File No 3109

See Pocket I for encl. 109

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

OCT 12 1979

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

Name	Organization	Phone #
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) 424-5816
D. B. Shipler	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. TIETJEN	KAISER ENGINEERS	296-5161
S. A. ZWICKLER	BURNS & ROE	201-265-8710
L. H. STINTON	Union Carbide Corp. - Nuclear Division UCC-ND	(615) 576-2551
L S HYBERG	LOWER ALLOWAY CREEK	(609) 645-1111
T. J. KABELE	TASC	(617) 944-6850
D. L. Kell	Fla. Dept Environmental Reg	904-487-1980
D. FEHRINGER	NRC	427-4177
L. Rossbach	NRC	427-4177
M. GRAYSON	NRC	427-4177
E. GOODMAN	DOE - PE (Forrestal)	252-5615
JOHN Graham	ANS	521-8801
Jack Ito	NAI	[illegible]
W. R. SCHMIDT	MSHA	2351337
Jack Peel	PR-42	353-4127
W M Hewitt	ONWI	614 424 5473
NJ Dayton	ONWI	614 424 4710
Janet L. Owen	Bechtel Nat'l	415-768-1940
G. Barry Bingaman	Battelle/ONWI	614-424-4092

Name	Organization	Phone
BARRY NAFT	NUS CORP	301 948-7010
Leslie E. ALSAGER	ENGINEERING CONSULTANT	7420 Zenith Ct Fallschurch, Va 22042
		703-573-6178
ANDREW YAROS	VEPCO	804-771-4386
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	STONE & WEBSTER	202 466-7415
JOHN A ADAM	NRC	301 427 4177
JOHN SURMEIER	NRC	301 427 4423
Roberto Palomino	MITRE	703 8[illegible] [illegible]
GUY MARTIN, JR.	ENVIROSPHERE	212 785 4374
EVERETT WICK	NRC	301 427 4177
ROBERT T. JASKE	NRC STATE PROGRAMS	301 492 8171
Critz H. George	DOE-HQ	301 353 3014
CYRUS KLINGSBERG	DOE HQ	301 353 3919
DONALD L. VIETH	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
F.A. Reichert	CEC	202-862-9500
A. A. CAMACHO	DOE-HQ	301-353-4001
JOHN W. BARTLETT	TASC	617-944-6850
J. Tassey	Westinghouse	202-833-5060
Lyn McIntosh	ANS	202 296-4520
M. Cullingford	NRC	301 492 8377

Name	Organization	Phone
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. GAMMON	DOE/CR-PPM	858-4703
JAMES A TURI	DOE/CR-PPM	353-5241.
JA SCHEPPNER	PENNA ELECT CO	
J MONOHAN	PENNA POWER & LTG	
B. O'BRIEN	PENNA HOUSE OF REP.	
CARLOS VELEZ	NRC/CON-BUD	492-7108
Mark Haisfield	NRC/CONFIRE	492-7251
Randal Scott	DOE/ETW	353-3984
VIRGIL JRICE	DOE/ETW	353 4267
DAVID McGUFF	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 996 5918
JOHN J. SCHREIBER	DOE/RL	FTS 444-7550
Lillie Lysense	MARS	800-265-3410
Ted Tencee Ef Ane Sixty	NRC/WP	492-7610

NAME	Organization	Phone
Thomas Hahn	NBS	921 3868
G. H. DALY	DOE/ETW	353-4001 FTS 233-4001
J.E. Dieckhoner	DOE/ETW	353-3273
Thomas J. Nicholson	NRC/OSD	443-5976
Joe Work	DOE/ETW	353-3791
Peter Stevens	USGS	928-6976
Warren K Eister	DOE/ETW	353 3188
ELI I GOODMAN	DOE/PE	252-5615
JM HOOPER.	British Embassy	462-1340.
Michael J Baiamo	DOE/RLC	FTS 976-5650
[illegible]	[illegible]	
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. Shipler	BMI/ONWI	FTS 976-7732
M. A. 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

Auxillary Roster for Oct 4

Briefing of DOE by NRC

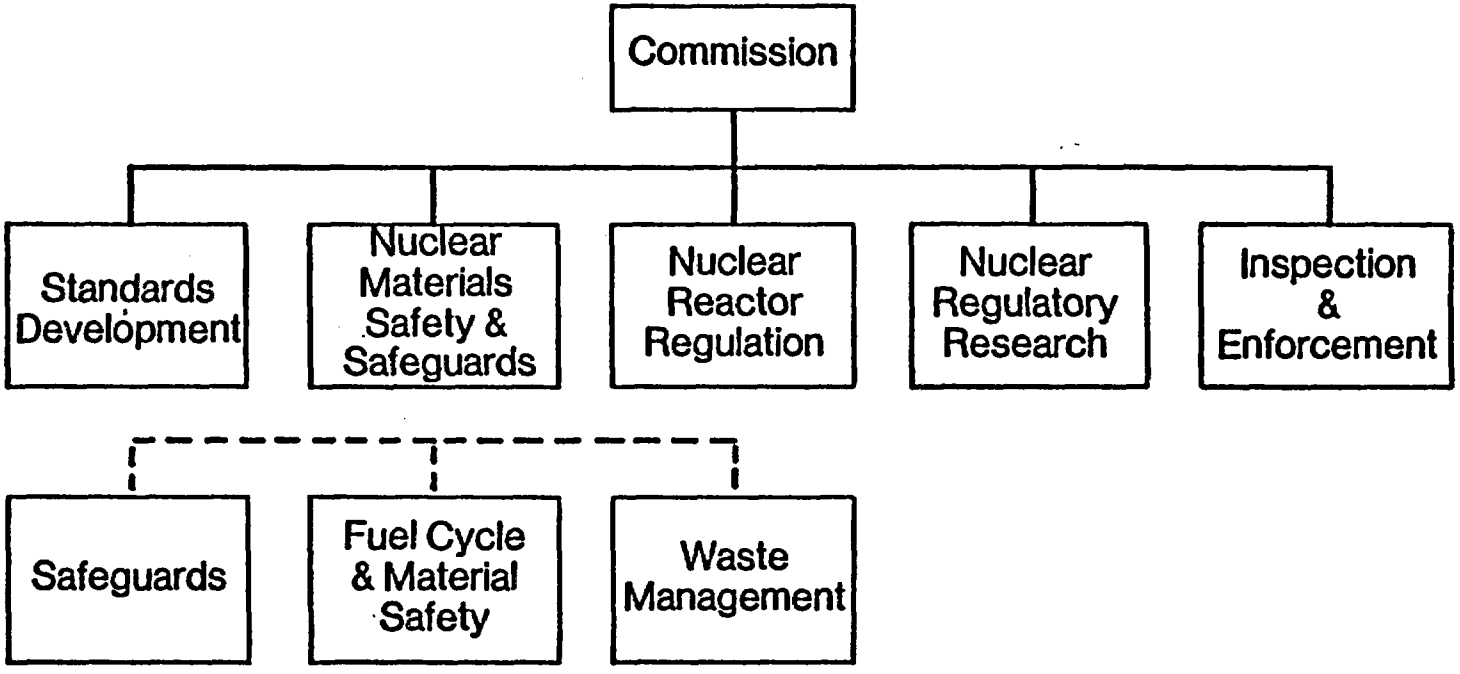
E J. Hennelly	Sav. Riv.	FTS 239-2828
R. G. GARVIN	SAV. RIV. Lab.	239-3790
T B HINDMAN	DOE/SR	239 2566
R D WALTON	DOE - ETW/P	FTS 253-5388
R.M. KETCHEL	G.E	637-4527
BETTY JANKUS	EPA	FTS 755-0770
MOHAN THADANI	TEKNEKRON	734-0800
EDWARD O'DONNELL	NRC	443-5976
Lucie Turnbull	OTA	224-5694
Bill Barnard	OTA	224-8701
STEPHEN F SCHREULS	NRC	427-4177
Robert Budnitz	NRC / Research	427-4338
PETER ANGELINI	ORNL	FTS 624-4565
KARL NOTZ	ORNL	FTS 624-6632
JOSEPH D. NANNO	NUS	948-7010
PETER B. MYERS	NAS/NRC	389-6431
CLYDE JUPITER	NRC/RES	301-427-4362
Robin Hutchinson	NBS	301-921-2396
DAVID M. ROHRER	NRC/WASTE FORM	301-427-4177
Gary Robbins	NRC/Waste Mang	301-427-4177
Albert McAgazzi	MITRE	703-827-6000
Joseph A. Lieberman	Nuclear Safety Assoc.	301 986 1310
George Sauter	NRC	634-1457
MAURICE AXELRAD	L,N,R,A&T	862-8400
JOHN W ROWEN	DOE/NBS	(301) 353 5691

