April 29, 1999

Mr. Samuel Rousso, Director
for Program Management and Integration
Office of Civilian Radioactive Waste Management
U.S. Department of Energy, RW 30
1000 Independence Avenue, S.W.
Washington, DC 20585

SUBJECT: MINUTES OF THE MARCH 31, 1999, NRC-DOE TECHNICAL EXCHANGE ON PRE-CLOSURE DESIGN ISSUES

Dear Mr. Rousso:

Enclosed are the Minutes of the March 31, 1999, Technical Exchange between the staff of the U.S. Nuclear Regulatory Commission (NRC) and representatives of the U.S. Department of Energy (DOE) on issues related to pre-closure design. The exchange was a video conference among NRC headquarters in Rockville, Maryland; DOE offices in Las Vegas, Nevada; and the Center for Nuclear Waste Regulatory Analyses in San Antonio, Texas. The meeting was also attended by representatives of Nye County and Clark County, Nevada; and DOE contractors.

If you have any questions regarding this letter, please contact Mysore S. Nataraja of my staff. Dr. Nataraja can be reached at (301) 415-6695 by phone or at msn1@nrc.gov by e-mail.

Sincerely,
[Original signed by K. McConnell for:]

C. William Reamer, Chief
High-Level Waste and Performance
Assessment Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

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NAME	MNataraja: kv		SWastler		CWReamer					
DATE	4/ 28 /99		4/28/99		4/29/99					

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Mr. Samuel Rousso, Director
for Program Management and Integration
Office of Civilian Radioactive Waste Management
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1000 Independence Avenue, S.W.
Washington, DC 20585

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Assessment Branch
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Office of Nuclear Material Safety
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OFC	HLWB		HLWB		HLWB					
NAME	MNataraja: kv		SWastler		CWReamer					
DATE	4/28/99		4/29/99		4/ /99					

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Distribution for letter from C. Reamer to S. Rousso dated April 29, 1999

cc: R. Loux, State of Nevada
S. Frishman, State of Nevada
L. Barrett, DOE/Wash, DC
A. Brownstein, DOE/Wash, DC
S. Hanauer, DOE/Wash, DC
C. Einberg, DOE/Wash, DC
N. Slater, DOE/Wash, DC
R. Dyer, YMPO
S. Brocoum, YMPO
R. Clark, YMPO
A. Gil, YMPO
B. Price, Nevada Legislative Committee
J. Meder, Nevada Legislative Counsel Bureau
D. Bechtel, Clark County, NV
E. von Tiesenhousen, Clark County, NV
J. Regan, Churchill County, NV
T. Cain, Esmeralda County, NV
L. Fiorenzi, Eureka County, NV
B. Mettam, Inyo County, CA
T. Manzini, Lander County, NV
E. Culverwell, Lincoln County, NV
J. Wallis, Mineral County, NV
L. Bradshaw, Nye County, NV
M. Murphy, Nye County, NV
J. McKnight, Nye County, NV
N. Stellavato, Nye County, NV
D. Kolkman, White Pine County, NV
D. Weigel, GAO
W. Barnard, NWTRB
R. Holden, NCAI
A. Mitre, NIEC
R. Arnold, Pahrump County, NV
J. Lyznicky, AMA
R. Clark, EPA
F. Marcinowski, EPA
R. Anderson, NEI
R. McCullum, NEI
S. Kraft, NEI
J. Kessler, EPRI

MINUTES

U.S. Department of Energy/U.S. Nuclear Regulatory Commission Technical Exchange on Preclosure Design

Staff from the U.S. Department of Energy (DOE) and the U.S. Nuclear Regulatory Commission (NRC) held a technical exchange on March 31, 1999, at the NRC offices at White Flint. This meeting is the third in a series of interactions to discuss DOE's approach to the following items: 1) Event Categorization; 2) Quality Assurance (QA) Classification and Grading; 3) Level of Detail in the License Application Design; and, 4) Integrated Safety Assessment (ISA). The purpose of these meetings was to arrive at a common understanding on the level of detail to be presented by DOE in its License Application Design; the approach used by DOE to classify structures, systems, and components (SSC) important to safety; and the graded QA approach (in which SCC classification is commensurate with importance).

Substantial progress has been made in gaining a mutual understanding of an acceptable treatment for these preclosure design issues. It was agreed that DOE's understanding of these issues is sufficient to implement NRC guidance due to the success of these interactions, and that this Technical Exchange would probably be the last formal interaction on the topic of event categorization/QA classification and grading methodology. Further discussions on the implementation of this methodology, (e.g., rationale for the assignment of a QA level to a particular item, details of the application of QA controls associated with each QA level), may be necessary in the future.

Items Discussed:

1) Preclosure performance objective: DOE presented its approach to showing compliance with the proposed 10 CFR Part 63 pre-closure performance objective, namely 25 mrem/yr dose to real people (for Category-1 events), and 5 rem/event to a hypothetical individual at the site boundary (for the Category-2 events).

2) Definition of Category 1 and Category 2 Events: DOE's position on the probability cutoff between Category 1 and 2 events is that this cutoff is based on the expectation that natural and human-induced events are expected to occur one or more times during the facilities preclosure operational lifetime (as applied for in the LA).

3) DOE is in the process of defining the Mined Geological Repository operational lifetime; this item will be the topic of a future interaction, as necessary.

4) Approach to potential doses due to Category 1 DBEs: DOE stated the dose assessment for Category 1 DBEs would be based on best estimate source terms and release fractions. In addition, annual average meteorology based on site data would be used for Category 1 dose assessments. With respect to QA, DOE proposes to adopt three quality levels based on risk criteria and existing staff guidance for other nuclear facilities. Simply stated, the three levels respectively correspond to: failures of SSCs that directly affect public health and safety (Q-

1); failures of SSCs that indirectly affect public health and safety (Q-2); and SSCs needed to limit occupational exposures (Q-3). DOE also summarized a white paper still in preparation that will outline the criteria for developing the contents of the License Application Design.

5) Approach to potential doses due to Category 2 DBEs: DOE stated that its approach for Category 2 DBEs is to assess the airborne release consequences and that ingestion doses would not be calculated for Category 2 DBEs. This approach is typical of DBE assessments for nuclear reactors for events not expected to occur in the facilities operational lifetime. Doses due to an ingestion pathway are typically accumulated very slowly over time. The ingestion pathway will be addressed by appropriate mitigation actions after post-event investigations as part of an emergency response plan.

6) The goal of DOE's repository design is to meet the 25 mrem limit for category 1 design basis events; however, for classification purposes, DOE is using 100 mrem as the category 1 design basis event Quality Level-1 risk criteria (on a per event sequence basis) and 25 mrem as the category 1 design basis event Quality Level-2 risk criteria (also on a per event sequence basis).

7) Regarding waste package retrievability, DOE is evaluating approaches to meet requirements; this item may be a topic for a future interaction.

8) Finally, DOE presented a summary of how the ISA will be used in the LAD to demonstrate compliance with pre-closure performance objectives.

9) NRC staff raised questions related to deterministic versus probabilistic methods of dose calculations for the Category-1 design basis events, and questions pertaining to items important to site characterization and retrievability. Staff explained the distinction between "events" and "event sequences" as applied to dose calculations for Category-2 events. Staff also clarified the intent of the proposed and alternative criteria in section 63.44.

10) DOE plans to provide the final version of the white paper on the level of detail for License Application and procedures for classification of events and graded QA.

