
  - o HIGH (POPULATION)
-

## EXCLUSION CRITERIA (ILLUSTRATIONS)

### AVOID ADVERSE HUMAN ACTIVITIES

1. REASONABLE POTENTIAL FOR DENYING SIGNIFICANT RESOURCES
2. REASONABLE POTENTIAL FOR SUBSURFACE PENETRATIONS
3. GROUNDWATER RESOURCES
4. AVOID HIGH POPULATION AREAS

### AVOID ADVERSE GEOLOGIC CONDITIONS

1. SURFICIAL GEOLOGIC PROCESSES
2. ACTIVE DISSOLUTIONING
3. TOPOGRAPHIC FEATURES INDICATIVE OF ACTIVE PROCESSES



## EXCULSION CRITERIA (ILLUSTRATIONS)

### ADVERSE TECTONIC CONDITIONS

1. QUATERNARY FAULTING
2. ZONES OF DEFORMATION
3. CONCENTRATIONS OF EARTHQUAKE ACTIVITY
4. QUATERNARY VOLCANISM

### ADVERSE HYDROLOGIC CONDITIONS

1. SIGNIFICANT CHANGES TO PALEOHYDROLOGY
  2. FLOODING
  3. RELATION OF AQUIFERS TO HOST ROCK
-

## SITE SUITABILITY FINDINGS

### 1. REEVALUATIONS AT LICENSING STAGES

### 2. VERIFICATIONS

- o SITE SAFETY VERIFICATION PROGRAM
- o QA
- o MONITORING

NMSS TECHNICAL ASSISTANCE PROGRAM

- STAFF
- PRIORITIES
- CONTRACTED TECHNICAL ASSISTANCE

RECENT

PRESENT AND PLANNED

MALCOLM KNAPP

OCTOBER 4, 1979

AT DOE

NMSS STAFF (WMHT)

- DESCRIPTION
- RESPONSIBILITIES

TECHNICAL ASSISTANCE - 1979

LAWRENCE LIVERMORE LABORATORY

I. "WASTE FORM"

II. SITE SUITABILITY

III. REPOSITORY DESIGN

IV. GEOSCIENCE DATABASE

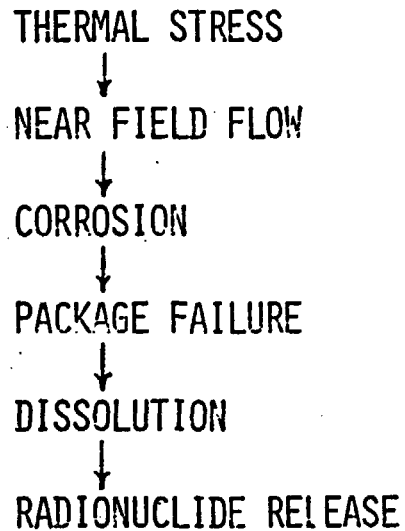
### TECHNICAL ASSISTANCE PRIORITIES

1. DEVELOP REGULATORY GUIDANCE
2. IDENTIFY TECHNICAL NEEDS
3. DEVELOP LICENSE REVIEW CAPABILITY

## REGULATORY GUIDANCE

- REGULATION OR RULE
- REGULATORY GUIDES
- STAFF POSITION PAPERS
  - SITING
  - REPOSITORY DESIGN
  - REPOSITORY OPERATIONS
  - WASTE FORM
- LICENSE REVIEW PLANS

## "WASTE FORM" - TASK I



RETRIEVAL ANALYSIS

ECONOMIC ANALYSIS (PLANNING)

TRU ANALYSIS (PLANNING)

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### TENTATIVE CONCLUSIONS:

- CONTINUED NEAR FIELD THERMAL MODELING IS JUSTIFIED
- EXPERIMENTAL APPROACH SHOULD BE EMPHASIZED



SITE SUITABILITY - TASK II

QUALITATIVE CRITERIA

MEASUREMENTS

MODELS

SYSTEMS

SIMPLE

DETAILED

MOCK SITING EXERCISE

REPOSITORY DESIGN - TASK III

TM-36 REVIEW

DESIGN PROCEDURE

REFERENCE REPOSITORY

## PRESENT AND PLANNED TECHNICAL ASSISTANCE

### GENERAL

- REVIEW GENERAL TECHNICAL SITUATION
- EXAMINE STRAWMAN CRITERIA

CONSIDER TYPE AND NUMERICAL VALUE

PROPOSE APPROPRIATE TESTS

IDENTIFY ACHIEVABLE SYSTEMS

TECHNICAL ASSISTANCE DURING FY 80 (\$7.2M)

WASTE FORM	BROOKHAVEN NATIONAL LABORATORY	\$ 1.5M
REGIONAL MODELING - SITE SUITABILITY	LAWRENCE LIVERMORE LABORATORY	\$ 3.0M
REGIONAL MODELING - TECHNOLOGY TRANSFER	SANDIA LABORATORY	\$ .4M
SITE SUITABILITY - DRAFT 10 CFR 60 AND FIELD STUDIES	RFP	\$ .5-1M
REPOSITORY DESIGN - DRAFT 10 CFR 60	RFP	\$ .5-1M
SYSTEMS OVERVIEW	RFP	\$ .5M

# HIGH LEVEL WASTE RESEARCH PROGRAM

## HIGH LEVEL WASTE RESEARCH PROGRAM

- o WASTE PACKAGE PERFORMANCE
- o SITE CHARACTERISTICS
- o REPOSITORY DESIGN, CONSTRUCTION, OPERATION AND CLOSURE
- o ENVIRONMENTAL AND HEALTH IMPACT ASSESSMENT (NEPA)
- o MONITORING AND VERIFICATION (PACKAGE, REPOSITORY, SITE AND ENVIRONMENTAL)

## WASTE PACKAGE PERFORMANCE STANDARDS AND CRITERIA

PROVIDE TECHNICAL INFORMATION TO CONFIRM AND IMPROVE PERFORMANCE STANDARDS AND CRITERIA FOR WASTES, MATRICES, CANISTERS, MULTIBARRIERS AND OVERPACKS; TO DEVELOP A BASIS FOR EVALUATING WASTE PACKAGE DESIGNS WHICH WILL CONTAIN THE RADIOACTIVE WASTES FOR 1,000 YEARS OR LONGER.

