

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

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

**SUBJECT: WASTE ACCEPTANCE
OVERVIEW**

PRESENTER: MICHAEL O. CLONINGER

**PRESENTER'S TITLE
AND ORGANIZATION: CHIEF, FIELD ENGINEERING BRANCH
YUCCA MOUNTAIN PROJECT
U.S. DEPARTMENT OF ENERGY
LAS VEGAS, NEVADA**

**PRESENTER'S
TELEPHONE NUMBER: (702) 794-7847**

AUGUST 28-29, 1990

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OUTLINE

- **WASTE ACCEPTANCE OBLIGATIONS**
- **WASTE ACCEPTANCE PROCESS**
- **WASTE ACCEPTANCE REQUIREMENTS**
- **WASTE DISPOSAL INFORMATION NEEDS**
 - **SPENT FUEL CHARACTERISTICS IMPORTANT TO EBS PERFORMANCE**
 - **HIGH-LEVEL WASTE GLASS CHARACTERISTICS IMPORTANT TO EBS PERFORMANCE**
- **WASTE ACCEPTANCE PRELIMINARY SPECIFICATIONS FOR HLW GLASS**

WASTE ACCEPTANCE OBLIGATIONS

- **NWPA (AS AMENDED): ACCEPT, TRANSPORT, STORE, DISPOSE HIGH-LEVEL WASTE (HLW)**
- **STANDARD CONTRACT WITH NUCLEAR UTILITIES FOR SPENT FUEL**
 - **BEGIN 1998; "OLDEST FIRST" RIGHTS**
 - **DETAILS STILL BEING NEGOTIATED**

ACCEPTANCE OBLIGATIONS

(CONTINUED)

- **ACCEPTANCE AGREEMENTS WITH OFFICE OF ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT (EM) FOR DEFENSE AND COMMERCIAL HLW GLASS**
 - ACCEPTANCE DATES UNCERTAIN
 - WASTE ACCEPTANCE PRELIMINARY SPECIFICATIONS (WAPS) AND WASTE PRODUCERS' RESPONSE IS PRESENT FOCUS

- **"GREATER THAN CLASS - C" (GTCC) WASTES**
 - NOT WELL DEFINED
 - NO CURRENT PLANS TO ACCEPT
 - EM TO ISSUE SCOPE OF GTCC REPORT EARLY FISCAL YEAR 1991

WASTE ACCEPTANCE PROCESS

REGULATORY REQUIREMENTS



NRC & EPA



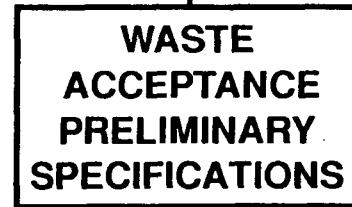
10 CFR PART 60

WASTE ACCEPTANCE,
TRANSPORTATION,
STORAGE, AND DISPOSAL



DOE/OCRWM

ACCEPTANCE REQUIREMENTS

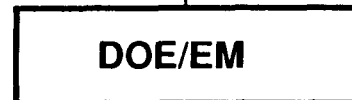


WASTE
ACCEPTANCE
PRELIMINARY
SPECIFICATIONS

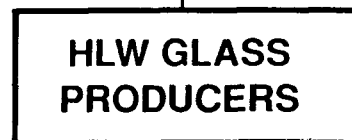


STANDARD
CONTRACT

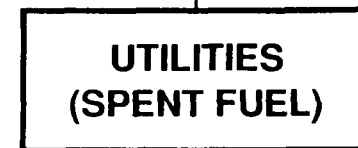
WASTE PRODUCTION
AND INTERIM STORAGE



DOE/EM



HLW GLASS
PRODUCERS



UTILITIES
(SPENT FUEL)

HLW ACCEPTANCE REQUIREMENTS

- **DOE-OCRWM INFORMATION NEEDS**

- **WHAT KIND OF WASTE**
- **HOW MUCH OF EACH TYPE**
- **SPECIFIC CHARACTERISTICS**

- **WHY WE NEED TO KNOW THIS**

- **TRANSPORTATION, STORAGE, DISPOSAL PLANNING,
AND REQUIREMENTS DEVELOPMENT**

BASIS FOR INFORMATION NEEDS

- **AS PART OF REPOSITORY LICENSING (10 CFR 60.113) WE NEED TO SHOW THROUGH TESTS AND CALCULATIONS FOR "ANTICIPATED PROCESSES AND EVENTS"**
 - **SUBSTANTIALLY COMPLETE CONTAINMENT**
 - **CONTROLLED RELEASE OF RADIONUCLIDES**
- **INFORMATION ABOUT THE SPECIFIC DESIGN CRITERIA (10 CFR 60.135) AND BEHAVIOR CHARACTERISTICS OF THE WASTE FORMS IS REQUIRED FOR THESE ANALYSES**