NRC BRIEFING TO DOE ON NRC HLW PROGRAM

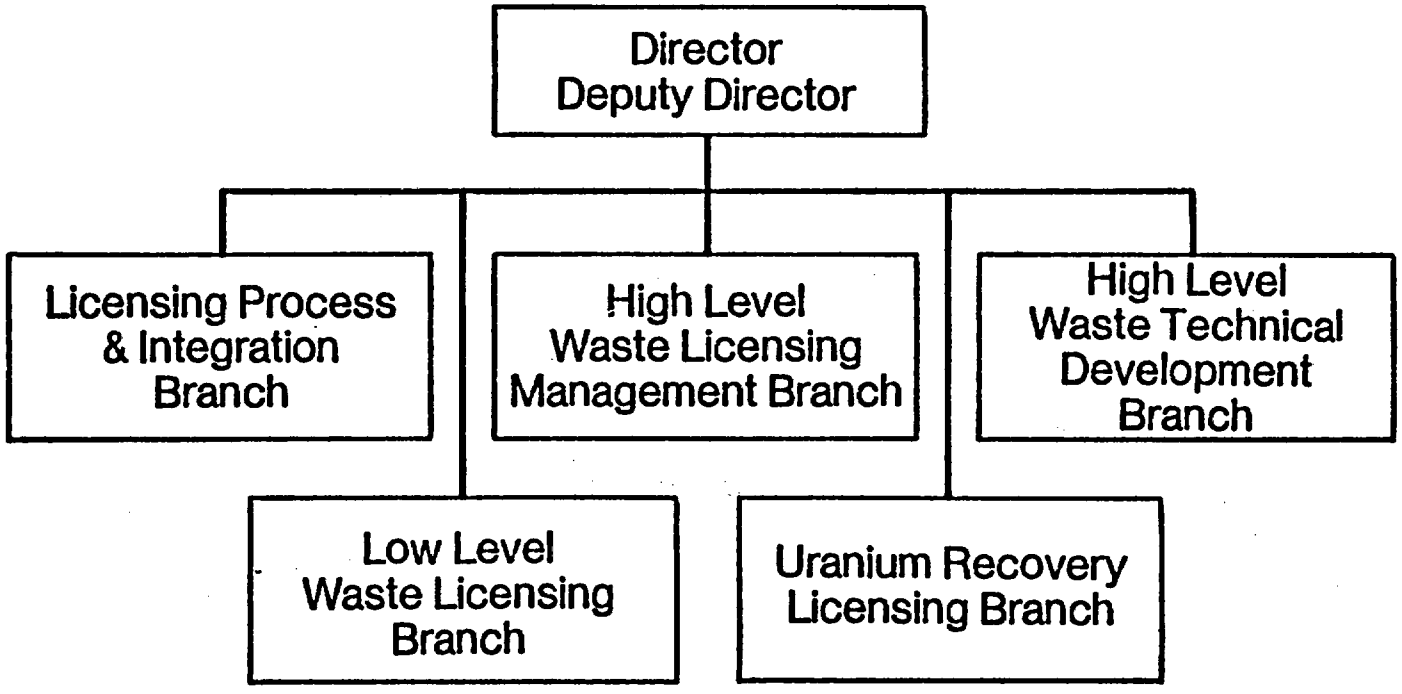
- Overview
- Regulatory Framework
  - — Developing a Regulatory Framework
  - — License Procedures and Process
  - — Technical Standards
- Technical Program
  - — Role Objective and Scope
  - — LLL Programs
  - — Sandia Program
  - — Other Research Programs