WASTE CHARACTERISTICS  
MATRICES FOR WASTES  
CANISTERS AND MULTIBARRIERS  
OVERPACKS AND WASTE PACKAGES

WASTE PACKAGE PERFORMANCE STANDARDS AND CRITERIA

WASTE CHARACTERISTICS

ASSESS THE CHEMICAL, RADIOCHEMICAL AND PHYSICAL CHARACTERISTICS OF WASTES  
WHICH AFFECT THEIR PROCESSING INTO WASTE MATRICES AND CONTAINMENT IN  
WASTE PACKAGES

FY-79 FY-80 FY-81 FY-82 FY-83

URANINITE SOLUBILITY (HARVARD) B-6662

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## WASTE PACKAGE PERFORMANCE STANDARDS AND CRITERIA

### MATRICES FOR WASTES

IDENTIFY PERTINENT ENVIRONMENTAL AND KINETIC PARAMETERS FOR DURABILITY OF WASTE MATRICES. RESULTS WILL PROVIDE TOOLS FOR ESTABLISHING PROPER PERFORMANCE CRITERIA, QUALITY CONTROL, AND UNDERSTANDING OF LONG TERM BEHAVIOR OF WASTE MATRICES

	<u>FY-79</u>	<u>FY-80</u>	<u>FY-81</u>	<u>FY-82</u>	<u>FY-83</u>
GLASS/CERAMIC CHEMICAL DURABILITY (CATHOLIC UNIV.) B-6330	_____				
GLASS/CERAMIC SURFACE CORROSION (UNIV. OF FLORIDA) B-6252	_____				
SUPERCALCINE DURABILITY (UNIV. OF TOLEDO) B-6624	_____				
DURABILITY OF OTHER MATRICES	_____				
COMBINED EFFECTS OF MULTIPLE DEGRADATION FACTORS ON ALTERNATIVE WASTE FORMS	_____				
THERMAL STRESS EFFECTS ON GLASS IN CANISTER (IOWA STATE)	_____				

WASTE PACKAGE PERFORMANCE STANDARDS AND CRITERIA

CANISTERS AND MULTIBARRIERS

TEST THE CAPABILITIES WITH TIME OF VARIOUS PROPOSED CANISTER MATERIALS AND  
DESIGNS TO CONTAIN WASTES AND SPENT FUEL AND DETERMINE THE EFFECTIVENESS OF  
PASSIVATING COATINGS

FY-79 FY-80 FY-81 FY-82 FY-83

CANISTER CORROSION

CANISTER/ROCK INTERACTIONS - LAB TEST  
(SAN JOSE STATE UNIV.) B-6625

METAL MATRICES

WASTE PARTICLE COATINGS

PROTECTIVE COATINGS FOR CANISTERS

SPENT FUEL CONTAINER INTEGRITY

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## WASTE PACKAGE PERFORMANCE STANDARDS AND CRITERIA

### OVERPACKS AND WASTE PACKAGE

DETERMINE THE CAPABILITY OF VARIOUS OVERPACK MATERIALS TO RETAIN  
RADIOISOTOPES THAT MAY LEAK FROM CORRODING CANISTERS; TEST THE  
CONTAINMENT RELIABILITY AND ALARA CAPABILITIES OF PROPOSED PACKAGES  
FOR WASTES AND SPENT FUEL

FY-79 FY-80 FY-81 FY-82 FY-83

ASSESS BENTONITES AND OTHER CANDIDATE  
MATERIALS

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LONG TERM INTEGRITY OF WASTE PACKAGES

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## SITE CHARACTERISTICS STANDARDS AND CRITERIA

PROVIDE TECHNICAL BASES FOR SITE SUITABILITY STANDARDS AND CRITERIA, INCLUDING GEOLOGY, HYDROLOGY AND NATURAL RESOURCES; TO SUPPORT EVALUATION OF SITES IN REGIONS WHERE THE NATURAL GEOLOGIC MEDIA AND PROCESSES WILL PROVIDE AN EFFECTIVE SECONDARY BARRIER TO RADIONUCLIDES WHEN THE WASTE PACKAGES ULTIMATELY FAIL

GEOCHEMICAL AND THERMAL PARAMETERS

HYDROLOGICAL PARAMETERS

RADIONUCLIDE MIGRATION DATA

GEOLOGIC PARAMETERS

CLIMATIC PARAMETERS

## SITE CHARACTERISTICS STANDARDS AND CRITERIA

### GEOCHEMICAL AND THERMAL PARAMETERS

IDENTIFY AND ASSESS GEOCHEMICAL INTERACTIONS BETWEEN WASTES AND GEOLOGIC MEDIA WHICH NEED TO BE CONSIDERED IN SELECTING GEOLOGIC MEDIA FOR A REPOSITORY. DETERMINE THE POTENTIAL GEOCHEMICAL IMPACTS OF ALTERNATIVE REPOSITORY MEDIA ON WASTE PACKAGES AND THE EFFECTS OF WASTE HEAT AND RADIATION UPON THESE PROCESSES

