

**U.S. DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT**

**PRESENTATION TO  
THE NUCLEAR WASTE TECHNICAL REVIEW BOARD**

**SUBJECT: HISTORICAL OVERVIEW OF  
DOE SITE-SELECTION CRITERIA  
10 CFR 960**

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# **PRESENTATION TOPICS**

## **THIS PRESENTATION WILL DISCUSS:**

- **HISTORY OF THE DEVELOPMENT OF 10 CFR PART 960 (SITING GUIDELINES)**
- **STRUCTURE OF 10 CFR PART 960, INCLUDING, IN PARTICULAR, SUBPART C: "POSTCLOSURE GUIDELINES" AND ITS CONNECTION TO SUBPART B: "IMPLEMENTATION GUIDELINES" AND APPENDIX III: "APPLICATION..DURING THE SITING PROCESS"**
- **APPLICATIONS OF THE NATURAL SYSTEM GUIDELINES IN THE CIVILIAN RADIOACTIVE WASTE MANAGEMENT PROGRAM**

# **HISTORICAL PERSPECTIVE - I**

**SECTION 112(a) - "GUIDELINES" - OF THE NUCLEAR WASTE POLICY ACT OF 1982 (PUBLIC LAW 97-425) STATES THAT:**

**"NOT LATER THAN 180 DAYS AFTER THE DATE OF THE ENACTMENT OF THIS ACT, THE SECRETARY, FOLLOWING CONSULTATION WITH THE COUNCIL OF ENVIRONMENTAL QUALITY, THE ADMINISTRATOR OF THE ENVIRONMENTAL PROTECTION AGENCY, THE DIRECTOR OF THE GEOLOGICAL SURVEY, AND INTERESTED GOVERNORS, AND THE CONCURRENCE OF THE COMMISSION SHALL ISSUE GENERAL GUIDELINES FOR THE RECOMMENDATION OF SITES FOR REPOSITORIES."**

# **HISTORICAL PERSPECTIVE - I**

(CONTINUED)

## **SECTION 112(a) - "GUIDELINES" - OF THE NUCLEAR WASTE POLICY ACT OF 1982 (PUBLIC LAW 97-425) STATES THAT:**

**SUCH GUIDELINES SHALL SPECIFY DETAILED GEOLOGIC CONSIDERATIONS THAT SHALL BE PRIMARY CRITERIA FOR THE SELECTION OF SITES IN VARIOUS GEOLOGIC MEDIA..SHALL SPECIFY FACTORS THAT QUALIFY OR DISQUALIFY ANY SITE FROM DEVELOPMENT AS A REPOSITORY, INCLUDING FACTORS PERTAINING TO THE LOCATION OF VALUABLE NATURAL RESOURCES, HYDROLOGY, GEOPHYSICS, SEISMIC ACTIVITY, AND ATOMIC ENERGY DEFENSE ACTIVITIES, PROXIMITY TO WATER SUPPLIES, PROXIMITY TO POPULATIONS, THE EFFECT UPON THE RIGHTS OF USERS OF WATER, AND PROXIMITY TO COMPONENTS OF THE NATIONAL PARK SYSTEM.."**

**"...THE SECRETARY SHALL USE GUIDELINES ESTABLISHED UNDER THIS SUBSECTION IN CONSIDERING CANDIDATE SITES FOR RECOMMENDATION ...NOT LATER THAN JANUARY 1, 1985, FOR CHARACTERIZATION..."**

# HISTORICAL PERSPECTIVE -- II

- **DOE ISSUED, AS A FIRST DRAFT, THE “PROPOSED GUIDELINES” IN FEBRUARY 1983, BASED ON**
  - **NWTS PROGRAM OBJECTIVES, SYSTEM PERFORMANCE AND SITE PERFORMANCE CRITERIA**
  - **NAS, IAEA, AND ERDA/OWI CRITERIA**
  - **ADVANCE INFORMATION FROM NRC REGARDING DEVELOPMENT OF 10 CFR PART 60**
  - **NWPA OF 1982**

# **HISTORICAL PERSPECTIVE - II**

(CONTINUED)