SPENT FUEL CHARACTERISTICS IMPORTANT TO EBS PERFORMANCE

● CHARACTERISTICS

- RADIONUCLIDE INVENTORY AND DISTRIBUTION**
- FUEL MICROSTRUCTURE**
- ROD GAS PRESSURE**
- CLADDING TYPE, OXIDE THICKNESS, HYDRIDE CONTENT, INCIPIENT DEFECTS**
- CRUD THICKNESS AND NATURE**
- BURNABLE POISON CONTENT**

● IN-REPOSITORY PERFORMANCE DATA AND MODELS

- OXIDATION**
- DISSOLUTION**
- GASEOUS RELEASE BEHAVIOR**

SPENT NUCLEAR FUEL INFORMATION: ROLE OF THE MATERIALS CHARACTERIZATION CENTER (MCC)

**MCC ACQUIRES AND CHARACTERIZES THE SPENT
FUELS THAT ARE USED AS THE SOURCE OF**

- **GENERAL SPENT FUEL CHARACTERISTICS DATA**
- **SPENT FUEL TESTING MATERIALS**

**THESE FUELS ARE APPROVED TESTING
MATERIALS (ATMs)**

ATMs - REQUIREMENTS

FOR THE TEST RESULTS AND CHARACTERIZATION DATA TO BE VALID, THE ATMs MUST

- **BE REPRESENTATIVE OF THE ENTIRE SPENT FUEL INVENTORY TO BE DISPOSED OF**
- **HAVE CHARACTERISTICS THAT ARE REPRESENTATIVE OF NOMINAL AND BOUNDING FUELS**