Encl to Memo
to Malone Jr.
Boyle - 10/12/79

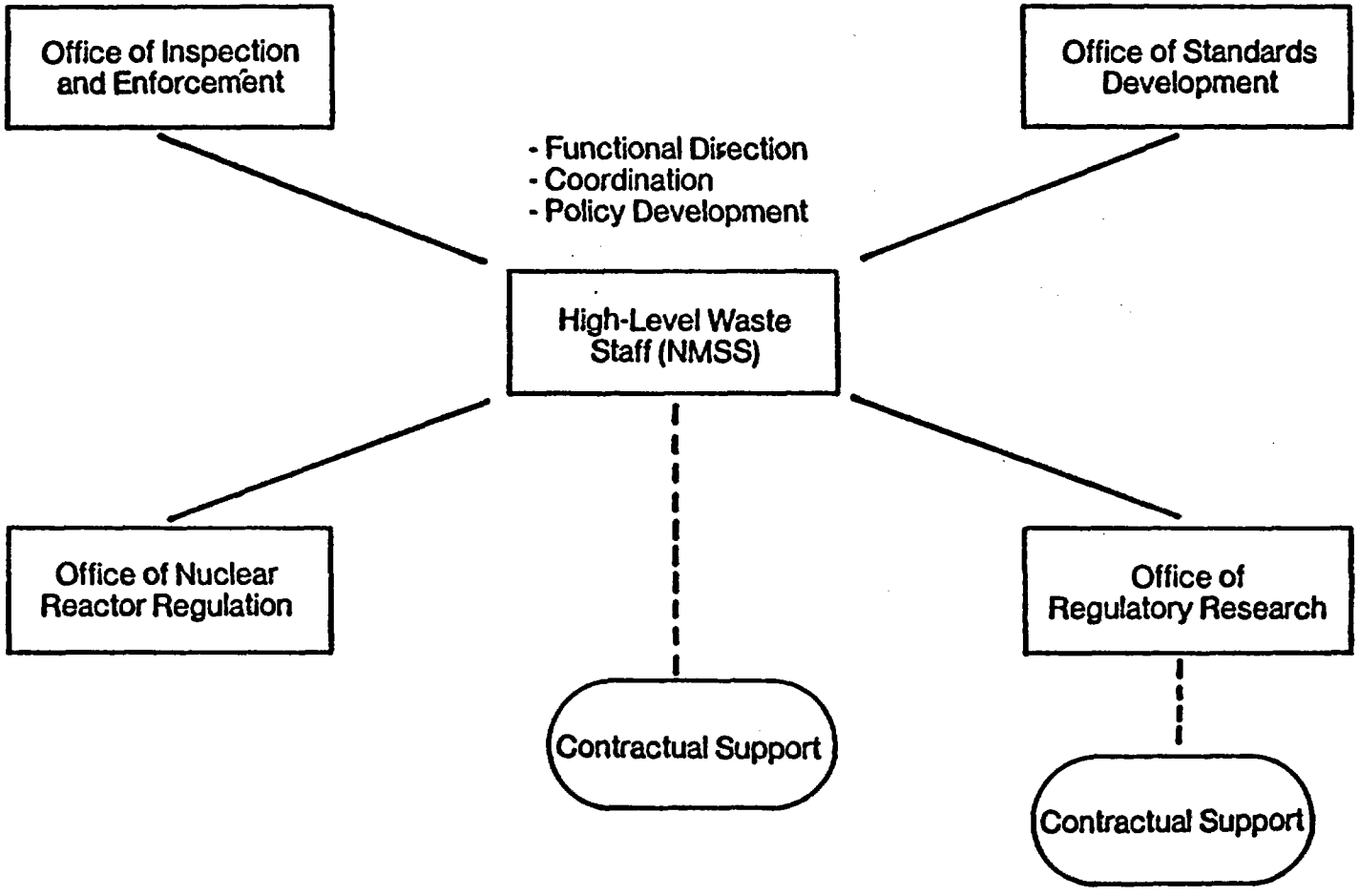
NUCLEAR REGULATORY COMMISSION



DIVISION OF WASTE MANAGEMENT



HLW PROGRAM ORGANIZATION



PROJECTED RESOURCE REQUIREMENTS
FOR NRC HLW PROGRAM

	FY79		FY80		FY81		FY82		FY83	
OFFICE	MY	$K	MY	$K	MY	$K	MY	$K	MY	$K
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

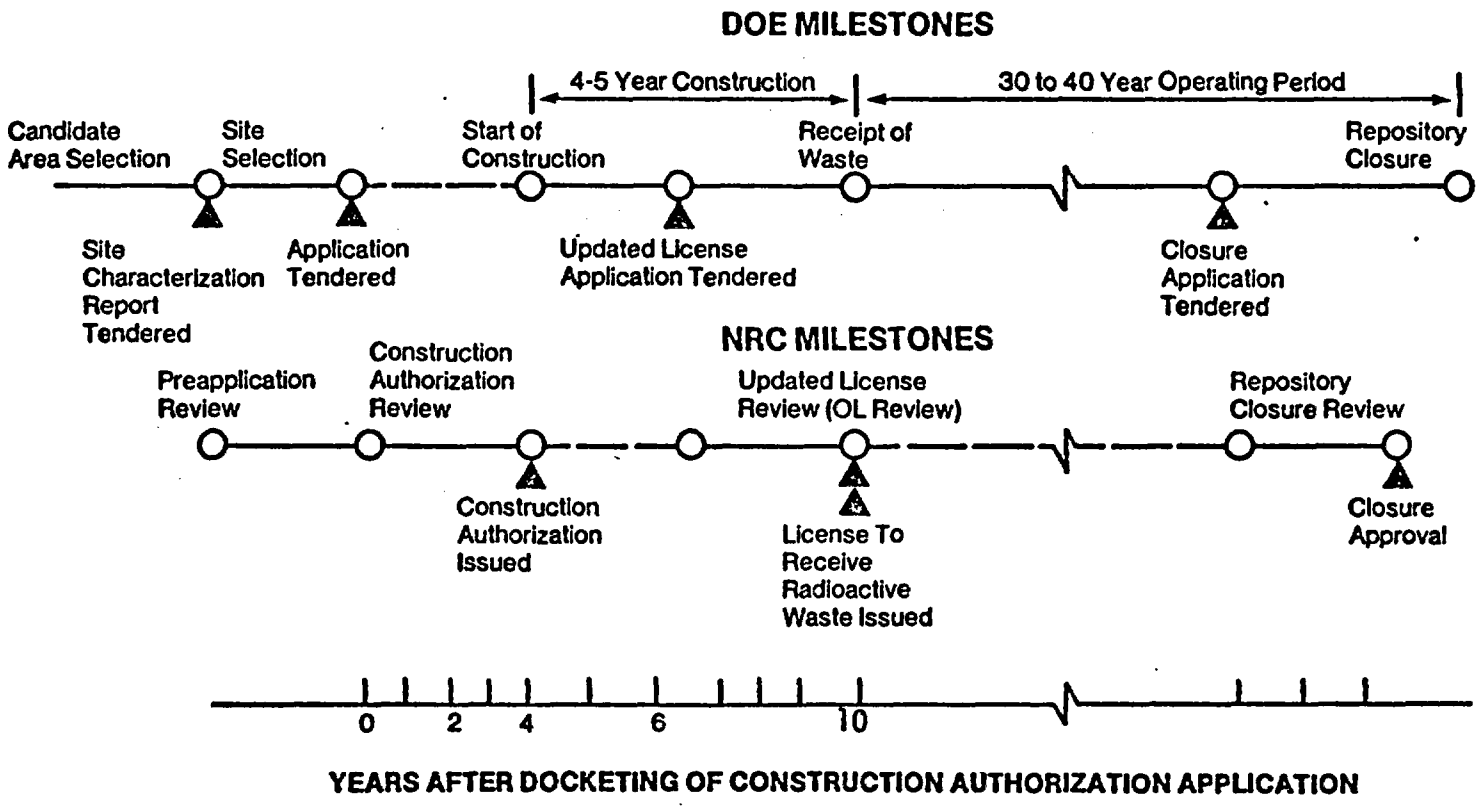
REGULATION (10CFR 60) DEVELOPMENT SCHEDULE

	Administrative Requirements	Technical Requirements
Commission Policy Statement		
• Publish Draft	Nov. 17, 1978	—
Regulation		
• 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 Authorzation 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