- **BASED ON COMMENT AND REVIEW BY THE PUBLIC AND AGENCIES, DOE ISSUED, AS A SECOND DRAFT, THE “ALTERNATIVE GUIDELINES” IN MAY 1983, WHICH OFFERED**
  - **DISCRETE SUBPARTS FOR IMPLEMENTATION, POSTCLOSURE, AND PRECLOSURE**
  - **DEVELOPMENT OF METHODOLOGY FOR APPLYING GUIDELINES TO SELECTION OF SITES FOR CHARACTERIZATION**
- **AFTER ADDITIONAL CONSULTATION WITH THE STATES, INDIAN TRIBES, AND FEDERAL AGENCIES, DOE ISSUED, AS A THIRD DRAFT, THE “REVISED GUIDELINES” IN AUGUST 1983, WHICH WAS**
  - **SUBMITTED TO DOE MANAGEMENT FOR REVIEW AND APPROVAL**
  - **SENT TO THE STATES FOR THEIR INFORMATION**

# **HISTORICAL PERSPECTIVE -- III**

- **IN NOVEMBER 1983, DOE SUBMITTED THE FINAL “REVISED GUIDELINES” TO THE NRC FOR CONCURRENCE**
  
- **THE NRC DECIDED TO APPLY THE FOLLOWING CRITERIA IN MAKING ITS PRELIMINARY CONCURRENCE DECISION**
  - **THE SITING GUIDELINES MUST NOT BE IN CONFLICT WITH 10 CFR PART 60**
  
  - **THE SITING GUIDELINES MUST NOT CONTAIN PROVISIONS THAT MIGHT LEAD THE DOE TO SELECT SITES THAT WOULD NOT BE REASONABLE ALTERNATIVES FOR AN ENVIRONMENTAL IMPACT STATEMENT**
  
  - **THE SITING GUIDELINES SHOULD NOT CONTAIN PROVISIONS THAT ARE IN CONFLICT WITH THE ACT**

# **HISTORICAL PERSPECTIVE - III**

(CONTINUED)

- **IN MARCH 1984, NRC ANNOUNCED THAT, BASED ON THESE CRITERIA, IT WOULD CONCUR WITH THE SITING GUIDELINES PROVIDED THAT DOE MET 7 CONDITIONS, INCLUDING:**
  - **SPECIFY IN GREATER DETAIL HOW THE GUIDELINES WOULD BE APPLIED AT EACH SITING STAGE, INCLUDING SITE NOMINATION AND CHARACTERIZATION (FOR EXAMPLE, SPECIFY IN THE IMPLEMENTATION GUIDELINES WHICH GUIDELINES WOULD BE APPLIED AT EACH STAGE OF SITE SCREENING)**
- **AFTER A SERIES OF 6 MEETINGS BETWEEN NRC STAFF AND DOE REPRESENTATIVES IN MARCH-MAY 1984, AND CORRESPONDING REVISION OF THE GUIDELINES, THE NRC COMMISSIONERS VOTED UNANIMOUSLY TO GRANT CONCURRENCE IN JUNE 1984**
- **THE SITING GUIDELINES WERE PUBLISHED IN THE FEDERAL REGISTER AS 10 CFR PART 960 IN DECEMBER 1984**

# **STRUCTURE OF THE SITING GUIDELINES - I**

## **SUBPART A -- GENERAL PROVISIONS**

- **APPLICABILITY: TO BE USED IN EVALUATING THE SUITABILITY OF SITES FOR THE DEVELOPMENT OF REPOSITORIES; RECOGNITION OF NRC JURISDICTION FOR RESOLUTION OF DIFFERENCES BETWEEN GUIDELINES AND 10 CFR PART 60**
- **DEFINITIONS: DETERMINATION; EVALUATION; LIKELY; MITIGATION; SITING; TO THE EXTENT PRACTICABLE**

# **STRUCTURE OF THE SITING GUIDELINES - I**

(CONTINUED)

## **SUBPART B -- IMPLEMENTATION GUIDELINES**

- **SITING PROVISIONS: DIVERSITY; REGIONALITY; EVIDENCE FOR SITING DECISIONS; BASIS FOR SITE EVALUATIONS**
- **SITING PROCESS: POTENTIALLY ACCEPTABLE SITES; NOMINATION AND RECOMMENDATION OF SITES FOR CHARACTERIZATION; RECOMMENDATION OF SITES FOR REPOSITORY DEVELOPMENT**
- **CONSULTATION; ENVIRONMENTAL IMPACTS**