Approved: 4/21/99

U.S. Nuclear Regulatory Commission Date

4/21/99

David Haught
U.S. Department of Energy Date

DOE/NRC TECHNICAL EXCHANGE AGENDA
Level of Detail/Design Basis Events
NRC Headquarters, Room 2B5,DOE Hillshire Atrium Room, Las Vegas
CNWRA, San Antonio
March 31st, 1999
8:00 AM-5: 00 PM EST

8:00 A.M.	Introduction/Opening Remarks	DOE/NRC
	Event Categorization and Offsite Dose Compliance	Dennis Richardson James Thornton
	BREAK	
	QA Classification and Grading	Dealis Gwyn
12:00-1:00	LUNCH	
	Level of Detail	Dennis Richardson
	Integrated Safety Analysis in the LA	Dennis Richardson
	CLOSING REMARKS	DOE/NRC
	• Potential Follow-up Meeting	
5:00 P.M.	ADJOURN	

Enclosure 2

NRC/DOE TECHNICAL EXCHANGE MEETING
Level of Detail/Design Basis Events
NRC Headquarters, Rockville, MD
March 31, 1999
8:00 am – 5:00 pm EST

Name	Organization	Telephone Number
MYSORE (RAJ) NATARAJA	US NRC	301-415-6695
TIM GUNTER	DOE / YMSCO	702-794-1343
Ray Wallace	USGS/HQ	202-586-1244
DENNIS RICHARDSON	M&O YMP	702 295 4392
JACKIE E. BESS	M&O	702-295-5184
Dealis Gwyn	M&O	702-295-3964
Tom Dunn	M&O	702-295-5983
Dave Haught	DOE	702 794-5424
Ken Ashe	M&O YMP	702 255-9754
Christian Lui	USNRC	301-415-6200
Christopher McKenney	USNRC	301 415-6663
TED CARTER	USNRC	301-415-6684
Tim McCartin	NRC	301-415-6681
Sheldon L Trubatch	Winston & Strawn	202 371 5785
Janet Kohn	NRC/DWM	301-415-6674
[illegible]	NRC/DWM	301-415-6726
Sidney Crawford	Self	301 565 6298 scrwfrd@erols.com
Rod McCullum	NEI	202-739-8082
April [illegible]	DOE	702 794-5578
Bret Leslie	USNRC	301 415-6657
Kien Chang	USNRC	301 415-6613
Les Bissell	Booz Allen / DOE	202 626 1071
Banad Jagannath	US NRC	301 415 6653
David Dancer	US NRC	301 415 6618

NRC/DOE TECHNICAL EXCHANGE MEETING

Level of Detail/Design Basis Events
NRC Headquarters, Rockville, MD
March 31, 1999
5:00 AM **8:00 am - 5:00 pm EST**
LAS VEGAS

Name	Organization	Telephone Number
E. von Tiesenhausen	CLARK COUNTY	702 455-5184
Leo A. Polivka	NYE COUNTY	702-363-2259
Wesley Wu	M&O, REPD	702-295-5032
T. M. FRANKS	M&O R&T	702-295-6595
Jim Linhart	NSNFP/LV	702-295-0366
R B Bradbury	MTS	702-794-5424
Steve Frishman	NV NWPO	775-687-3744
Judy Treichel	NNWTF	702-248-1127
RICHARD QUITTMEYER	M&O/NEPO	702-295-3551
Douglas ORVIS	M&O/SE+I	702-295-4137
[illegible] Mattson	M&O/Fluor Daniel	702-295-2385
Mike GLORA	M+O/SAIC	702-295-4193
GARY GRIFFITH	M&O - SURFACE FACIL	702-295-4416
KRISHNA IYENGAR	M&O - Reg. Affs.	702-295-6517
Bernard Verma	DOE/OPE	702-794-1374
JERRY SELF	M&O LICENSING	702-295-5204
RAM B. MURTHY	DOE/RW-3	702-794-5549
Jim Snyder	NR	702-295-2465
EP STROUPE	M&O/SE&I	5-3944
Jim KAPPES	M&O/SE&I	702 295-4206

NRC/DOE TECHNICAL EXCHANGE MEETING
Level of Detail/Design Basis Events
NRC Headquarters, Rockville, MD
March 31, 1999
8:00 am – 5:00 pm EST

Name	Organization	Telephone Number
Asad Chowdhury	CNWRA	(210) 522-5151
Bruce Mabrito	CNWRA	" " -5149
Wesley Patrick	CNWRA	" " 5158
Simon Hsiung	CNWRA	(210) 522-5209
NARASI SRIDHAR	CNWRA	x5538
Budhi Sagar	CNWRA	x5252
James Weldy	CNWRA	x6800
JOHN STAMATAKOS	CNWRA	x5247
Gordon Wittmeyer	CNWRA	x5082
PAT MACKIN	CNWRA	X 5054

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To M. NATARAJA	From A Chowdhury	
Co./Dept.	Co.	
Phone #	Phone #	
Fax # 5398	Fax #	

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PROJECT

Studies

Opening Remarks & Outline

Presented to:
DOE/NRC Technical Exchange Meeting
on Design Basis Events
Rockville, MD.

Presented by:
David Haught
Department of Energy

U.S. Department of Energy
Office of Civilian Radioactive
Waste Management

March 31, 1999

Enclosure 4
Attachment 1

Topics

Goal of Meeting: Agreement on the following topics

- Event categorization
- QA classification/QA grading
- Level of detail
- Integrated safety analysis

Prior Meeting on Design Basis Events: Dec. 10, 1998

- License Application design details (Level of Detail paper)
- Design Basis Events (Issues and approach for License Application)
  - Part 63 draft issues
  - Licensing base dose criteria (e.g., separation of normal and anticipated operational occurrences)
  - Preliminary hazards analysis (Qualitative screening; part of Integrated Safety Analysis)

Prior Meeting on Design Basis Events: Dec. 10, 1998

(Continued)

- Internal Design Basis Events (Quantification of sequence freqs. & Category 1 - Category 2 binning)
- External Design Basis Events (Regulatory precedents for Systems, Structures, and Components Important to Safety)
- Release fractions for Commercial Spent Nuclear Fuel (Reg. Precedent)

- QA Classification
- Integrated Safety Analysis - Nuclear Regulatory Commission introductory comments

Issues from December 10 Meeting

- Need for/extent of discussion of "incredible" events in License Application
- Impact of Integrated Safety Analysis requirement on organization and content of License Application
- Occupational rad-safety and Q-list
- Offsite dose criteria for Category 1 may require interpretation in definitions in Part 63
- Interpretation of Part 63 definition of Category 2 Design Basis Events for external events

Approach for External Events

- DOE proposes to use regulatory precedents for external events
- Screen out or include events using Nuclear Regulatory Commission guidance and approaches; e.g.
  - Aircraft crash
  - Industrial/military activity
- Design criteria for Structures, Systems, and Components Important to Safety per NUREGs, regulatory guides, etc.
  - Extreme wind, tornado
  - Flooding

Approach for External Events

(Continued)

- Three topical reports for YMP approach to seismic hazard and design
  - Follow guidance of NUREG-0800 and RG 1.165
  - Two topical reports have been submitted to Nuclear Regulatory Commission and conditionally approved

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Studies

Event Categorization and Offsite Dose Compliance

Presented to:
DOE/NRC Technical Exchange Meeting
on Design Basis Events
Rockville, MD.

Presented by:
Dennis Richardson
James Thornton
CRWMS Management & Operating Contractor

U.S. Department of Energy
Office of Civilian Radioactive
Waste Management

Enclosure 4
Attachment 2

March 31, 1999

Goals and Objectives

- Establish basis for concurrence with 10 CFR 63 offsite dose criteria applicable to preclosure operations
  - Design Basis Events categorization
  - Offsite dose acceptance criteria
- Present License Application approach for demonstrating compliance with 10 CFR 63 offsite public dose requirements

10 CFR 63 Design Basis Events Categorization

- Category 1
  - 10 CFR 63.2 definition:

    "Those natural and human-induced events that are expected to occur one or more times before permanent closure of the GROA"
  - Interpreted as those conditions of normal operation which are expected to occur one or more times during preclosure facility lifetime
- Category 2
  - 10 CFR 63.2 definition:

    "Other natural and man-induced events that have at least one chance in 10,000 of occurring before permanent closure of the geologic repository"
  - Interpreted as Design Basis Events occurring with frequencies ranging from Category 1 to 10^{-6} per year (i.e., Category 1 > Fi $\geq 10^{-6}$/yr)

10 CFR 63 Offsite Dose Criteria

- **Category 1**

  10 CFR 63.111(b)(1) requires that:

  (1) The GROA shall meet the requirements of part 20, and

  (2) During normal operations, and for Category 1 design basis events, the annual dose to any real member of the public, located beyond the boundary of the site, shall not exceed a TEDE of 25 mrem

- **Category 2**

  10 CFR 63.111(b)(2) requires that:

  – No individual located on, or beyond, any point on the boundary of the site, will receive the more limiting of a TEDE of 5 rem, or the sum of the deep-dose equivalent to any individual organ or tissue (other than the lens of the eye) of 50 rem

Event Definition

- Category 1: Summation of all Category 1 Design Basis Events
  - Direct exposure and radiological release calculations performed consistent with guidance provided for power reactors in NUREG-0017[1]
    - » Annual average
    - » Realistic operating assumptions and engineering judgement
  - Sum all Category 1 direct exposures and releases over facility preclosure lifetime
  - Divide sum by facility preclosure lifetime to produce annual average exposure

[1] USNRC, *Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Pressurized Water Reactors*, Revision 1, 1985.