FY-79 FY-80 FY-81 FY-82 FY-83

REPOSITORY ROCK THERMAL CONDUCTIVITY  
(CORNELL) B-6626

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GEOCHEMICAL INTERACTIONS BETWEEN RELEASED  
WASTES AND REPOSITORY ROCKS

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WASTE HEAT EFFECTS ON GEOCHEMICAL  
PROCESSES

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RADIATION EFFECTS ON GEOCHEMICAL PROCESSES

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WASTE HEAT EFFECTS ON INCLUSIONS IN SALT

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## SITE CHARACTERISTICS STANDARDS AND CRITERIA

### HYDROGEOLOGICAL PARAMETERS

ASSESS METHODS AND DEVELOP TECHNICAL BASIS FOR EVALUATING HYDROLOGICAL PARAMETERS THAT WILL BE USED IN THE SITE SELECTION PROCESS; INCLUDING: HYDRAULIC CHARACTERISTICS OF ROCK SURROUNDING WASTE PACKAGE, RATE OF GROUND WATER MOVEMENT, AGE OF WATER IN ROCK, CHEMICAL NATURE OF THE GROUND WATER, AND THE DEGREE TO WHICH SURROUNDING ROCK MODIFIES THE WATER

WATER CHEMISTRY LIMITATIONS

TESTING TRANSPORT MODELS (UNIV. OF ARIZONA) B-5753

SALT PERMEABILITY (GEO TECH.) B-6665

PARTICULATE MIGRATION - LAB TEST  
(GEORGIA TECH.) B-6338

WATER DATING TECHNOLOGY (UNIV. OF ARIZONA)  
B-6628

AQUIFER LIMITATIONS

FY-79 FY-80 FY-81 FY-82 FY-83

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## SITE CHARACTERISTICS STANDARDS AND CRITERIA

### RADIONUCLIDE MIGRATION DATA

IMPROVE CAPABILITY FOR PREDICTING LONG TERM MIGRATION OF RADIONUCLIDES  
IN GEOLOGIC MEDIA. ASSESS DATA FROM EXISTING CASES OF RADIONUCLIDE  
MIGRATION AND INVESTIGATE THE CHARACTERISTICS OF NATURAL ORE DEPOSITS WHICH  
CAN SERVE AS ANALOGUES FOR PREDICTING THE FATE OF RADIOACTIVE WASTES

FY-79   FY-80   FY-81   FY-82   FY-83

WEST VALLEY HIGH LEVEL WASTE MIGRATION  
(NYGS) B-6350

ASSESS DATA BASE ON RADIONUCLIDE MIGRATION  
IN GEOLOGIC MEDIA (STANFORD)

NATURAL ORE ANALOGUES OF WASTE MIGRATION

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## SITE CHARACTERISTICS STANDARDS AND CRITERIA

### GEOLOGIC PARAMETERS

ASSESS LIMITING PARAMETERS AND CRITERIA FOR USE IN CONSIDERING GENERAL GEOLOGIC FACTORS IN THE SITE SELECTION PROCESS, INCLUDING MINERALOGICAL NATURE OF ROCK, ROCK RESPONSE TO CRUSTAL FORCES, EFFECTS OF CHANGES IN THE LAND SURFACE, AND INDIRECT GEOPHYSICAL MEASUREMENT TECHNIQUES WHICH ARE NEEDED TO SUPPLEMENT DIRECT FIELD AND LABORATORY GEOLOGIC MEASUREMENTS

	<u>FY-79</u>	<u>FY-80</u>	<u>FY-81</u>	<u>FY-82</u>	<u>FY-83</u>
LITHOLOGIC REQUIREMENTS AND LIMITATIONS					_____
EROSION POTENTIAL LIMITATIONS					_____
TECTONIC LIMITATIONS					_____
REPOSITORY ROCK REQUIREMENTS					_____
SURFACE GEOPHYSICAL CHARACTERIZATION TECHNIQUES					_____
NONINTRUSIVE ANALYSES TECHNIQUES (UNIV, OF ARIZONA) B-6337					_____
CONSTRAINTS FROM NATURAL RESOURCES					



SITE CHARACTERISTICS STANDARDS AND CRITERIACLIMATIC PARAMETERS

EVALUATE REGULATORY NEEDS AND METHODS FOR PREDICTING LONG TERM CLIMATIC  
IMPACTS ON REPOSITORIES

FY-79 FY-80 FY-81 FY-82 FY-83

CLIMATIC CHANGE PREDICTION AND IMPACT  
ASSESSMENT AND LIMITATIONS

## REPOSITORY PERFORMANCE EVALUATION

TEST AND DEVELOP INFORMATION TO IMPROVE CRITERIA WHICH WILL ASSURE ADEQUATE MARGINS OF SAFETY FOR THE ENGINEERING DESIGN, CONSTRUCTION, OPERATION AND CLOSURE OF REPOSITORIES. THIS SHALL INCLUDE MAINTAINING RADIATION EXPOSURES ALARA.