# **STRUCTURE OF THE SITING GUIDELINES - II**

## **SUBPART C - POSTCLOSURE GUIDELINES**

- **ONE SYSTEM GUIDELINE AND NINE TECHNICAL GUIDELINES**
- **TEN QUALIFYING CONDITIONS AND SIX DISQUALIFYING CONDITIONS**
- **GEOHYDROLOGY, GEOCHEMISTRY, ROCK CHARACTERISTICS, CLIMATIC CHANGES, EROSION, DISSOLUTION, TECTONICS, HUMAN INTERFERENCE (NATURAL RESOURCES AND SITE OWNERSHIP AND CONTROL)**

# **STRUCTURE OF THE SITING GUIDELINES - II**

(CONTINUED)

## **SUBPART D -- PRECLOSURE GUIDELINES**

- **THREE SYSTEM GUIDELINES AND ELEVEN TECHNICAL GUIDELINES**
- **FOURTEEN QUALIFYING CONDITIONS AND ELEVEN DISQUALIFYING CONDITIONS**
- **POPULATION, SITE OWNERSHIP AND CONTROL, METEOROLOGY, OFF-SITE INSTALLATIONS AND OPERATIONS, ENVIRONMENTAL QUALITY, SOCIOECONOMICS, TRANSPORTATION, SURFACE CHARACTERISTICS, ROCK CHARACTERISTICS, HYDROLOGY, TECTONICS**

## **APPENDICES I, II, III, AND IV**

- **NRC AND EPA PERFORMANCE REQUIREMENTS**
- **SITING PROCESS FINDINGS AND TYPES OF INFORMATION FOR SITE NOMINATION**

# **STRUCTURE OF THE NATURAL SYSTEM (POSTCLOSURE) GUIDELINES -- I**

## **SYSTEM GUIDELINES**

- **REQUIRES THAT THE RADIONUCLIDE RELEASES FROM THE WASTE TO THE ACCESSIBLE ENVIRONMENT MEET THE REQUIREMENTS SPECIFIED BY 40 CFR PART 191, AS IMPLEMENTED BY 10 CFR 60.112**
- **REQUIRES THAT THE GEOLOGIC SETTING AT THE SITE WILL ALLOW FOR THE USE OF ENGINEERED BARRIERS TO ENSURE COMPLIANCE WITH THE CONTAINMENT AND GRADUAL RELEASE REQUIREMENTS SPECIFIED BY 10 CFR 60.113(a)(1)**

# **STRUCTURE OF THE NATURAL SYSTEM (POSTCLOSURE) GUIDELINES -- I**

**(CONTINUED)**

## **TECHNICAL GUIDELINES**

### **● EXPECTED CONDITIONS**

- GEOHYDROLOGY**
- GEOCHEMISTRY**
- ROCK CHARACTERISTICS**

### **● POTENTIALLY DISRUPTIVE PROCESSES AND EVENTS**

- CLIMATIC CHANGES**
- EROSION**
- DISSOLUTION**
- TECTONICS**
- HUMAN INTERFERENCE**
  - \* NATURAL RESOURCES**
  - \* (SITE OWNERSHIP AND CONTROL)**

# **STRUCTURE OF THE NATURAL SYSTEM (POSTCLOSURE) GUIDELINES -- II**

## **CONSTRUCT OF THE TECHNICAL GUIDELINES**

- **QUALIFYING CONDITIONS**

- **EXPECTED CONDITIONS**

- (1) COMPATIBILITY OF SITE CHARACTERISTICS WITH  
WASTE CONTAINMENT AND ISOLATION**

- (2) MEETING THE REQUIREMENTS OF**

- (a) SYSTEM GUIDELINE FOR RADIONUCLIDE RELEASES  
TO THE ACCESSIBLE ENVIRONMENT, AND**

- (b) 10 CFR 60.113 (a) (1) FOR THE ENGINEERED BARRIER  
SYSTEM**

# **STRUCTURE OF THE NATURAL SYSTEM (POSTCLOSURE) GUIDELINES -- II**

(CONTINUED)

- **POTENTIALLY DISRUPTIVE PROCESSES AND EVENTS**

- (1) **LOCATE SITE WHERE SUCH PROCESSES AND EVENTS ARE NOT LIKELY TO LEAD TO RADIONUCLIDE RELEASES GREATER THAN THOSE ALLOWED BY THE SYSTEM GUIDELINE**