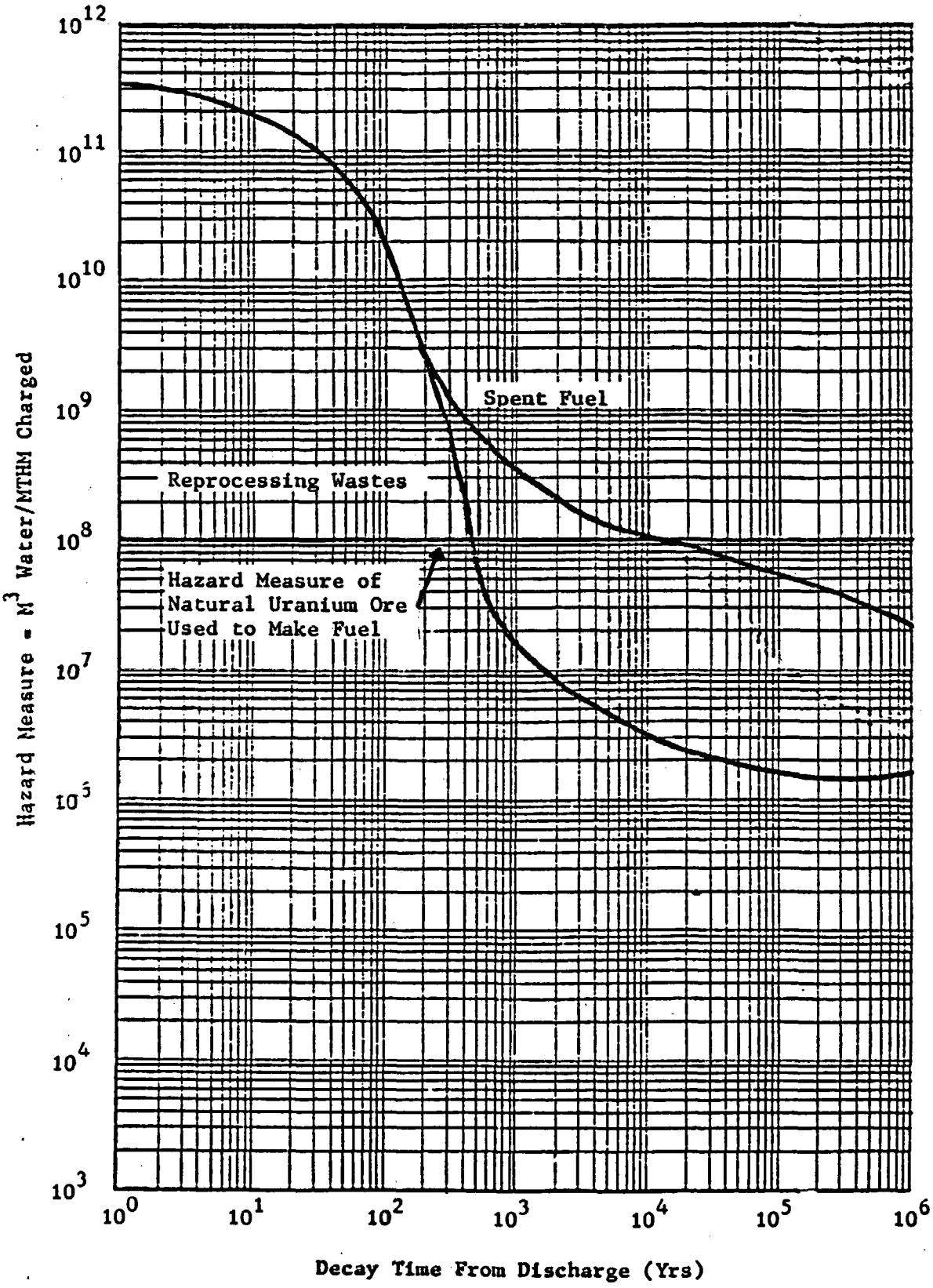
LONG-TERM PERFORMANCE OBJECTIVES

1. 1000 YEAR PACKAGE

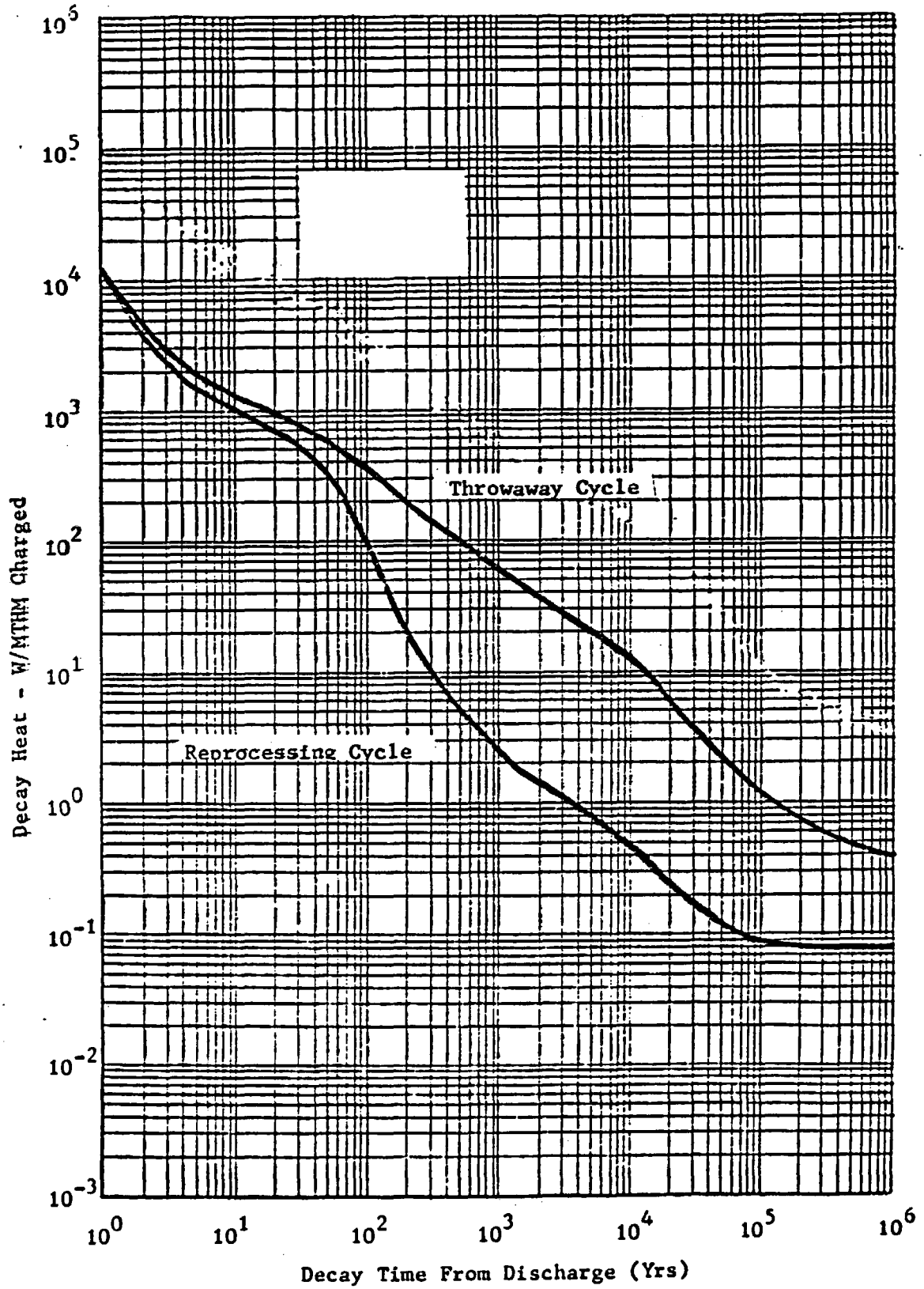
2. OPTION TO RETRIEVE WASTE FOR 50 YEARS AFTER OPERATION