ROCK MECHANICS

REPOSITORY ENGINEERING

OCCUPATIONAL SAFETY

## REPOSITORY PERFORMANCE EVALUATION

### ROCK MECHANICS

TEST GEOPHYSICAL MEASUREMENT METHODS AND DEVELOP TECHNICAL BASIS FOR  
STANDARDS THAT WILL DEFINE REASONABLE ROCK CHARACTERISTICS THAT CAN  
ADEQUATELY ACCOMMODATE REPOSITORY CONSTRUCTION

FY-79 FY-80 FY-81 FY-82 FY-83

STRESS MEASUREMENTS AND TECHNOLOGY,  
B-6011

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THERMAL CRACKING, B-5825

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PREDICTION AND ANALYSIS OF FRACTURES  
AND DISCONTINUITIES, B-6667

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RADIATION EFFECTS ON STRUCTURAL  
CHARACTERISTICS OF ROCK

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ROCK MASS RESPONSE TO COMBINED STRESS

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## REPOSITORY PERFORMANCE EVALUATION

### REPOSITORY ENGINEERING

ASSESS AND IMPROVE TECHNOLOGIES NEEDED TO TEST AND CONFIRM THE SAFETY AND EFFECTIVENESS OF THE REPOSITORY, AND THE CAPABILITY TO RECOVER WASTE PACKAGES AND STORED FUELS WITHIN DETERMINED TIME LIMITS.

BOREHOLE AND SHAFT SEALING TECHNOLOGY  
ASSESSMENT AND TESTING (UNIV. OF ARIZONA)  
B-6627

MINE STABILITY TO MEET TIME REQUIREMENTS  
B-6664

ENGINEERED BARRIER ANALYSES

SPENT FUEL RETRIEVAL TECHNIQUE, B-6629

HIGH LEVEL WASTE RETRIEVAL TECHNIQUES

REPOSITORY DESIGN ANALYSES

FY-79 FY-80 FY-81 FY-82 FY-83

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## REPOSITORY PERFORMANCE EVALUATION

### OCCUPATIONAL SAFETY

DEVELOP ENGINEERING, DESIGN AND OPERATIONAL CONTROL REQUIREMENTS TO  
SUPPORT OCCUPATIONAL SAFETY CRITERIA AND TO CONTROL RADIATION EXPOSURES  
TO ALARA LEVELS

FY-79 FY-80 FY-81 FY-82 FY-83

ENGINEERING DESIGNS TO REDUCE OCCUPATIONAL  
EXPOSURES

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OCCUPATIONAL PROCEDURES SAFETY ANALYSES  
B-6663

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## ENVIRONMENTAL IMPACT ASSESSMENT

DEVELOP DATA, METHODS AND CRITERIA WHICH WILL PROVIDE GUIDANCE FOR SITE SELECTION WHICH WILL COMPLY WITH NEPA AND SUPPORT ENVIRONMENTAL IMPACT ASSESSMENTS BY NRC; DEVELOP METHODOLOGY FOR ESTIMATING CONSEQUENCES AND RISKS TO HUMANS AND THE ENVIRONMENT

## ENVIRONMENTAL IMPACT ASSESSMENT

DEVELOP REQUIREMENTS AND TEST METHODS FOR CONDUCTING ENVIRONMENTAL STUDIES AND  
PREDICTING ENVIRONMENTAL IMPACTS. PROVIDE GUIDANCE FOR PREPARING  
ENVIRONMENTAL IMPACT STATEMENTS AND TECHNICAL BASIS FOR EVALUATING THEM

FY-79 FY-80 FY-81 FY-82 FY-83

REPOSITORY OPTIONS ASSESSMENT (HARVARD)  
B-6623

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RADIONUCLIDE PATHWAYS TO MAN CONFIRMATION,  
B-6663

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IMPACTS ON NATURAL RESOURCES

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IDENTIFY POTENTIAL SOURCES OF ENVIRON-  
MENTAL IMPACTS FROM SITE EXPLORATION,  
CONSTRUCTION, OPERATION AND REPOSITORY  
CLOSURE PROCEDURES

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ECOLOGICAL IMPACTS

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## MONITORING TECHNOLOGY AND VERIFICATION

DETERMINE WHAT CHARACTERISTICS OR PROCESSES PERTAINING TO THE SITING, CONSTRUCTION, OPERATION OR CLOSURE OF A REPOSITORY SHOULD BE MONITORED. TEST, EVALUATE AND DEVELOP MONITORING TECHNIQUES.



## MONITORING TECHNOLOGY AND VERIFICATION

TEST AND IMPROVE METHODS AND PROVIDE VERIFICATION MEASUREMENTS FOR MONITORING THE PERFORMANCE OF WASTE PACKAGES, MEASURING VARIOUS GEOPHYSICAL AND GEOCHEMICAL CHARACTERISTICS OF THE REPOSITORY, SAFETY PERFORMANCE OF REPOSITORY STRUCTURES AND OPERATINGS, RADIATION EXPOSURES TO WORKERS AND FOR ENVIRONMENTAL IMPACTS THAT MAY RESULT FROM THE SITE EXPLORATION, OR THE CONSTRUCTIONS OR OPERATIONS OF REPOSITORIES

	<u>FY-79</u>	<u>FY-80</u>	<u>FY-81</u>	<u>FY-82</u>	<u>FY-83</u>
WASTE PACKAGE CHARACTERISTICS					
REPOSITORY WATER CHARACTERISTICS					
AQUIFER					
REPOSITORY SAFETY PERFORMANCE					
ENVIRONMENTAL IMPACTS					