- (2) **KINDS OF FACTORS THAT MUST BE TAKEN INTO CONSIDERATION WHEN PREDICTING THE LIKELIHOOD OF SUCH PROCESSES AND EVENTS**

- **FAVORABLE CONDITIONS: 29**

- **POTENTIALLY ADVERSE CONDITIONS: 26**

# **STRUCTURE OF THE NATURAL SYSTEM (POSTCLOSURE) GUIDELINES -- III**

## **CONSTRUCT OF THE TECHNICAL GUIDELINES**

### **● DISQUALIFYING CONDITIONS**

- **GEOHYDROLOGY - PRE-WASTE-EMPLACEMENT GROUND-WATER TRAVEL TIME LESS THAN 1,000 YEARS (10 CFR 60.113(a)(2)).**
- **EROSION - PORTIONS OF THE UNDERGROUND FACILITY LESS THAN 200 METERS BELOW GROUND SURFACE**
- **DISSOLUTION - LOSS OF WASTE ISOLATION IS LIKELY BECAUSE OF ACTIVE DISSOLUTION OF THE HOST ROCK**
- **TECTONICS - LOSS OF WATER ISOLATION IS LIKELY BECAUSE OF THE NATURE AND RATE OF FAULT MOVEMENT OR OTHER GROUND MOTION**
- **HUMAN INTERFERENCE (NATURAL RESOURCES) - SIGNIFICANT PATHWAYS HAVE BEEN CREATED BECAUSE OF PREVIOUS EXPLORATION, MINING, OR EXTRACTION ACTIVITIES FOR RESOURCES OF COMMERCIAL IMPORTANCE**
- **HUMAN INTERFERENCE (NATURAL RESOURCES) - INADVERTENT LOSS OF WASTE ISOLATION BECAUSE OF ONGOING OR LIKELY FUTURE ACTIVITIES TO RECOVER VALUABLE NATURAL MINERAL RESOURCES OUTSIDE THE CONTROLLED AREA**

# **APPLICATION OF THE GUIDELINES - I**

**PROCESS OF APPLICATION SPECIFIED IN SUBPART B -  
“IMPLEMENTATION GUIDELINES” AND IN APPENDIX III -  
“APPLICATION OF THE SYSTEM AND TECHNICAL  
GUIDELINES DURING THE SITING PROCESS.”  
SPECIFICALLY --**

## **● 960.3-1-5 - BASIS FOR SITE EVALUATIONS**

- “EVALUATIONS OF INDIVIDUAL SITES AND COMPARISONS BETWEEN AND AMONG SITES SHALL BE BASED ON THE POSTCLOSURE AND PRECLOSURE GUIDELINES...”**
- “...SUCH EVALUATIONS SHALL PLACE PRIMARY SIGNIFICANCE ON THE POSTCLOSURE GUIDELINES...”**
- “...FOR EACH TECHNICAL GUIDELINE, AN EVALUATION OF COMPLIANCE WITH THE QUALIFYING CONDITION SHALL BE MADE IN THE CONTEXT OF THE COLLECTION OF SYSTEM ELEMENTS..., CONSIDERING ON BALANCE THE FAVORABLE CONDITIONS AND POTENTIALLY ADVERSE CONDITIONS...”**
- “COMPARISONS BETWEEN AND AMONG SITES SHALL BE BASED ON THE SYSTEM GUIDELINES, TO THE EXTENT PRACTICABLE...”**

# **APPLICATION OF THE GUIDELINES - I**

(CONTINUED)

- **960.3-2 - SITING PROCESS**

- **SITE SCREENING FOR POTENTIALLY ACCEPTABLE SITES**
- **NOMINATION OF SITES AS SUITABLE FOR CHARACTERIZATION**
- **RECOMMENDATION OF SITES FOR CHARACTERIZATION**
- **RECOMMENDATION OF SITES FOR THE DEVELOPMENT OF REPOSITORIES**

# **APPLICATION OF THE GUIDELINES - II**

- **APPENDIX III SPECIFIES HOW THE POSTCLOSURE AND PRECLOSURE GUIDELINES ARE APPLIED AT THE PRINCIPAL DECISION POINTS IN THE SITING PROCESS**
  - **IDENTIFICATION OF POTENTIALLY ACCEPTABLE SITES**
  - **NOMINATION AND RECOMMENDATION OF SITES FOR CHARACTERIZATION**
  - **RECOMMENDATION OF A SITE FOR REPOSITORY DEVELOPMENT**
  