Event Definition

(Continued)

- Category 2: Single Category 2 Design Basis Events
  - Direct exposures and radiological releases calculated using conservative assumptions
  - Analysis performed for each "single" Category 2 Design Basis Event

Category 1 Design Basis Event Contribution to Annual Releases

(Developed in accordance with NUREG-0017/01)

Category 1 DBE(N)	Curies/ DBE(N)	Number of Occurrences	Operational Life Release From DBE(N)
DBE (1)	0.25	3	0.75
DBE(2)	0.3	2	0.6
DBE(3)	0.1	4	0.4
•	•	•	•
•	•	•	•
•	•	•	•
DBE(N)	0.003	3	0.009
Total Curies from Category 1 DBE			1.80

For operational life of 30 years:
Category 1 DBE annual releases = 1.80 / 30 or 0.06 curies/yr

Summary of 10 CFR 63 License Application Compliance Approach

DBE Category	Dose Criteria	Analysis Basis
Category 1	25 mrem/yr†	Exposure Source Term: Best-estimate annual average Meteorology: Annual average Receptor: Nearest real member of public Dose Pathways: Direct, submersion, inhalation and ingestion
Category 2	5 rem/event	Exposure Source Term: Conservative single even Meteorology: Conservative case Receptor: Individual at location of maximum dose Dose Pathways: Direct, submersion & inhalation

Notes:
† Airborne radiological effluent component limited to 10 mrem/yr by 10 CFR 20.1101(d).

Exposure Source Terms

- Category 1: Best-estimate annual average
  - Average waste/crud radiological source terms
  - Maximum expected annual waste receipt rate
  - Best-estimate release fractions
  - Credit for normal operational radioactive waste processing system (e.g., HEPA filters)
  - Potential for exceeding annual average in any given year addressed by facility administrative controls and limits as well as Structures, Systems, and Components QA classification evaluations
- Category 2: Conservative single event
  - Conservative waste/crud radiological source terms
  - Conservative release fractions
  - Mitigation system credit restricted consistent with safety classification

Meteorology

- Category 1: Annual average
  - Meteorological dispersion and deposition parameters calculated based on site specific measured data
  - Based on annual average meteorological conditions
  - Parameters calculated for each specific offsite receptor (i.e., real member of public) location
- Category 2: Conservative
  - Meteorological dispersion and deposition parameters calculated based on site specific measured data
  - Based on 95th percentile conservative meteorological conditions for duration of Design Basis Event (Reg. Guide 1.145)
  - Parameters calculated for maximum offsite location on or beyond site boundary (i.e., 5 kilometers)

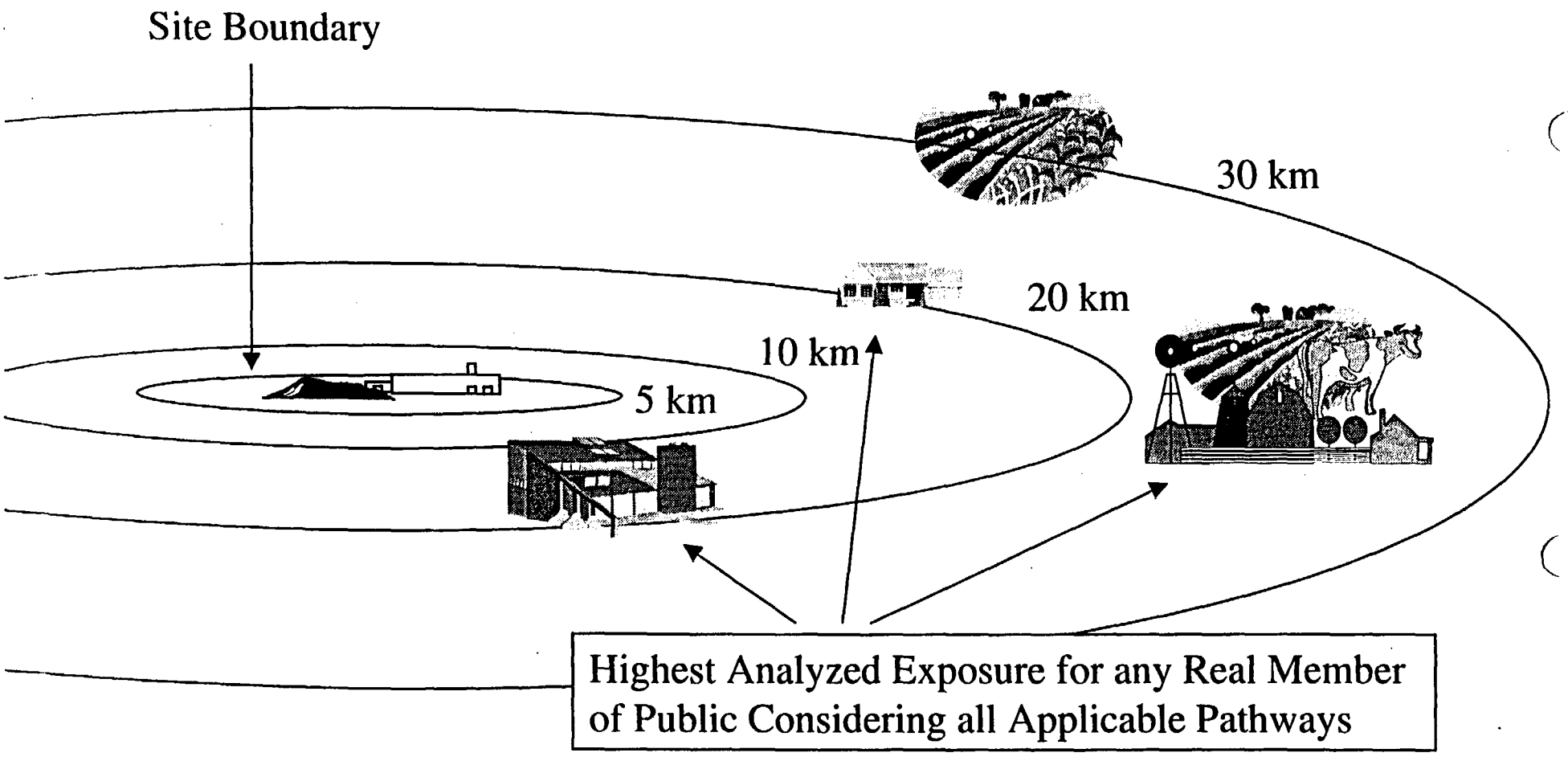
Receptors

- Category 1: Nearest real member of public
  - Site survey conducted to identify residences and agricultural activities in vicinity of site
  - Dose calculations performed for "real individual" locations identified by site survey
  - Dose from all applicable pathways summed for each location
  - Nearest real member of public identified based on maximum calculated dose for any location
- Category 2: Individual at location of maximum dose
  - Maximum location on, or beyond, any point on the boundary
  - Individual assumed present for duration of event