3. REPOSITORY DESIGN

4. GEOLOGIC SYSTEM



HAZARD MEASURE OF SPENT FUEL AND REPROCESSING WASTES



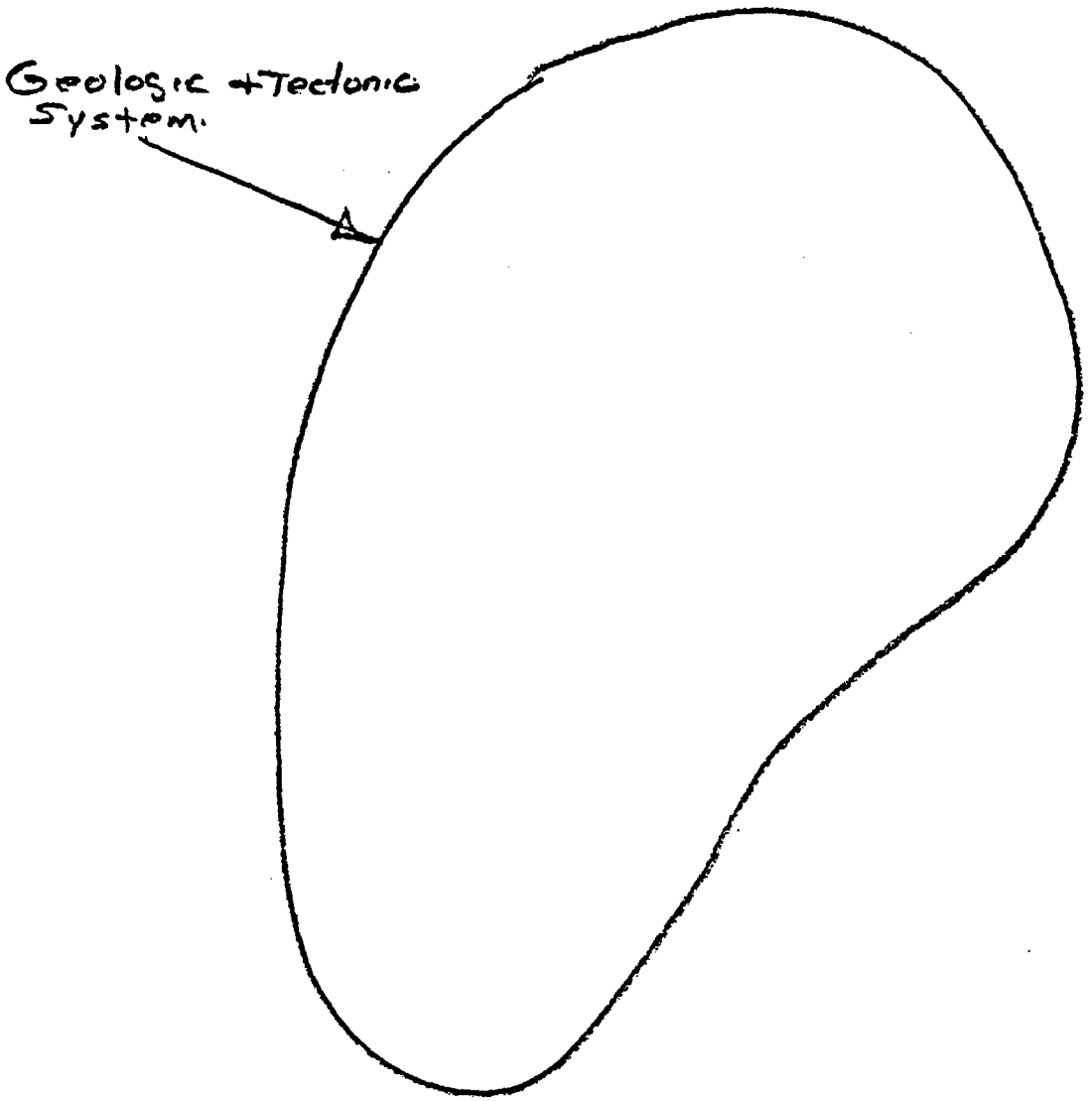
DECAY HEAT GENERATION - THROWAWAY VERSUS REPROCESSING CYCLES

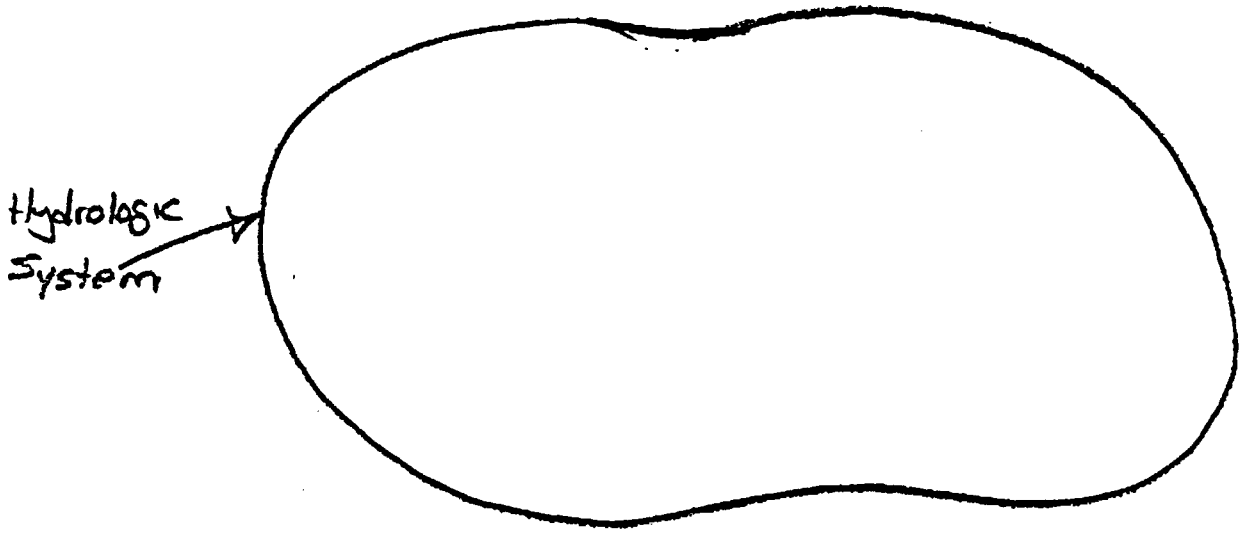
SITING CRITERIA
TECHNICAL CONSIDERATIONS