PROBABILISTIC ANALYSIS STAFF

FUEL CYCLE SECTION

M. C. CULLINGFORD

NRC BRIEFING TO DOE - OCTOBER 4, 1979

## PROGRAM AREAS IN WASTE MANAGEMENT RISK ASSESSMENT

### WASTE MANAGEMENT:

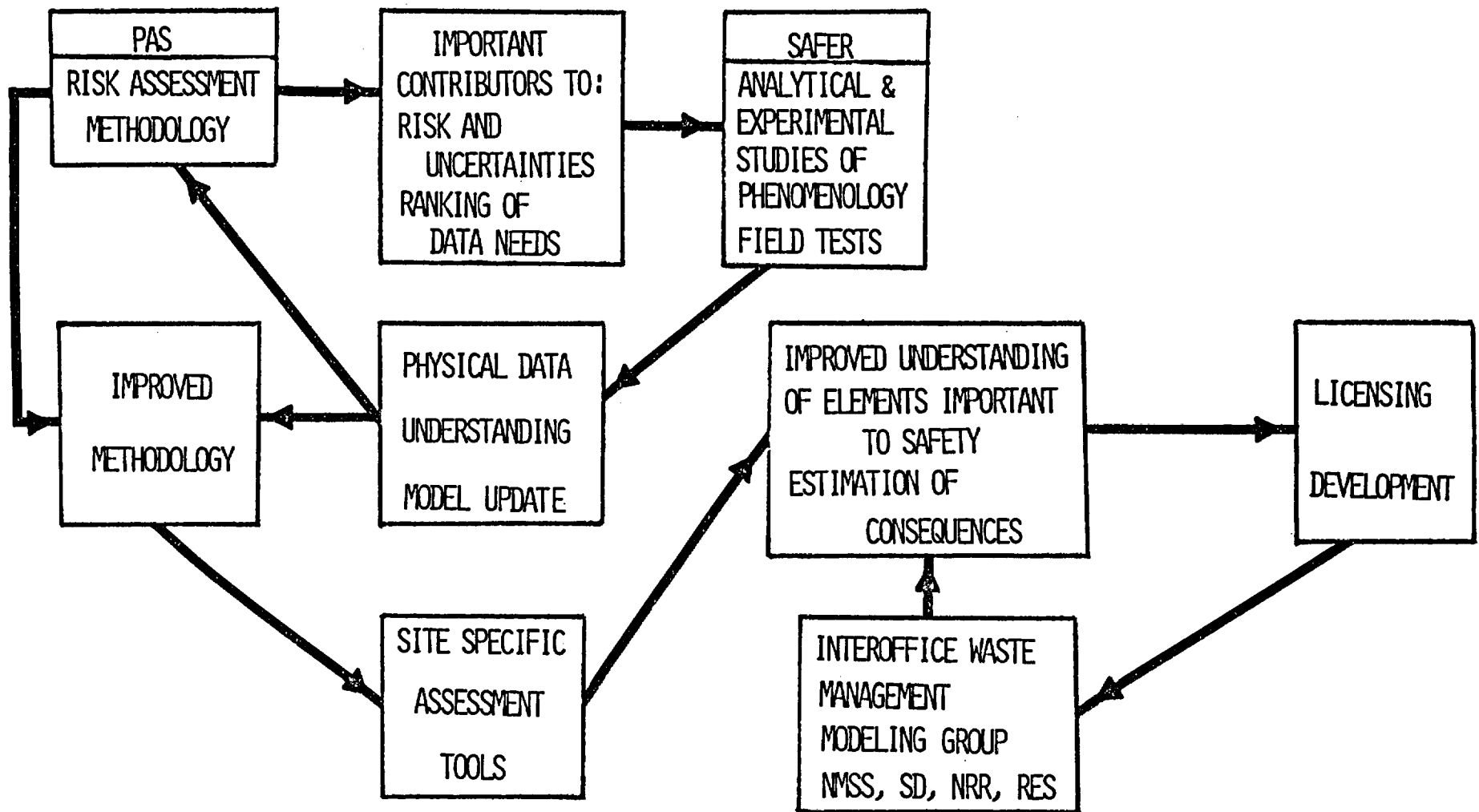
- o WASTE ISOLATION RISK ASSESSMENT  
METHODOLOGY DEVELOPMENT
- o SPENT FUEL ISOLATION ALTERNATIVES
- o SCENARIO ASSESSMENT FOR WASTE  
REPOSITORIES
- o DYNAMIC SIMULATION OF WASTE/ROCK  
PROCESSES

### OPERATIONAL AND FACILITY RISK ASSESSMENT:

- o WASTE MANAGEMENT OF RADIOACTIVE  
GASES

### PEER REVIEW GROUP AND CONSULTANTS

# SAFER/PAS COORDINATION



# PAS WASTE MANAGEMENT PROGRAM COORDINATION

INTEROFFICE: IWMG

## RESEARCH REVIEW GROUPS

### OTHER AGENCIES AND ORGANIZATIONS:

USGS

EPA

APS

USGS

SHAW, PEARSON, TRASK  
AND DEBUCHANANNE

UCLA

APOSTOLAKIS

WOODS HOLE

HOLLISTER

BPNL

BURKHOLDER

UI

DONATH

ASU

HELTON

## CONTACTS WITH OTHER AGENCIES

- USGS:   o   REFERENCE FACILITY DEFINITION FOR ANALYSIS OF  
          BEDDED SALT
- o   DYNAMIC SIMULATION OF WASTE/ROCK PROCESSES CONTRACT
- o   CONSULTANTS TO RESEARCH REVIEW GROUP
  
- EPA:    o   REVIEW OF THE EPA AND ADL RISK ASSESSMENT WORK IN  
          SUPPORT OF THE EPA WASTE MANAGEMENT STANDARD (MEMORANDUM  
          TO LEVINE, MINOGUE AND DIRCKS, DATED MARCH 16, 1979)
- o   TECHNICAL COORDINATION MEETINGS
  