SPENT FUEL ATM SELECTION CRITERIA

- **BURNUP**
- **PERCENT FISSION GAS RELEASE DURING REACTOR OPERATION**

THESE TWO CRITERIA

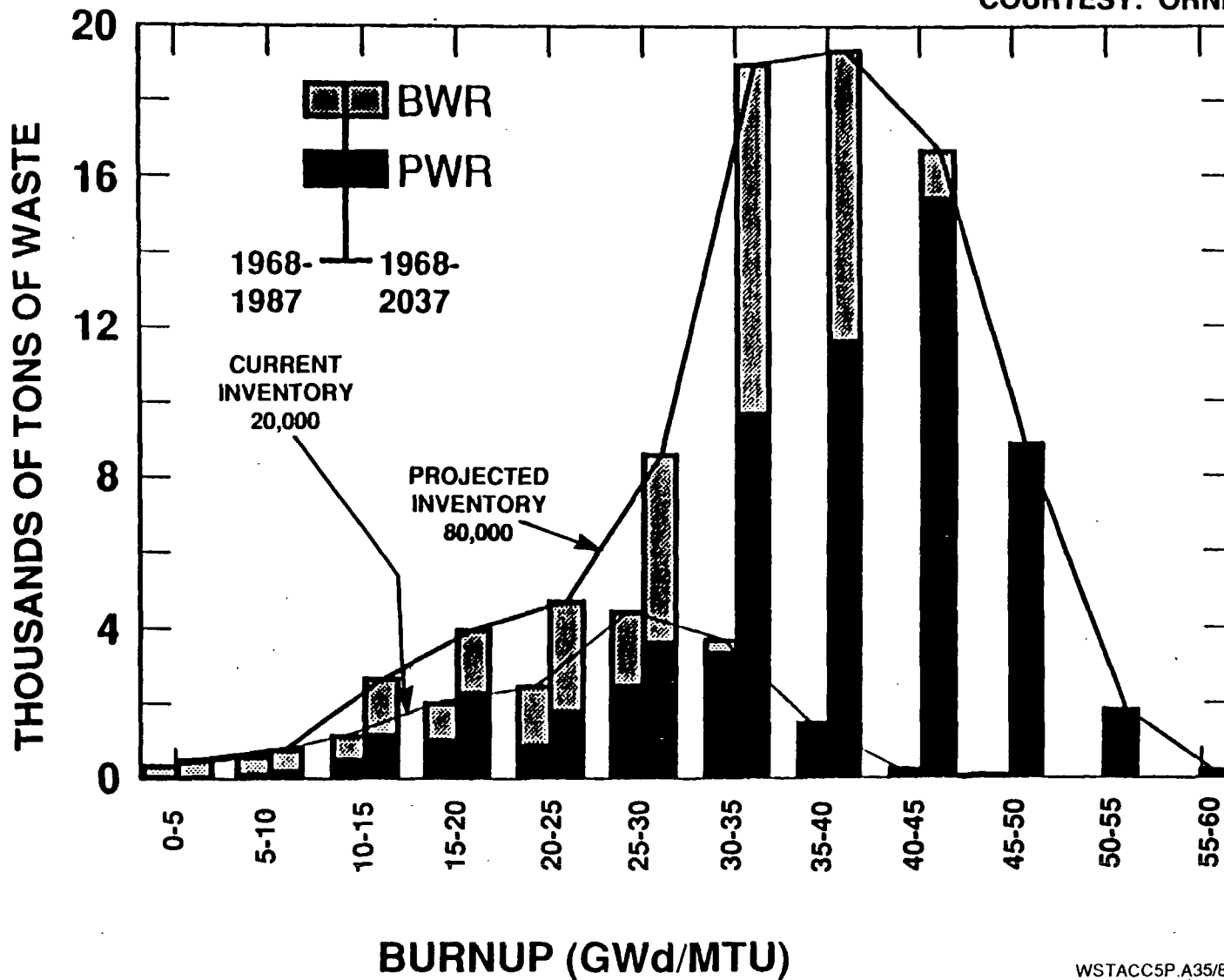
- (1) APPARENTLY CORRELATE WITH MOST PERFORMANCE CHARACTERISTICS OF INTEREST (UNCONFIRMED) AND**
- (2) ARE AVAILABLE OR CAN BE ESTIMATED FOR THE POPULATION**