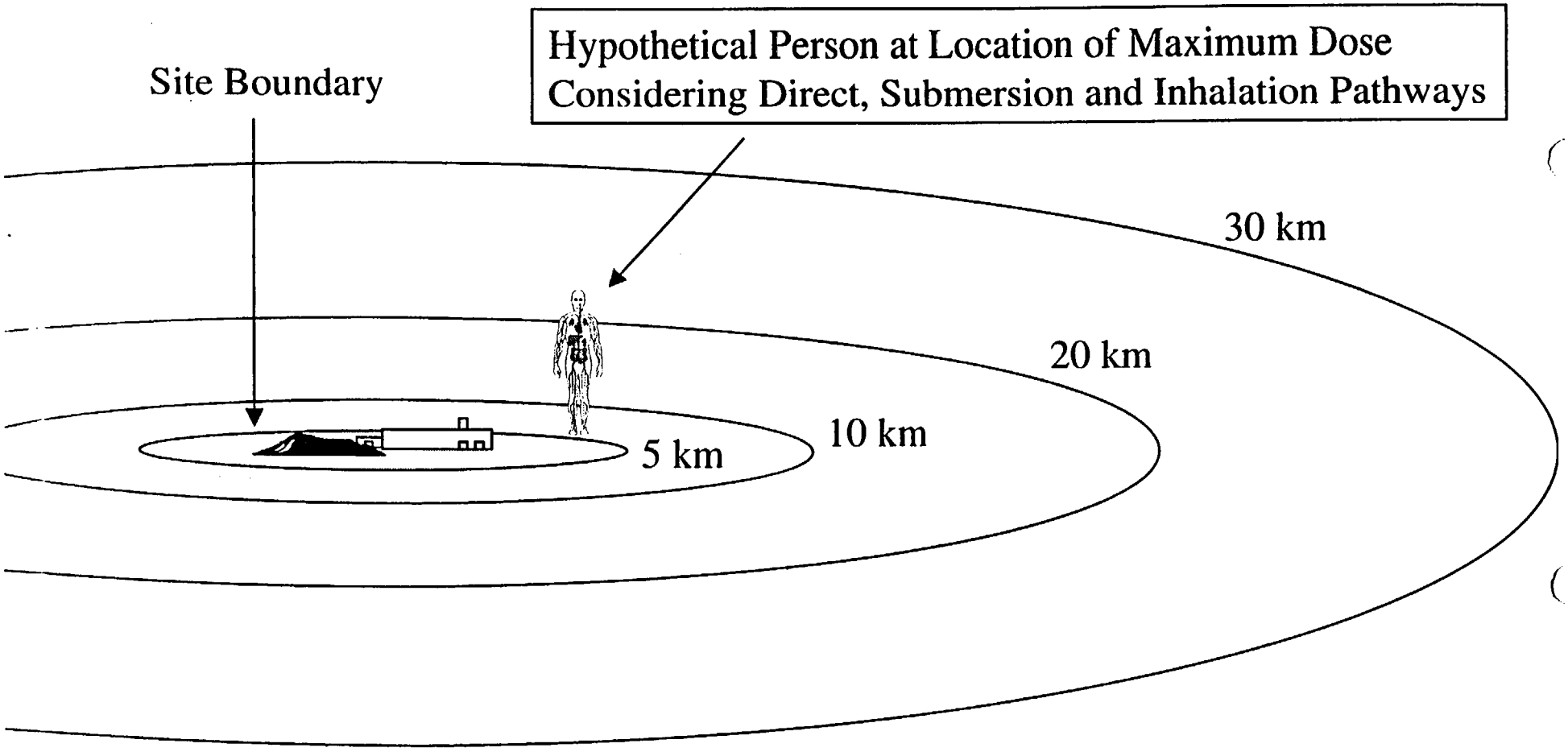
Dose Pathways

- Category 1:
  - All applicable direct, submersion, inhalation, and ingestion pathways to nearest real individual
- Category 2:
  - Dose summed for direct, submersion and inhalation pathways

Category 1 Dose Receptors and Pathways



Category 2 Dose Receptor and Pathways



Conclusions - License Application Approach to Demonstrating Design Basis Event Compliance with 10 CFR 63

- License Application event classification approach consistent with Part 63 Category 1 and Category 2 definitions
- License Application offsite dose acceptance criteria require different dose assessment approaches for each event category
  - Category 1
    - » Annual average summation analysis and dose criteria
    - » Best-estimate source terms and release fractions
    - » Potential for exceeding annual average in any given year addressed by facility administrative controls and limits as well as Structures, Systems, and Components QA classification evaluations
  - Category 2
    - » Single event analysis and dose criteria
    - » Conservative radiological source terms and release fractions

Conclusion - License Application Compliance Approach

DBE Category	Dose Criteria	Analysis Basis
Category 1	25 mrem/yr†	Exposure Source Term: Best-estimate annual average Meteorology: Annual average Receptor: Nearest real member of public Dose Pathways: Direct, submersion, inhalation and ingestion
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Notes:
† Airborne radiological effluent component limited to 10 mrem/yr by 10 CFR 20.1101(d).

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Studies

Quality Assurance Classification and Grading

Presented to:
DOE/NRC Technical Exchange Meeting
on Design Basis Events
Rockville, MD.

Presented by:
Dealis W. Gwyn
CRWMS Management & Operating Contractor

U.S. Department of Energy
Office of Civilian Radioactive
Waste Management

March 31, 1999

Enclosure 4
Attachment 3

Agenda

- Classification/Graded QA
- Quality Level Criteria
- Graded QA Implementation
- Conclusion

Graded QA

- Preferential allocation of resources commensurate with Structures, Systems, and Components safety significance
- Three quality levels based on safety significance
- Quality levels based on risk criteria and/or functions

Implementation Guidance Tools

- NRC Generic Letter 88-20
  - PRA to evaluate Structures, Systems, and Component safety contribution in accordance with Individual Plant Examination Project
- Maintenance Rule, 10 CFR Part 50.65
  - Monitor performance or condition of Structures, Systems, and Components against goals established commensurate with Structures, Systems, and Component Importance to Safety

Implementation Guidance Tools

- NUREG/CR-6407
  - Classification of transportation packaging and dry spent fuel storage system components according to Importance to Safety
- Regulatory Guide 1.176
  - An approach for plant-specific, risk-informed decisionmaking: graded quality assurance

Quality Level I

Criteria

- Failure could directly result in a condition adverse to public safety
- Required to meet offsite dose requirements for Category 1 and 2 Design Basis Event (100 mrem/yr, 5 rem)
- Required for containment and criticality control of high level waste and spent nuclear fuel
- Directly required to meet postclosure performance objectives

Bases/Implementation

- Equivalent to reactor "nuclear safety related"
- Quality Assurance Requirements Document
- Reliance on specified industry codes and standards

Quality Level II

Criteria

- Failure could indirectly result in a condition adverse to public safety (i.e., defense in depth)
- Failure could directly result in an offsite dose in excess of normal guidelines (25 mrem/yr)
- Required for radioactive waste treatment or fire protection systems for QL I Structures, Systems, and Component
- Failure could indirectly result in a condition adverse to waste isolation (i.e., defense in depth)

Bases/Implementation

- Graded QA program
  - Design control
  - Commercially qualified fabricators (e.g., NFPA)
  - Maintenance and surveillance program determined by analysis
- Reliance on specified industry codes and standards