- DOE:    o   PROGRAM REVIEW MEETINGS AND BRIEFINGS

METHODOLOGY DEVELOPMENT FOR RISK ASSESSMENT  
OF RADIOACTIVE WASTE ISOLATION

FUNDING:	FY 79 (500)	FY 80 (365)	FY 81 (450)
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JUSTIFICATION: ACRS RECOMMENDATIONS NUREG-0496, NUREG-0392,  
LETTER (DECEMBER 20, 1976, MOELLER TO ROWDEN)  
USER OFFICE REQUEST NMSS 76-3  
APS  
IRG REPORT

METHODOLOGY DEVELOPMENT FOR RISK ASSESSMENT  
OF RADIOACTIVE WASTE ISOLATION

- OBJECTIVES:
- TO DEVELOP A METHODOLOGY TO EXAMINE THE LONG-TERM RISK FROM RADIOACTIVE WASTE ISOLATION IN DEEP GEOLOGIC FORMATIONS
  - TO DEMONSTRATE THE METHODOLOGY BY APPLICATION TO A HYPOTHETICAL REFERENCE REPOSITORY IN BEDDED SALT
  - TO PROVIDE INSIGHTS ON THE IMPORTANT PROCESSES AND MECHANISMS WHICH GOVERN TRANSFER OF RADIONUCLIDES TO HUMANS AND THUS GUIDE THE FORMATION OF LICENSING DECISIONS



OBJECTIVES OF RISK METHODOLOGY DEVELOPMENT  
FOR RADIOACTIVE WASTE ISOLATION PROGRAM

1. DEVELOP METHODOLOGIES APPROPRIATE FOR THE TIME  
DEPENDENT ANALYSIS OF DEEP GEOLOGIC ISOLATION OF  
RADIOACTIVE WASTE.
2. IDENTIFY EVENTS, SEQUENCES OF EVENTS, PROCESSES  
(NATURAL AND MAN MADE), SITE PROPERTIES AND FACILITY  
CHARACTERISTICS OF A DEEP GEOLOGIC REPOSITORY THAT  
DETERMINE ITS LONG TERM CONTAINMENT ABILITY FOR  
RADIOACTIVE WASTE.
3. IDENTIFY REQUIRED PROPERTY SPECIFICATION OF SITE/  
REPOSITORY FOR THE ANALYSIS OF LONG TERM SAFETY.

OBJECTIVES OF RISK METHODOLOGY DEVELOPMENT FOR  
RADIOACTIVE WASTE ISOLATION PROGRAM

(CONTINUED)

4. PERFORM A SENSITIVITY ANALYSIS TO IDENTIFY:
  - (A) THOSE PROCESSES AND CHARACTERISTICS WHICH DOMINATE ISOLATION PHENOMENA.
  - (B) SITE PROPERTIES WHICH REQUIRE MORE AND/OR BETTER DATA SO THAT EXPERIMENTAL PROGRAMS CAN BE INITIATED TO OBTAIN THIS DATA.
  - (C) SOURCES AND ESTIMATE MAGNITUDES OF THE UNCERTAINTIES IN THE ANALYSIS OF THE LONG TERM SAFETY OF A REPOSITORY.
5. MEET ABOVE OBJECTIVES FOR SEVERAL WASTE FORMS (HLW, TRU, SPENT FUEL) AND DIFFERENT EMPLACEMENT MEDIA.
6. IF POSSIBLE, DEMONSTRATE A RISK ASSESSMENT CAPABILITY BY PERFORMING A RISK ASSESSMENT FOR THE REFERENCE REPOSITORY SITE.

METHODOLOGY DEVELOPMENT FOR RISK ASSESSMENT  
OF RADIOACTIVE WASTE ISOLATION IN DEEP GEOLOGIC MEDIA

PHASE A (1/78)

1. DEFINE REFERENCE REPOSITORY SYSTEM FOR  
ANALYSIS

(10/78)

2. DEVELOP MODELS TO SIMULATE

- WASTE CHARACTERISTICS
- WASTE/HOST ROCK INTERACTIONS
- TRANSPORT AND ADSORPTION PROCESSES
- PATHWAYS TO HUMAN FOOD CHAIN
- ABNORMAL BEHAVIOR MECHANISMS
- DOSIMETRY AND HEALTH EFFECTS

METHODOLOGY DEVELOPMENT FOR RISK ASSESSMENT  
OF RADIOACTIVE WASTE ISOLATION IN DEEP GEOLOGIC MEDIA

PHASE B (8/79)

1. IDENTIFY SYSTEM PROPERTIES IMPORTANT TO LONG-TERM SAFETY
2. IDENTIFY DATA DEFICIENCIES
3. IDENTIFY SOURCES AND MAGNITUDES OF UNCERTAINTIES
4. DEMONSTRATE RISK METHODOLOGY

(9/80)

PHASE C (9/80)

- EXTEND PROGRAM TO CONSIDER
- EMPLACEMENT MEDIA OTHER THAN BEDDED SALT
    - o DOMED SALT
    - o GRANITE
    - o BASALT
    - o SHALE
    - o CLAY

PHASE D (9/81)

1. MODEL IMPROVEMENT
2. SITE SPECIFIC LICENSING TOOLS

## PRODUCTS

- \* 0 REPORT ON MODEL DEVELOPMENT (NUREG/CR-0458)
- \* 0 SENSITIVITY ANALYSIS REPORT (NUREG/CR-0394)
- \* 0 TRANSPORT MODEL REPORT (NUREG/CR-0424)
- 0 STATISTICAL METHODS FOR TREATING UNCERTAINTIES (NUREG/CR-0394)
- 0 MODELS WITH USER MANUALS WHICH COULD BECOME STANDARD  
CALCULATIONAL AND LICENSING TOOLS
- 0 ESTIMATE OF CONSEQUENCES
- 0 REPOSITORY ASSESSMENT PROCEDURES