BASIC APPROACH

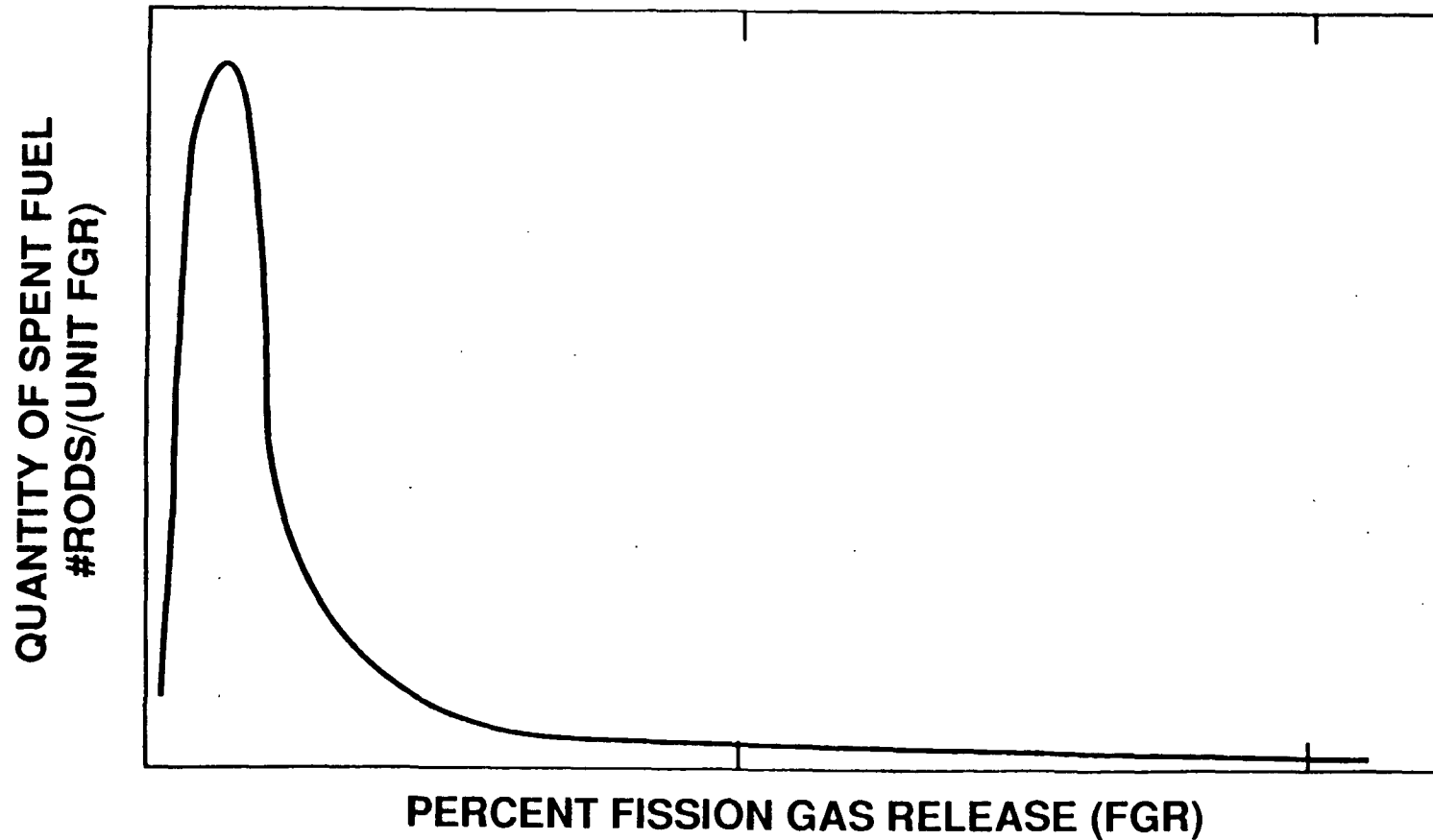
- **REQUIRES COOPERATION FROM UTILITIES AND VENDORS**
- **BURNUP DATA DIRECTLY FROM REACTOR-SPECIFIC DATA BASE FROM ENERGY INFORMATION ADMINISTRATION VIA UTILITIES**
 - **CURRENT INVENTORY AND PROJECTIONS**
- **CALCULATE FISSION GAS RELEASE FOR ABOVE INVENTORY**
 - **BASED ON AVAILABLE CODES AND VENDOR MODELS**