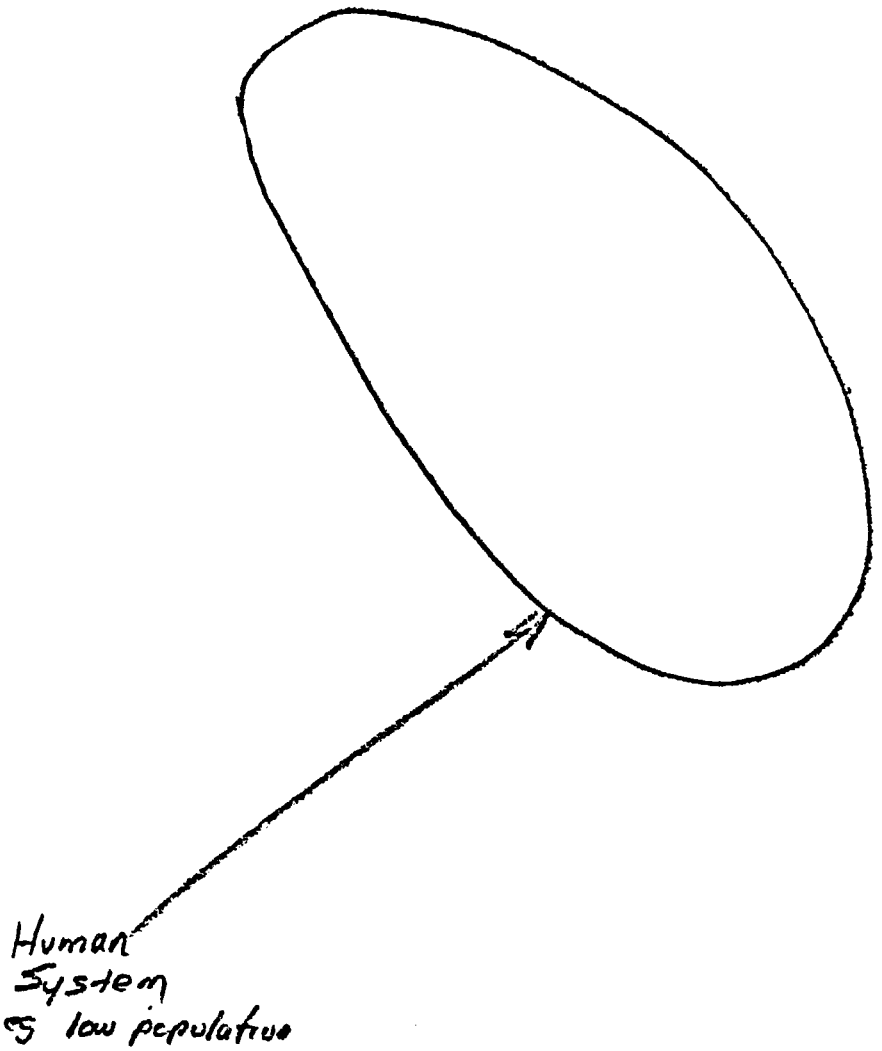
1. LIMITATIONS IN SCIENTIFIC KNOWLEDGE
   (BOUND SCIENTIFIC UNCERTAINTY)

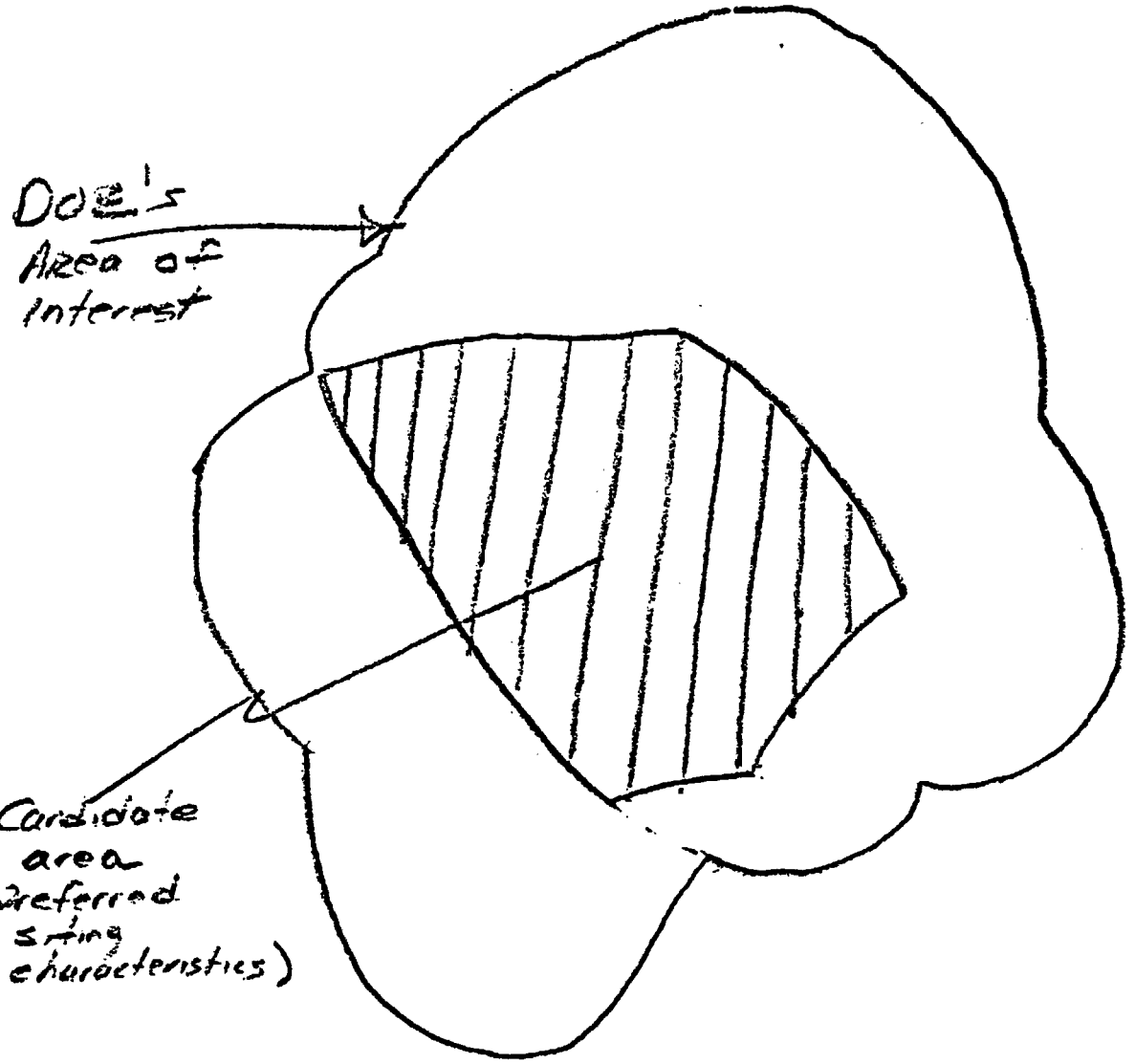
2. NEED FOR EXTRAPOLATION OF PAST GEOLOGIC HISTORY
   (DEFINE SCOPE OF INVESTIGATIONS)

3. NEED TO TEST CRITERIA (MODELS) AGAINST EPA STANDARD
   (GOOD PRACTICE TO COMPENSATE FOR MODEL LIMITATIONS)

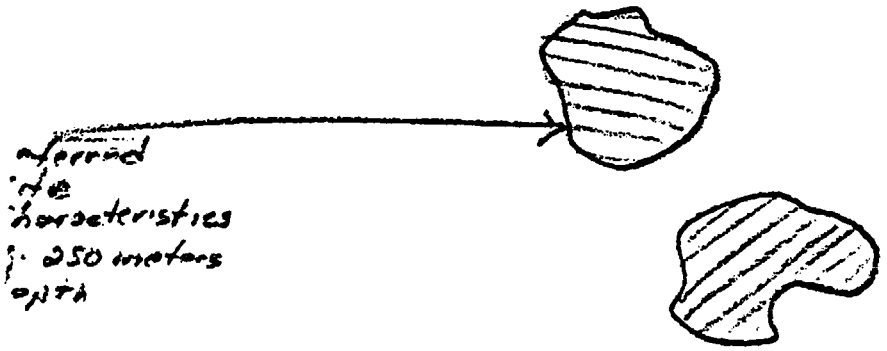

Geologic + Tectonic
System.