\* COMPLETED

## INSIGHTS

- \* 0 UNDERSTANDING OF THE MECHANISMS AND GEOLOGIC PROPERTIES IMPORTANT TO WASTE ISOLATION
  - IMPORTANT CONTRIBUTORS TO RISK
  - IMPORTANT CONTRIBUTORS TO UNCERTAINTIES
- 0 GUIDANCE AS TO WHERE RESOURCES SHOULD BE EXPENDED TO GATHER DATA
- 0 GUIDANCE IN PLANNING AND PRIORITIZING FURTHER RESEARCH PROGRAMS
- 0 DEMONSTRATION OF RISK METHODOLOGY BY APPLICATION TO THE REFERENCE SITE

\* COMPLETED

## FUTURE PLANS

- o APPLY THE RISK METHODOLOGY DEVELOPED FOR WASTE ISOLATION IN BEDDED SALT TO DOMED SALT, BASALT, SHALE, CLAY, AND OTHER MEDIA.
- o THROUGH IWMG, DEFINE USES OF THE RISK METHODOLOGY TO SUPPORT THE LICENSING PROCESSES AND DEVELOP MODELS AS LICENSING TOOLS.
- o DEFINE AND SCOPE PROBLEM OF EXTENSION OF RISK METHODOLOGY TO SPENT FUEL ISOLATION.
- o INVESTIGATE APPLICATION OF METHODOLOGY TO OPERATING REPOSITORY SAFETY.

## RISK METHODOLOGY FOR SPENT FUEL ISOLATION ALTERNATIVES

FUNDING:            FY 79 (150)            FY 80 (270)            FY 81 (355)

JUSTIFICATION:    USER OFFICE REQUEST NMSS 76-3

OBJECTIVES:        TO CHARACTERIZE ELEMENTS OF THE PROBLEM OF RISK  
ASSESSMENT OF SPENT FUEL ISOLATION IN DEEP  
GEOLOGIC FORMATIONS

TO MODIFY THE RISK METHODOLOGY DEVELOPED FOR  
WASTE ISOLATION TO ALLOW EXAMINATION OF THE  
RISK FROM ISOLATION OF SPENT FUEL

TO DEMONSTRATE THE METHODOLOGY BY APPLICATION  
TO A REFERENCE SPENT FUEL REPOSITORY



## RISK METHODOLOGY FOR SPENT FUEL ISOLATION ALTERNATIVES

<u>PRODUCTS</u>	<u>DATE</u>
REPORT ON REFERENCE SPENT FUEL REPOSITORY	9/80
WASTE ISOLATION RISK MODEL MODIFICATION REPORT	9/80
DATA RESEARCH NEEDS	3/81
IDENTIFICATION OF PROPERTIES IMPORTANT TO LONG TERM SAFETY	3/81
EVALUATE UNCERTAINTIES	9/81
RISK ASSESSMENT OF OTHER EMPLACEMENT MEDIA	9/82

## SCENARIO ASSESSMENT FOR WASTE REPOSITORIES

FUNDING:            FY 79 (139)            FY 80 (200)            FY 81 (260)

OBJECTIVES:        TO EXAMINE THE RELATIVE IMPORTANCE OF VARIOUS  
                      RELEASE MODES  
  
                      TO DEVELOP GUIDANCE ON FORMULATION OF LICENSING  
                      REVIEW PROCEDURES

JUSTIFICATION:    EARLY AND INEXPENSIVE GUIDANCE TO DIRECTION OF:  
  
                      o WASTE ISOLATION RISK METHODOLOGY DEVELOPMENT  
                      o WASTE MANAGEMENT LICENSING QUESTIONS

<u>PRODUCTS</u>	<u>DATE</u>
GUIDANCE IN THE SCREENING AND SELECTION OF EVENT SEQUENCES	9/80
QUICK RUNNING CODE TO ADDRESS LICENSING QUESTIONS ABOUT MASS TRANSPORT	9/81