SPENT FUEL INVENTORY- HISTORY AND PROJECTION

COURTESY: ORNL

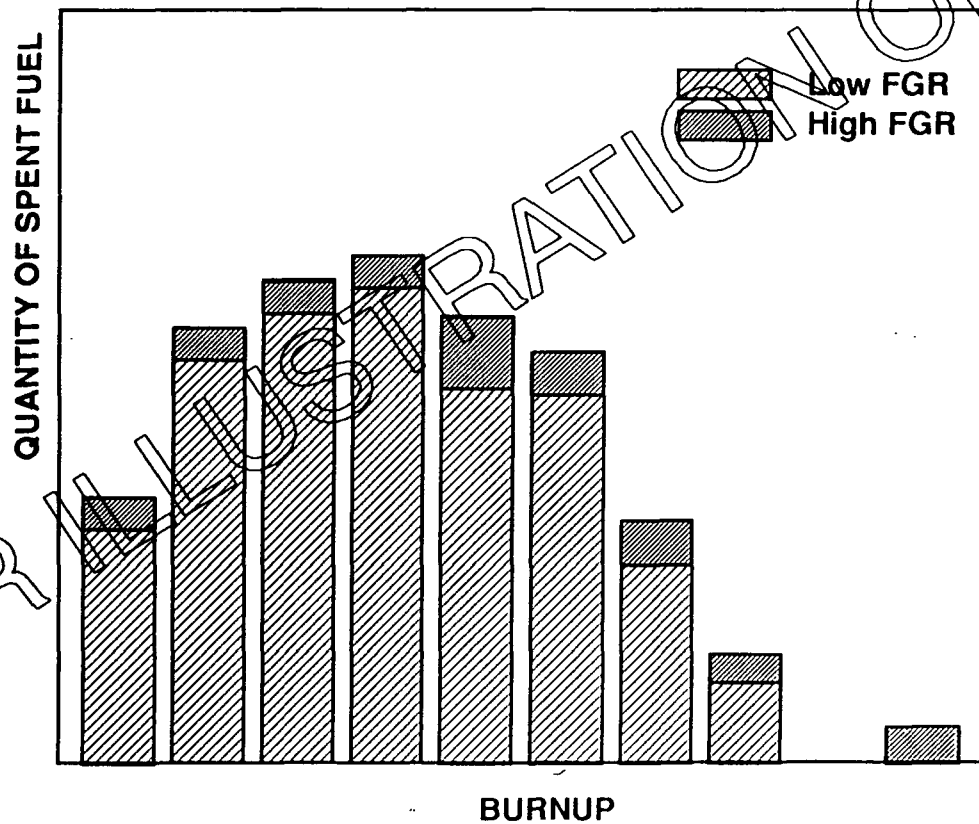


ILLUSTRATIVE ROD POPULATION DISTRIBUTION OF FISSION GAS RELEASE



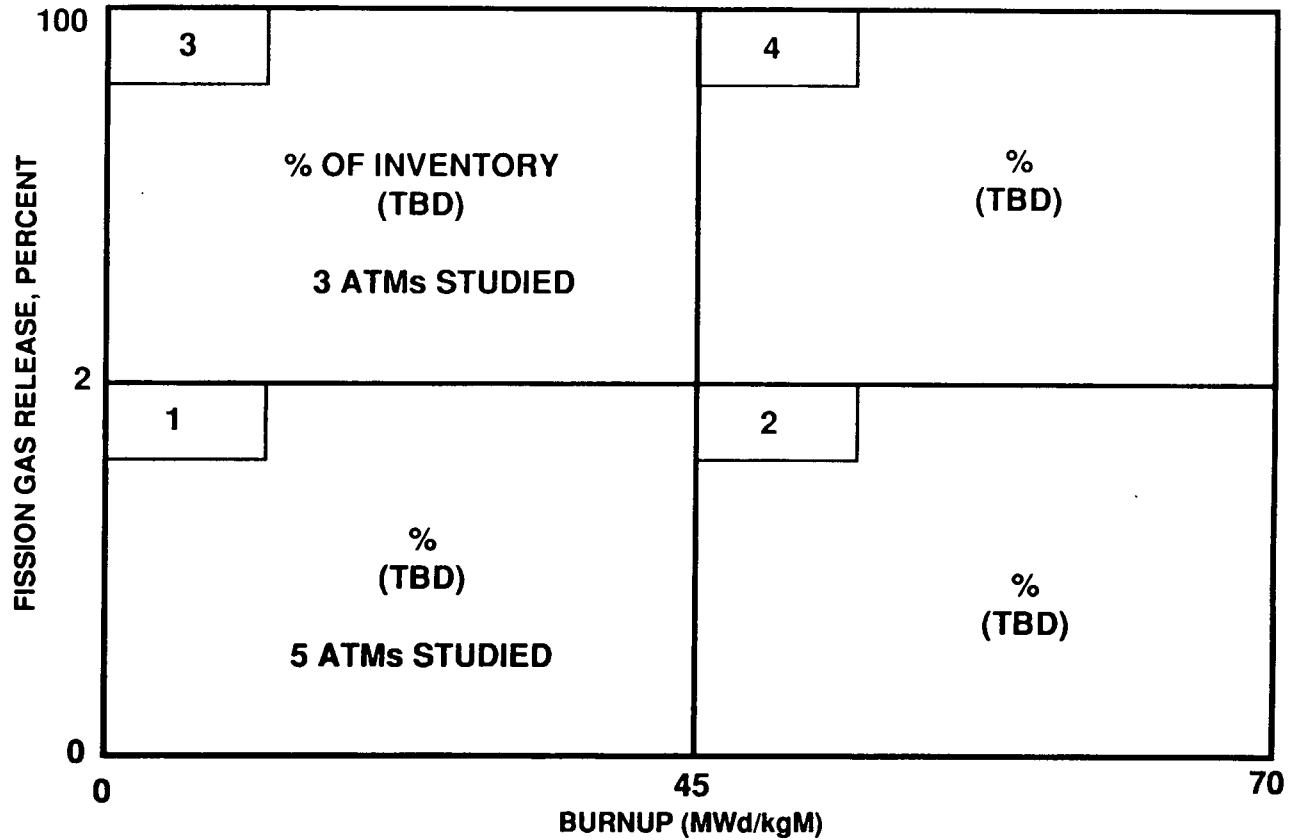
EXAMPLE OF EXPECTED RESULTS

FISSION GAS RELEASE AND BURNUP DISTRIBUTIONS



QUANTITY OF SPENT FUEL

WHAT NEXT?