Quality Level III

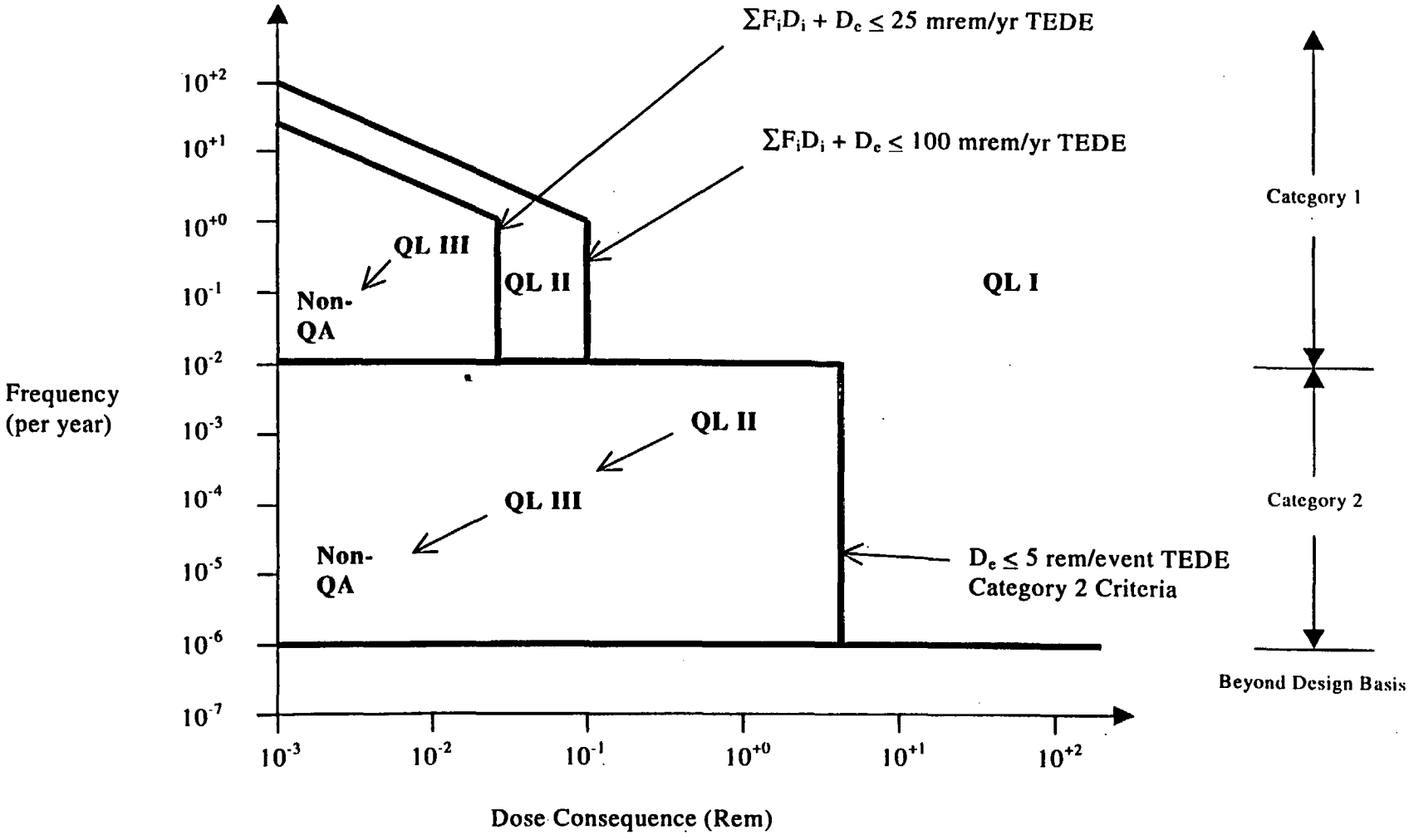
Criteria

- Structures, Systems, and Components required to meet occupational exposure requirements
- ALARA design features
- Radiological, technical specification compliance, and emergency response monitoring functions

Bases/Implementation

- Graded QA program
  - Design control
  - Off-the-shelf
  - Maintenance and surveillance program determined by analysis