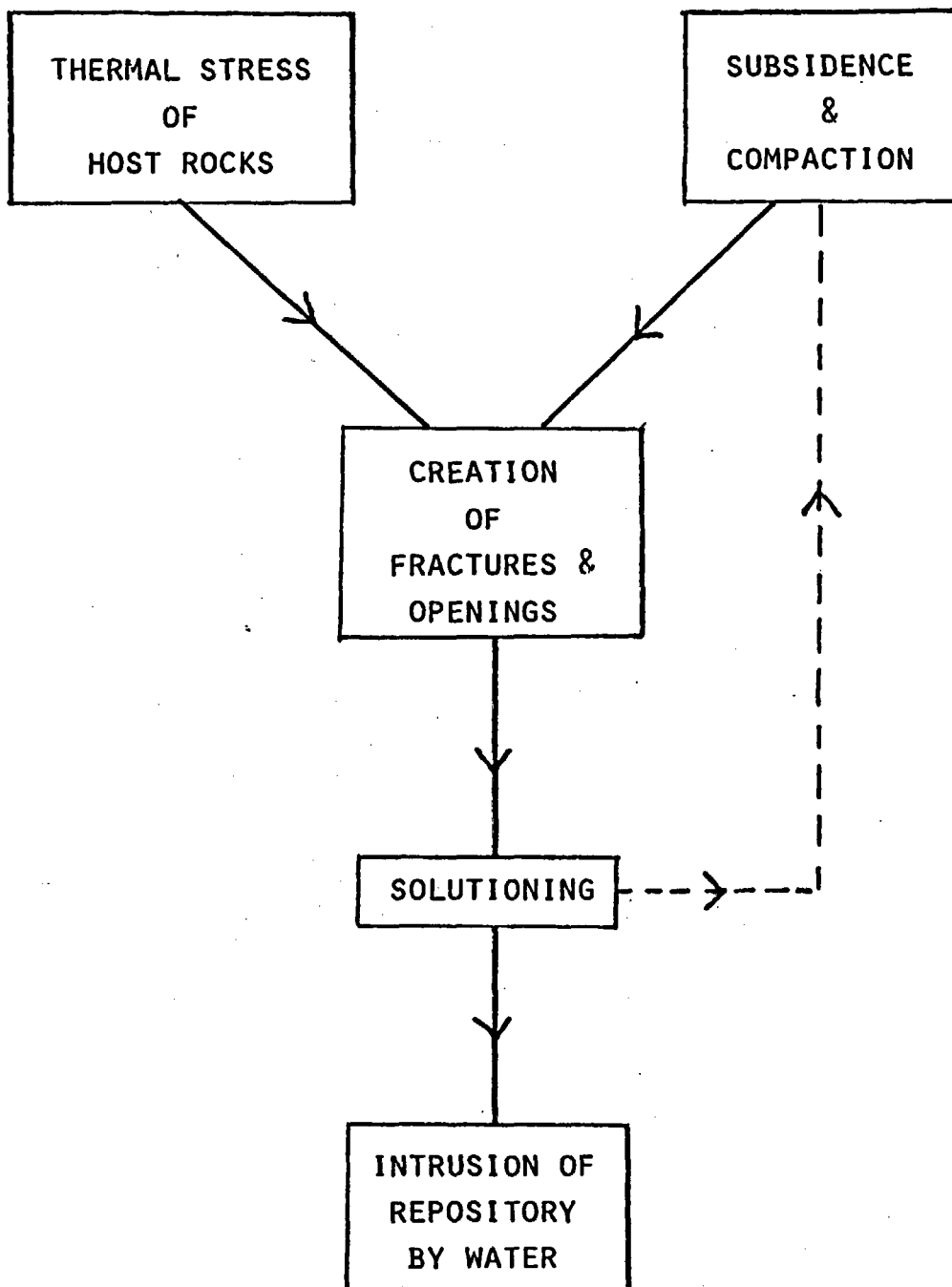
## DYNAMIC SIMULATION OF WASTE/ROCK PROCESSES

FUNDING:            FY 79 (87)            FY 80 (96)            FY 81 (100)

JUSTIFICATION:    INFORMATION NEEDED BY WASTE AND SPENT FUEL  
ISOLATION PROJECTS

OBJECTIVE:        TO MODEL AND ANALYZE GEOLOGIC PROCESSES WHICH  
RESULT IN FEEDBACK MECHANISMS

<u>PRODUCTS</u>	<u>DATE</u>
CHAPTER IN NUREG/CR-0458, "METHODS OF SIMULATION ANALYSIS APPLIED TO QUESTIONS OF GEOLOGIC STABILITY OF THE REFERENCE SYSTEM"	10/78
SCOPING CALCULATIONS FOR SCENARIO DEVELOPMENT IN WASTE ISOLATION RISK ASSESSMENT	ONGOING



## RADIOACTIVE WASTE GASES

FUNDING:            FY 79 (140)            FY 80 (150)            FY 81 (140)

OBJECTIVE:        IDENTIFY LEAST RISK ALTERNATIVE FOR MANAGEMENT OF  
GASEOUS C<sup>14</sup>, I<sup>129</sup>, KR<sup>85</sup> FROM FUEL CYCLE FACILITIES

JUSTIFICATION:    o RESPONSE TO ACRS CONCERNS (REF. 12/20/76 LETTER,  
MOELLER TO ROWDEN)

                    o RESPONSE TO NMSS USER REQUEST 78-32 (06/07/78)

                    o EPA STANDARDS (FEDERAL REGISTER 01/13/77) LIMITING  
GASEOUS RELEASES OF I<sup>129</sup>, KR<sup>85</sup> AND C<sup>14</sup> TO LEVELS  
BELOW THOSE ACHIEVED BY DILUTION AND DISPERSAL

PRODUCTS:        o IDENTIFICATION OF VIABLE MANAGEMENT ALTERNATIVES (79)

                    o DEVELOPMENT OF METHODOLOGY FOR RISK ASSESSMENT ON  
SELECTED MANAGEMENT ALTERNATIVES (80)

                    o COST/BENEFIT ANALYSES OF SELECTED MANAGEMENT  
ALTERNATIVES (80)

                    o RECOMMENDATION OF FACILITY PERFORMANCE CRITERIA (80)

## IWMG

- OBJECTIVES:
- o TO DEVELOP NRC STAFF EXPERTISE IN USING  
THE WASTE MANAGEMENT MODELS
  - o TO ACQUIRE AN UNDERSTANDING OF THE CAPABILITIES  
AND LIMITATIONS OF THE MODELS
  - o TO DEVELOP EXPERTISE IN THE APPROPRIATE  
APPLICATION OF THE METHODOLOGY IN THE LICENSING  
AND RULEMAKING PROCESSES

## IWMG PHASE I PROBLEMS

- I. HYDRAULIC FLOW SIMULATION IN 1-D VARYING BCs
- II. FLOW WITH RADIONUCLIDE DECAY
- III. EXAMINATION OF SOLUTION TECHNIQUES
- IV. 2-D SOLUTION OF "REFERENCE REPOSITORY"
- V. INCLUSION OF SOURCE TERM MODEL, WELL INPUT AND FIELD DATA