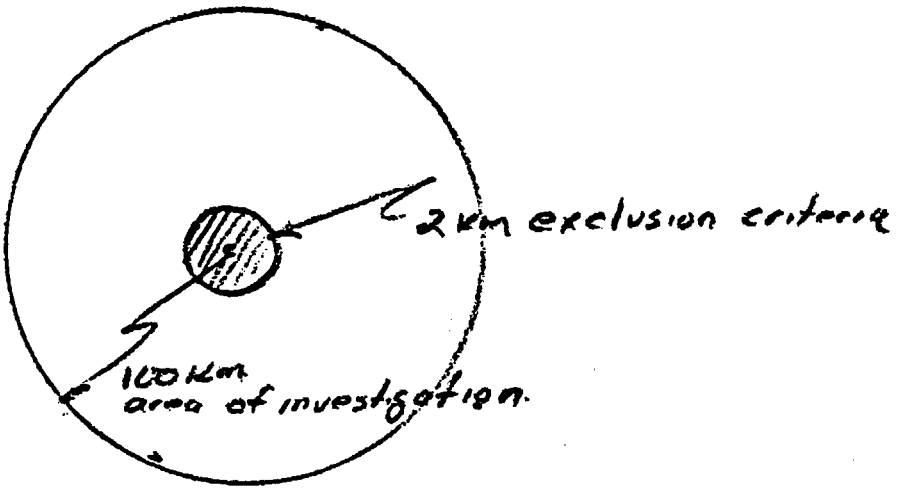

Hydrologic
System


Human
System
S low population


DOE's
Area of
Interest
Candidate
area
(preferred
siting
characteristics)

Choosing Sites




2 km exclusion criteria
100 km
area of investigation.

PREFERRED SITING CHARACTERISTICS

APPLICATIONS:

- CHOOSING CANDIDATE AREA
- 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:

- LOW PROBABILITY OF ADVERSE EVENTS
- MINIMUM DEPTH OF 250 METERS
- EFFECTIVE SEALING OF ROCK UNITS
- 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

THERMAL STRESS
↓
NEAR FIELD FLOW
↓
CORROSION
↓
PACKAGE FAILURE
↓
DISSOLUTION
↓
RADIONUCLIDE RELEASE

RETRIEVAL ANALYSIS

ECONOMIC ANALYSIS (PLANNING)

TRU ANALYSIS (PLANNING)

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

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

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

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

WASTE PACKAGE PERFORMANCE STANDARDS AND CRITERIA

OVERPACKS AND WASTE PACKAGE

DETERMINE THE CAPABILITY OF VARIOUS OVERPACK MATERIALS TO RETAIN RADIONUCLIDES 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		----------	————	————	————
LONG TERM INTEGRITY OF WASTE PACKAGES			————	————	————

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					
GEOCHEMICAL INTERACTIONS BETWEEN RELEASED WASTES AND REPOSITORY ROCKS					
WASTE HEAT EFFECTS ON GEOCHEMICAL PROCESSES					
RADIATION EFFECTS ON GEOCHEMICAL PROCESSES					
WASTE HEAT EFFECTS ON INCLUSIONS IN SALT					

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

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

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		- - -	- - -	- - -	- - -

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

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

CLIMATIC 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		--------	———	———	———
THERMAL CRACKING, B-5825		--------	———	———	———
PREDICTION AND ANALYSIS OF FRACTURES AND DISCONTINUITIES, B-6667		———	———	———	———
RADIATION EFFECTS ON STRUCTURAL CHARACTERISTICS OF ROCK			———	———	———
ROCK MASS RESPONSE TO COMBINED STRESS				———	———

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.

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

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		--------	———	———	———
OCCUPATIONAL PROCEDURES SAFETY ANALYSES		--------	———	———	———

B-6663

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	———	———	———		
RADIONUCLIDE PATHWAYS TO MAN CONFIRMATION, B-6663		———	———	———	
IMPACTS ON NATURAL RESOURCES					———
IDENTIFY POTENTIAL SOURCES OF ENVIRONMENTAL IMPACTS FROM SITE EXPLORATION, CONSTRUCTION, OPERATION AND REPOSITORY CLOSURE PROCEDURES				———	———
ECOLOGICAL IMPACTS				———	———

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

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

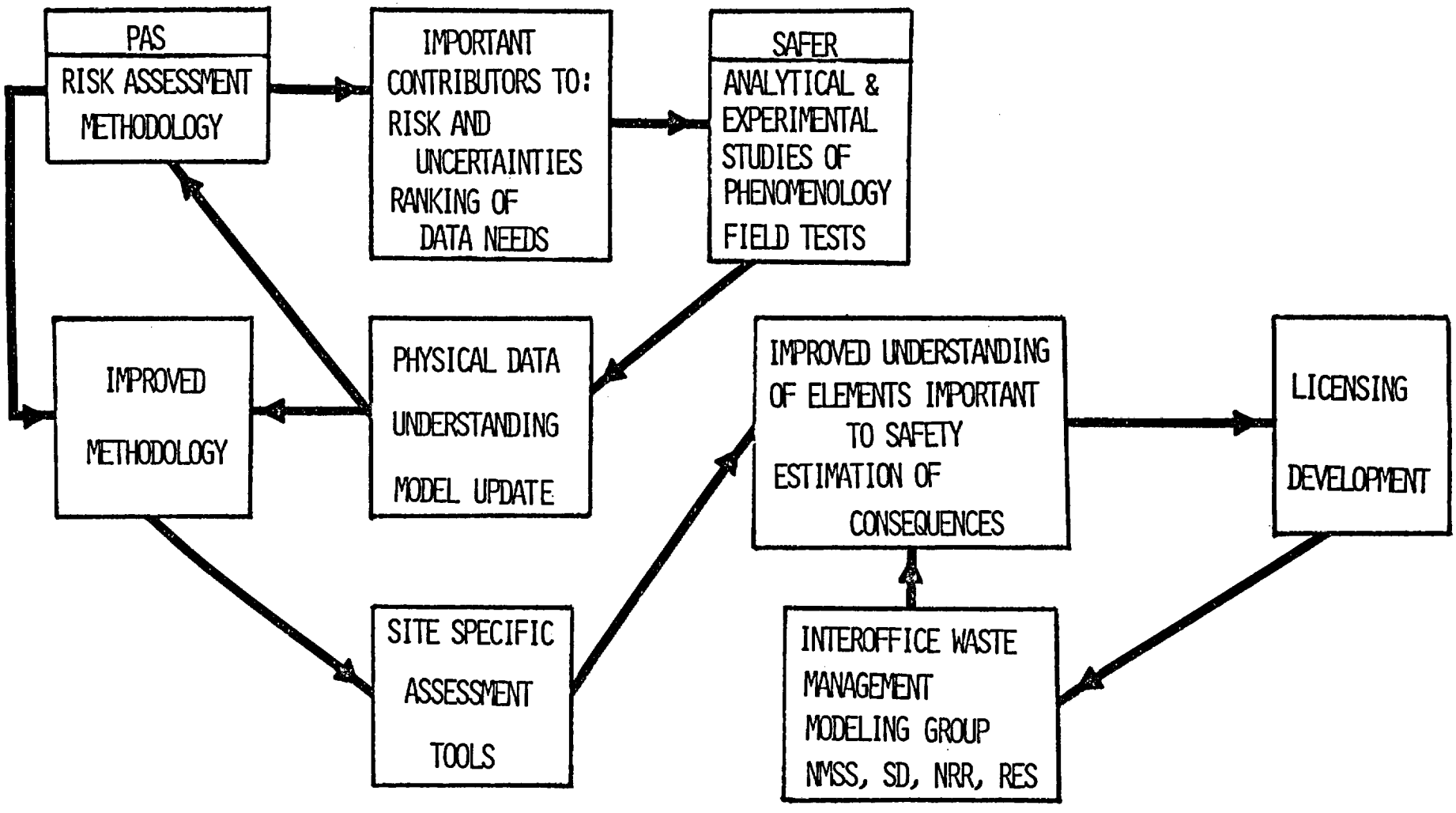
- o WASTE ISOLATION RISK ASSESSMENT METHODOLOGY DEVELOPMENT
- o SPENT FUEL ISOLATION ALTERNATIVES
- o SCENARIO ASSESSMENT FOR WASTE REPOSITORIES
- o DYNAMIC SIMULATION OF WASTE/ROCK PROCESSES