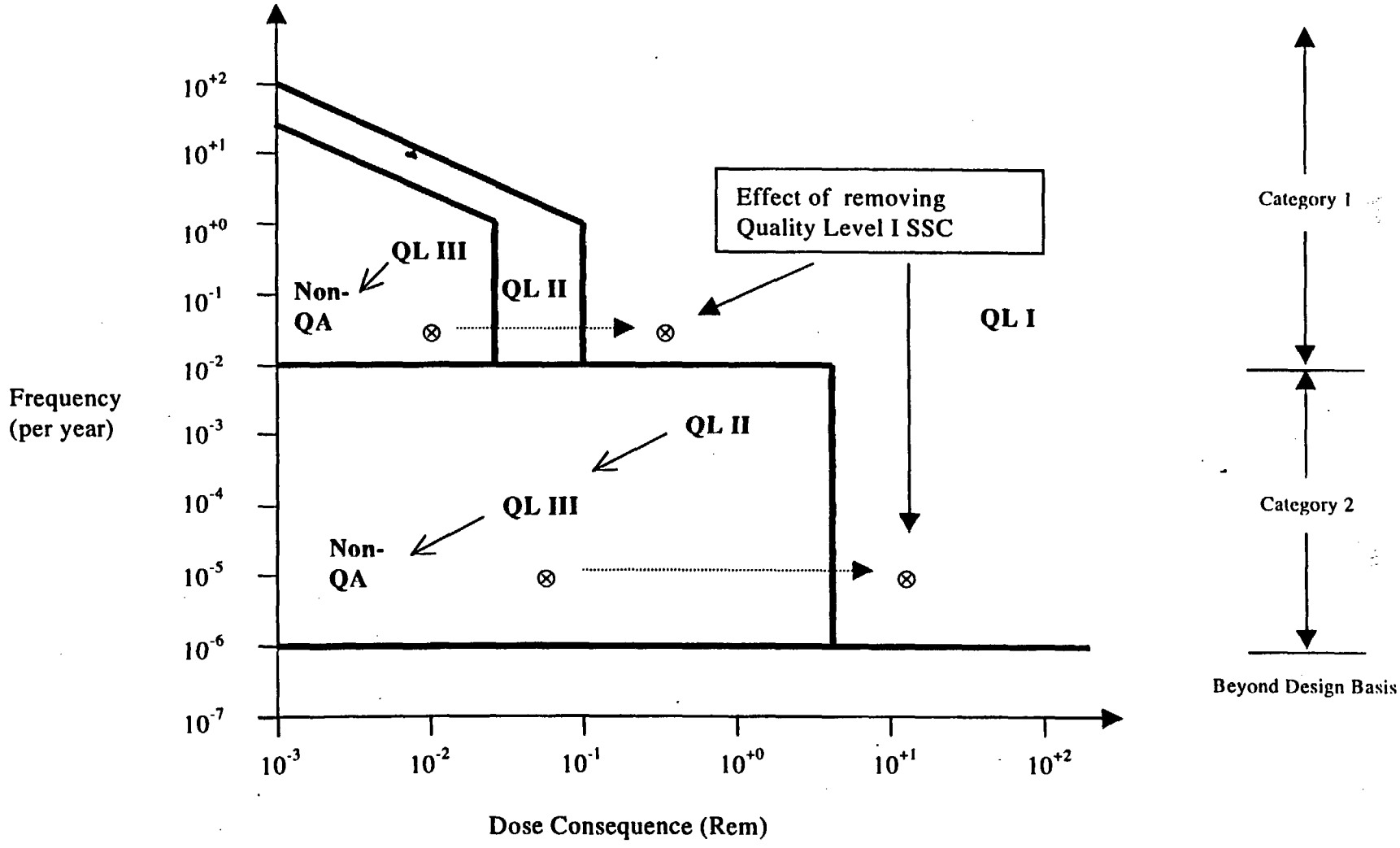
Offsite Dose Classification Criteria



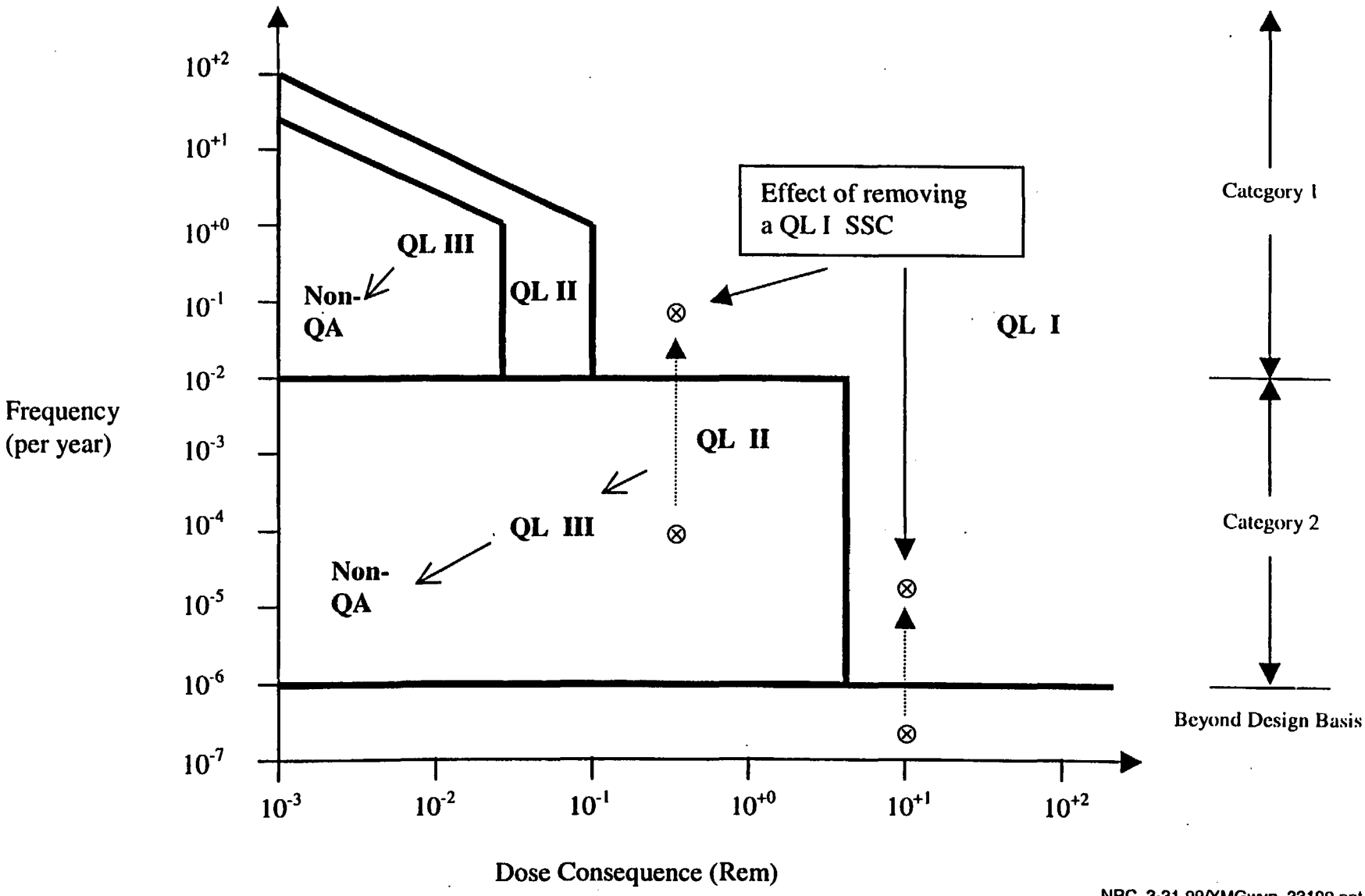
Graded QA Implementation

- Identify candidate Structures, Systems, and Components and activities
- Evaluate risks (qualitative and quantitative)
- Engineering evaluation
- Defense-in-depth consideration
- Assign QA controls commensurate with Structures, Systems, and Components safety significance

QL I Structures, Systems, and Components Required for Offsite Dose Mitigation



QL I Structures, Systems, and Components Required for Prevention



Conclusions

- QA Classification system provides for systematic graded implementation
  - Three quality levels
  - Risk and functional criteria
  - QA controls commensurate with Structures, Systems, and Components safety significance

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PROJECT

Studies

Level of Detail

Presented to:
DOE/NRC Technical Exchange Meeting
on Design Basis Events
Rockville, MD.

Presented by:
Dennis Richardson
CRWMS Management & Operating Contractor

U.S. Department of Energy
Office of Civilian Radioactive
Waste Management

Enclosure 4

Attachment 4

March 31, 1999

Purpose of the White Paper

- To present the criteria to:
  - Determine what will be in the License Application for Construction Authorization
  - Determine what documentation will be in the records system to support the License Application for Construction Authorization
- The level of design detail in the License Application will provide the information to:
  - Ensure the protection of public and worker health and safety
  - Demonstrate compliance with regulatory requirements

Level of Design Detail

- In the License Application
  - Summary and conclusion of the safety analyses
  - Quality Level I (Structures, Systems, and Components to protect the public):
    - » Applicable Codes/Standards
    - » Regulatory Design Basis
    - » Summary Drawings (Electrical, Flow, P&ID, General Arrangement, Handling)

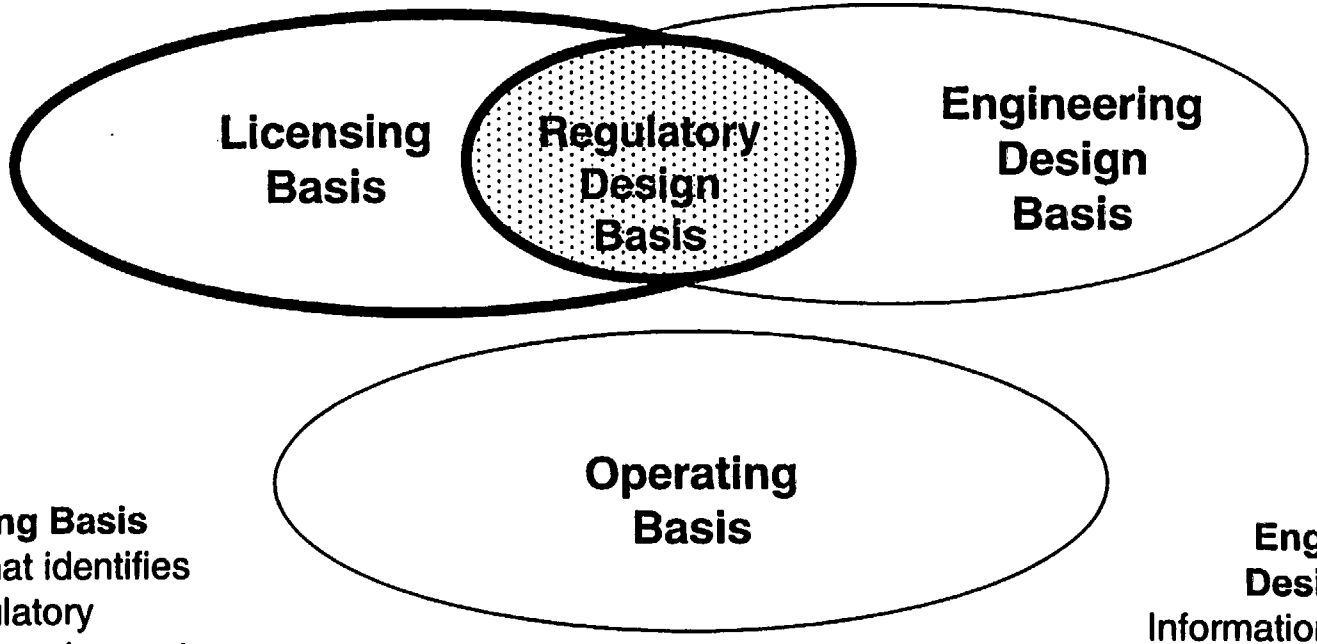
    Design Criteria

    General System Description
  - Quality Level II (Structures, Systems, and Components that indirectly protect the public):
    - » Applicable Codes/Standards
    - » General System Descriptions

    Design Criteria
  - Quality Level III (Structures, Systems, and Components not included above but provide offsite or occupational radiological safety benefits):
    - » General Descriptions

    Design Criteria
  - For nonsafety Structures, Systems, and Components
    - » General Descriptions