- **CONCEPT OF LOWER-LEVEL AND HIGHER-LEVEL “FINDINGS” AS APPLIED TO THE QUALIFYING CONDITIONS FOR THE SYSTEM AND TECHNICAL GUIDELINES AND THE DISQUALIFYING CONDITIONS**

# **APPLICATION OF THE GUIDELINES - II**

(CONTINUED)

- **EXAMPLES OF LOWER-LEVEL FINDINGS FOR SITE NOMINATION AND RECOMMENDATION FOR CHARACTERIZATION**

- **“THE EVIDENCE DOES NOT SUPPORT A FINDING THAT THE SITE IS DISQUALIFIED”**
- **“THE EVIDENCE DOES NOT SUPPORT A FINDING THAT THE SITE IS NOT LIKELY TO MEET THE QUALIFYING CONDITION”**

- **EXAMPLES OF HIGHER-LEVEL FINDINGS FOR REPOSITORY SITE SELECTION**

- **“THE EVIDENCE SUPPORTS A FINDING THAT THE SITE MEETS THE QUALIFYING CONDITION AND IS LIKELY TO CONTINUE TO MEET THE QUALIFYING CONDITION”**
- **“THE EVIDENCE SUPPORTS A FINDING THAT THE SITE IS NOT DISQUALIFIED ON THE BASIS OF THAT EVIDENCE AND IS NOT LIKELY TO BE DISQUALIFIED”**

# **APPLICATION OF THE GUIDELINES - III SPECIFIC EXAMPLES**

- **1984: DRAFT ENVIRONMENTAL ASSESSMENTS FOR NINE SITES, INCLUDING THE YUCCA MOUNTAIN SITE**
  - **MAKES LOWER-LEVEL FINDINGS FOR THE QUALIFYING AND DISQUALIFYING CONDITIONS**
  - **COMMON CHAPTER 7 WITH COMPARATIVE EVALUATION OF NINE SITES ON BASIS OF THE QUALIFYING CONDITIONS FOR THE PRECLOSURE AND POSTCLOSURE GUIDELINES**
  
- **1986: COMPARATIVE EVALUATION (MUA) OF SITES NOMINATED FOR CHARACTERIZATION FOR THE FIRST RADIOACTIVE-WASTE REPOSITORY (DOE/RW-0074)**
  - **INCORPORATES ALL NATURAL SYSTEM GUIDELINES INTO MUA POSTCLOSURE OBJECTIVES FOR MINIMIZING ADVERSE HEALTH EFFECTS ATTRIBUTABLE TO REPOSITORY FOR 10,000 AND 100,000 YEARS**

# **APPLICATION OF THE GUIDELINES - III SPECIFIC EXAMPLES**

(CONTINUED)

- **1986: ENVIRONMENTAL ASSESSMENT FOR THE  
YUCCA MOUNTAIN SITE (DOE/RW-0073)**
  - **MAKES LOWER-LEVEL FINDINGS FOR THE QUALIFYING  
AND DISQUALIFYING CONDITIONS**
  
- **1988: SITE CHARACTERIZATION PLAN FOR THE  
YUCCA MOUNTAIN SITE (DOE/RW-0199)**
  - **KEY ISSUES 1, 2, AND 4 INCORPORATE THE  
REQUIREMENTS OF THE POSTCLOSURE AND  
PRECLOSURE GUIDELINE**
  - **ISSUES 1.9, 2.5, AND 4.1 ADDRESS THE HIGHER-LEVEL  
FINDINGS**

# **APPLICATION OF THE GUIDELINES - III SPECIFIC EXAMPLES**

(CONTINUED)

- **1991: EXPLORATORY SHAFT FACILITY  
ALTERNATIVES STUDY (SANDIA REPORT)**
  - **INCORPORATES THOSE NATURAL SYSTEM GUIDELINES  
THAT PROVIDE A BASIS FOR DISCRIMINATING BETWEEN  
AND AMONG ESF OPTIONS INTO PERFORMANCE  
MEASURES FOR CONSEQUENCES AND PROBABILITIES**