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)

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

(9/80)

4. DEMONSTRATE RISK METHODOLOGY

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

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

* COMPLETED

INSIGHTS

* o UNDERSTANDING OF THE MECHANISMS AND GEOLOGIC PROPERTIES IMPORTANT TO WASTE ISOLATION
    - IMPORTANT CONTRIBUTORS TO RISK
    - IMPORTANT CONTRIBUTORS TO UNCERTAINTIES
- o GUIDANCE AS TO WHERE RESOURCES SHOULD BE EXPENDED TO GATHER DATA
- o GUIDANCE IN PLANNING AND PRIORITIZING FURTHER RESEARCH PROGRAMS
- o 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

PRODUCTS	DATE
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

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

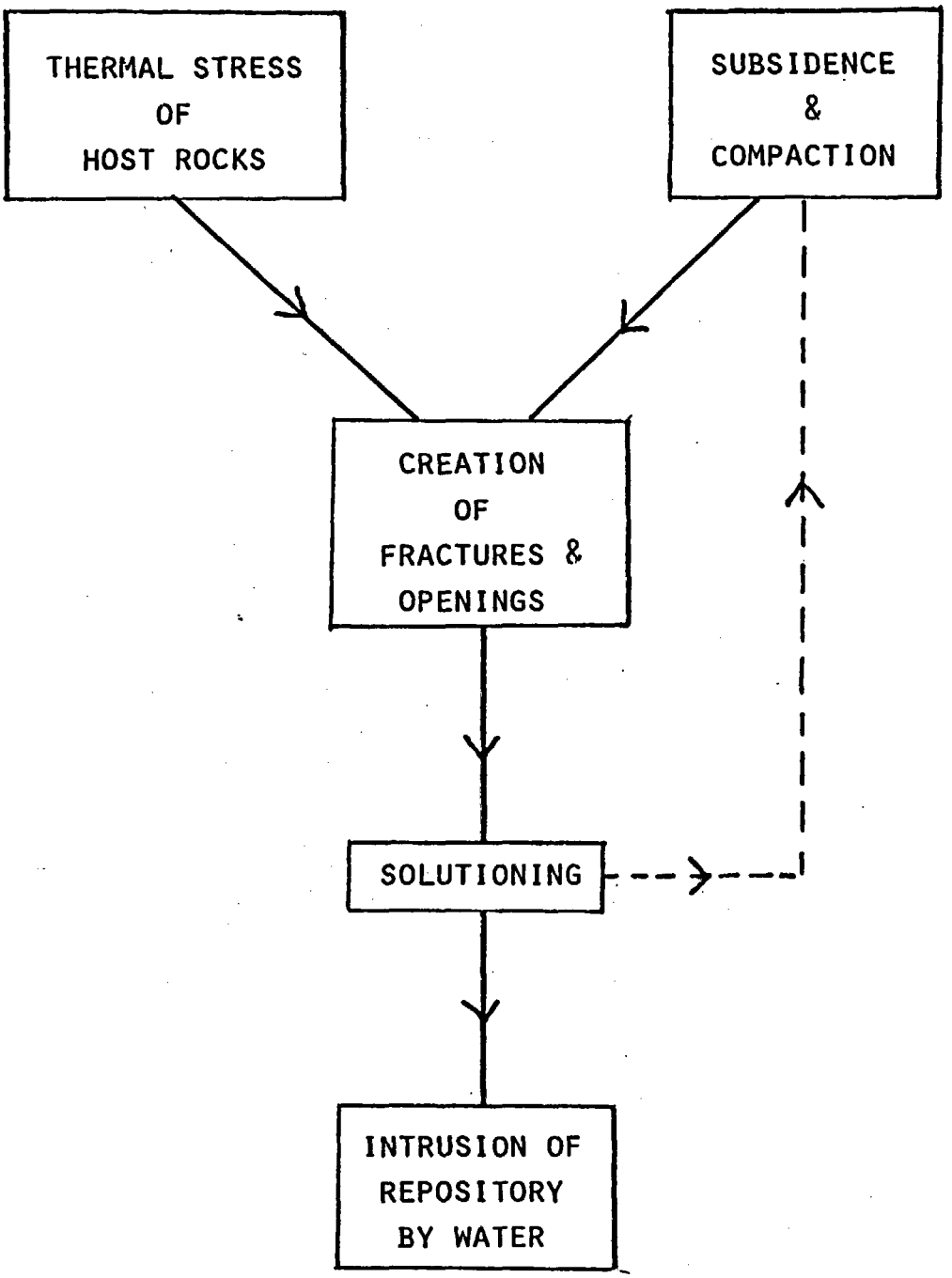
DYNAMIC SIMULATION OF WASTE/ROCK PROCESSES

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

PRODUCTS	DATE
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


THERMAL STRESS OF HOST ROCKS
SUBSIDENCE & COMPACTION
CREATION OF FRACTURES & OPENINGS
SOLUTIONING
INTRUSION OF REPOSITORY BY WATER

RADIOACTIVE WASTE GASES

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

OBJECTIVE: IDENTIFY LEAST RISK ALTERNATIVE FOR MANAGEMENT OF GASEOUS C^{14}, I^{129}, Kr^{85} 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^{129}, Kr^{85} AND C^{14} 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