Key Program Elements

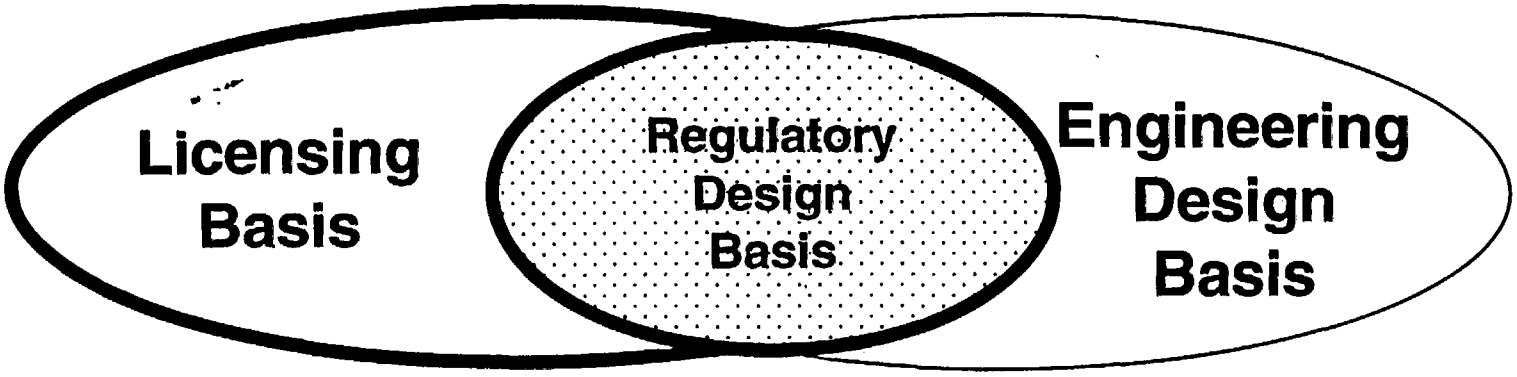


Licensing Basis
Information that identifies Nuclear Regulatory Commission requirements applicable to repository and DOE's written commitments for assuring compliance with and operation within these requirements

Regulatory Design Basis
Design restraints that form the basis for the Nuclear Regulatory Commission staff's safety judgment

Operating Basis
Procedures, practices and processes required to assure plant operation within the bounds of the design

Engineering Design Basis
Information that identifies the specific functions to be performed by a structure, system, or components and the values or ranges of values chosen controlling parameters as reference bounds for design



Licensing Requirements Outside of Design:

QA Program
Emergency Plan
Security Plan
Training
Radiation Safety
Personnel Safety
Shift Staffing
Environmental Protection Agency Limits Post Closure Plan

Regulatory Design Basis Requirements:

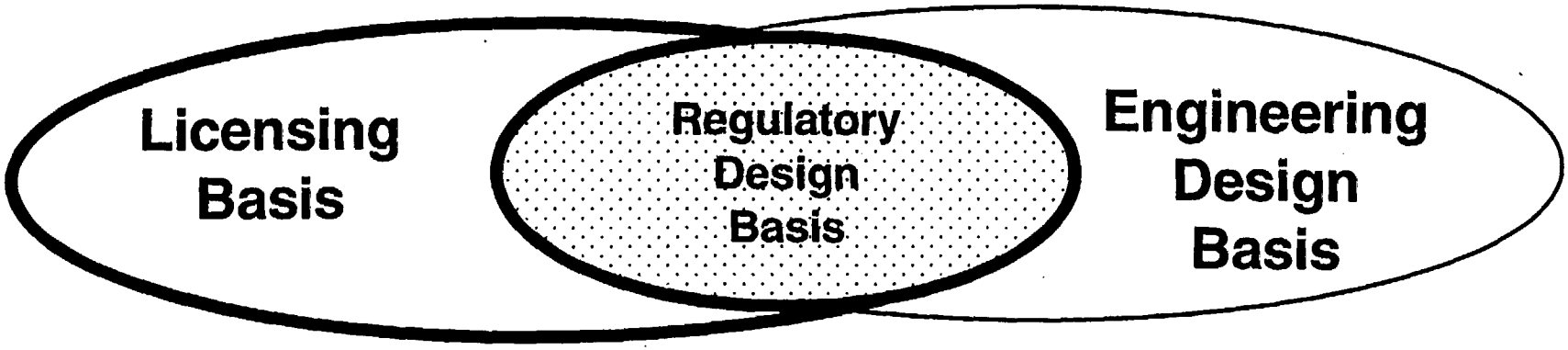
Safety Functions as Describe/Implied in License Application Chapters 7 & 8

or

Specific Design Requirements Imposed by Nuclear Regulatory Commission as a Basis for its approval

General Design Requirements:

Operational Requirements specified in design system/components that are **<u>not required</u>** for accident mitigation or otherwise required by Nuclear Regulatory Commission as a basis for its safety judgment



- Regulatory Design Basis
  - A subset of the engineering design basis included in the current licensing basis that forms the basis for the Nuclear Regulatory Commission staff's safety judgment
  - Information that identifies specific functions to be performed by a structure, system, or component and specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be
    - » (1) restraints derived from generally accepted "state-of-the-art" practices for achieving functional goals or
    - » (2) requirements derived from analysis of the effects of a postulated accident or performance analysis for which a structure, system, or component must meet its functional goals.

License Application Content

- License Application contains a summary of the Licensing/Regulatory commitments that ensure the final design, repository operation and post-closure will not adversely impact public health
- License Application contains a summary of all safety/performance analysis and resulting performance requirements and or constraints on required Structures, Systems, and Components (Regulatory Design Basis)

What is Required to Support the License Application

- DOE will provide the regulatory design basis in the License Application for Nuclear Regulatory Commission review
- DOE will work to the controlled design basis documents that support the License Application
- The License Application requires an understanding of the operational concepts

What is Required to Support the License Application

(Continued)

- Safety Analyses
  - Process flows (for systems involving the handling of radioactive materials)
  - General arrangement drawings
  - General system descriptions
  - Concepts of operations
- QA Classification Analyses

What is Required to Support the License Application

(Continued)

- The documentation of the Regulatory Design Basis associated with those items provided in the License Application for Construction Authorization:
  - Section 1 of the System Description Documents
    - » applicable codes and standards
    - » design criteria and design basis (as applicable to the License Application discussion)
    - » a general system description
  - Analyses used to develop Section 1 of the System Description Documents
  - Summary drawings

Level of Design Detail

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Design Criteria

General System Description

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Design Criteria

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Design Criteria

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Important to Safety

- Important to Safety defined by 63.2 includes 63.111(b)(1) which invokes 10 CFR Part 20
  - Structures, Systems, and Components required for worker radiological protection are Important to Safety
- 63.44 requires a fully documented Unreviewed Safety Question Determination on all changes to a Structures, Systems, and Components that are identified as Important to Safety
  - Applying verbatim compliance, a Structures, Systems, and Components relating solely to worker radiological safety could require a fully documented Unreviewed Safety Question Determination and Nuclear Regulatory Commission approval, even if the change does not have any "significant" impact on worker safety

Important to Safety

(Continued)

- Other Sections of Part 63 also become applicable to all aspects of normal operations
  - 63.153 Physical requirements
    - » Physical condition and general health of personnel certified for operations that are Important to Safety must be evaluated
  - 63.151 General requirements (Training)
    - » Operations of systems and components identified as Important to Safety shall be performed only by trained and certified personnel...
  - 63.142 Applicability (Quality Assurance)
    - » The QA program applies to all Structures, Systems, and Components identified as Important to Safety...

YUCCA
MOUNTAIN
PROJECT

Studies

Integrated Safety Analysis in the License Application

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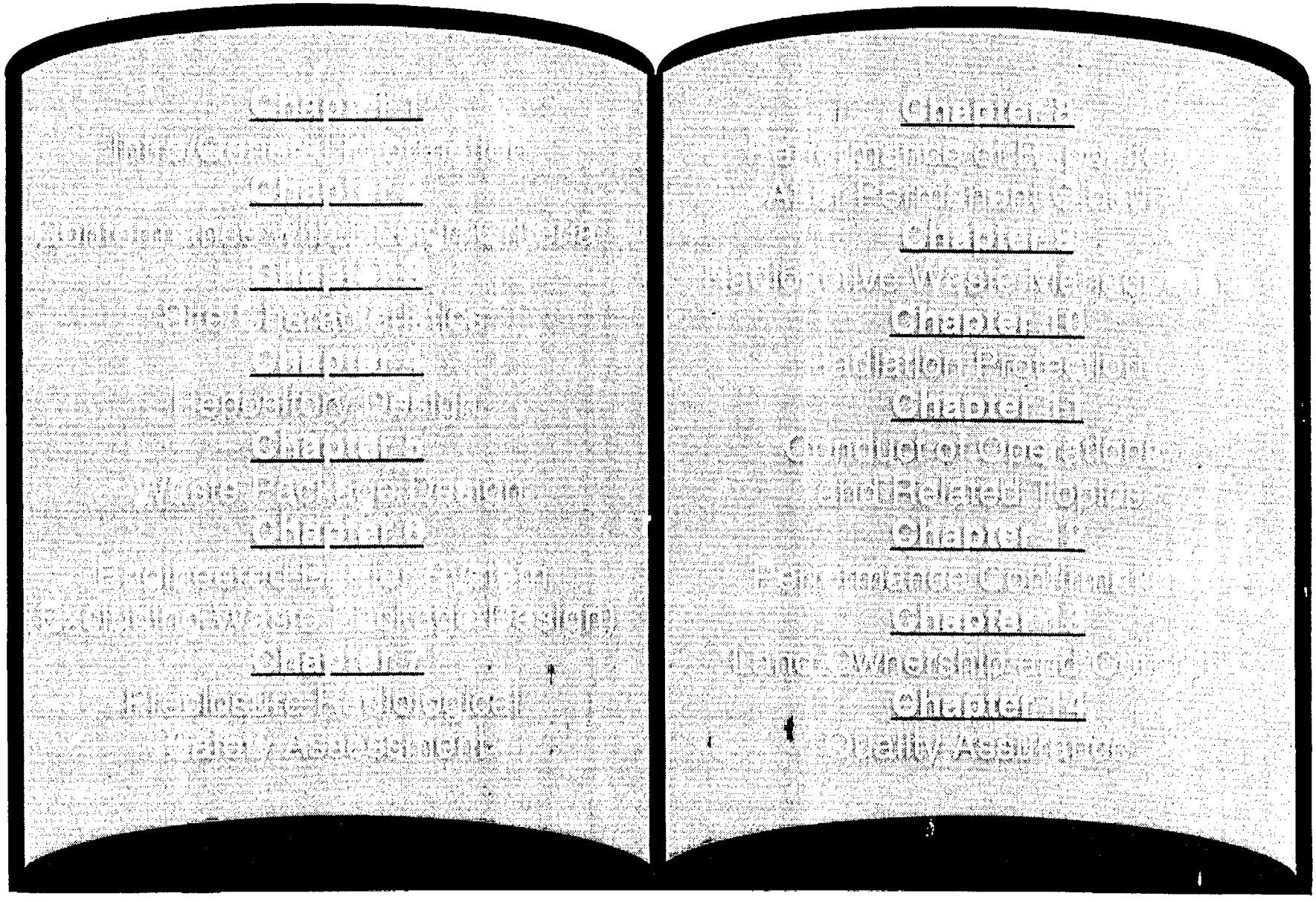
Objective

- Present a plan for addressing Integrated Safety Analysis requirements in 10 CFR Part 63.112 in the License Application

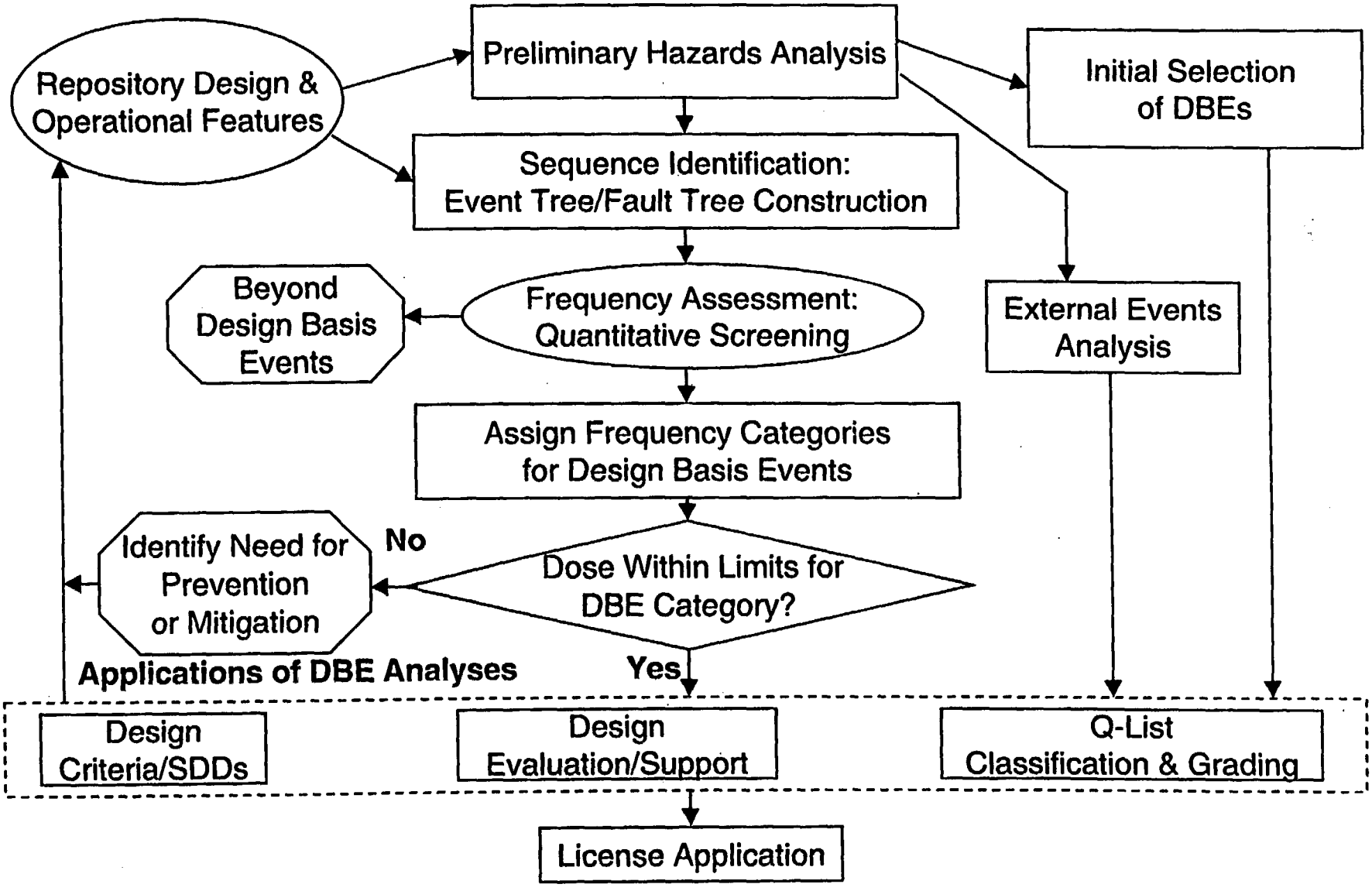
License Application Chapter Layout



Integrated Safety Analysis in the License Application

- Compliance with Integrated Safety Analysis requirements will be demonstrated throughout the License Application
- Chapter 2 will contain a "roadmap" to the specific sections that describe compliance with Integrated Safety Analysis
- Analyses that support Integrated Safety Analysis requirements will be available for review

Implementation of Integrated Safety Analysis



Six Major Integrated Safety Analysis Requirements

• General description of Structures, Systems, and Components and activities	Summarized in Chapter 2
• Identification and Analysis of natural and human-induced hazards (Design Basis Events)	Chapter 7

Six Major Integrated Safety Analysis Requirements

• Site Characteristics	Chapter 3
• Technical Basis for Inclusion/Exclusion of Hazards in the Integrated Safety Analysis	Chapter 7
• Description of the Repository Design and Design Criteria	Chapter 4

Six Major Integrated Safety Analysis Requirements

- Analysis to Identify Important to Safety Structures, Systems, and Components and controls
  - Structures, Systems, and Components to mitigate or prevent Design Basis Events
  - Radiation protection for the repository worker
  - Criticality control
  - Structures, Systems, and Component performance during Design Basis Events
  - Control of site-generated waste

Chapter 7, Chapter 9, and Chapter 10 with reference to other chapters for design details

Conclusion

- Integrated Safety Analysis requirements will be addressed throughout License Application
- Roadmap will be provided that links License Application section to Integrated Safety Analysis requirement