CLASSIFICATION OF SPENT FUEL POPULATION BY HIGH AND LOW BURNUP AND FISSION GAS RELEASE ALLOWS SELECTION OF REPRESENTATIVE ATMs

HIGH-LEVEL WASTE GLASS CHARACTERISTICS IMPORTANT TO EBS PERFORMANCE

- **CHARACTERISTICS**

- **RADIONUCLIDE INVENTORY**
- **PHYSICAL AND CHEMICAL PROPERTIES**

- **IN-REPOSITORY PERFORMANCE DATA AND
MODELS**

- **DISSOLUTION AND SOLUBILITY BEHAVIOR**
- **ALTERATION BY A WATER VAPOR ATMOSPHERE**

HLW GLASS ACCEPTANCE

- **OCRWM/EM AGREEMENTS ON WASTE ACCEPTANCE PROCESS**
 - **WASTE ACCEPTANCE PRELIMINARY SPECIFICATIONS (WAPS)**
 - **WASTE FORM COMPLIANCE PLAN (WCP)**
 - **WASTE FORM QUALIFICATION REPORT (WQR)**
 - **WASTE FORM PRODUCTION RECORDS (PR)**
- **THESE DOCUMENTS ASSURE OCRWM THAT THE WASTE ACCEPTED IS "AS AGREED"**

WASTE ACCEPTANCE PRELIMINARY SPECIFICATIONS

- **CURRENTLY DRAFTED FOR HLW GLASS**
- **TECHNICAL INFORMATION REQUIRED:**
 - **IDENTIFICATION OF CHEMICAL AND ISOTOPIC COMPOSITION**
 - **MINIMUM LEACH PERFORMANCE**
 - **CHEMICAL AND PHASE STABILITY**
 - **CHEMICAL COMPATIBILITY**
 - **CANISTER MATERIAL, DIMENSIONS, WEIGHT, SEALING, ID, AND HANDLING FEATURES**
 - **LIQUIDS, GASES, COMBUSTIBLES, ETC.**
 - **EXTERNAL CONTAMINATION**
 - **THERMAL OUTPUT, DOSE RATES**
 - **SUBCRITICALITY**
 - **DROP TEST SURVIVAL**
 - **QUALITY ASSURANCE**
 - **NONCONFORMANCE REPORTING**

WASTE ACCEPTANCE PRELIMINARY SPECIFICATIONS

(CONTINUED)

● FINALIZATION DEPENDS ON

- **OCRWM/EM AGREEMENT ON WAPS, WCP**
- **DEFENSE WASTE PROCESSING FACILITY (DWPF) COLD OPERATIONS EXPERIENCE; WQR**

● FINALIZATION DOES NOT DEPEND ON

- **SELECTION OF ANY PARTICULAR SITE AS A REPOSITORY**
- **CONCURRENCE OF ANY PARTIES OTHER THAN OCRWM, EM, AND THE SECRETARY OF ENERGY (HOWEVER NRC INPUT HAS BEEN SOUGHT)**

NRC QUESTIONS

- **WHAT DOES WAPS COMPLIANCE SAY ABOUT QUALIFICATION FOR REPOSITORY SERVICE?**
 - **COMPLIANCE WITH WAPS PROVIDES OCRWM**
 - * **REAL GLASS, NOT FOAM OR CERAMIC**
 - * **COMPOSITION AND GEOMETRY IS BOUNDED**
 - * **PRODUCT IS WITHIN OUR TEST AND MODEL RANGE**
 - * **PRODUCT COMPLIES WITH 10 CFR 60.135**
 - **QUALIFICATION FOR A SPECIFIC SITE AND DESIGN IS ANOTHER STEP FOR OCRWM**

NRC QUESTIONS

(CONTINUED)

- **WHAT ABOUT NON-COMPLYING PRODUCTS?**
 - **WILL BE DETERMINED ON A CASE-BY-CASE BASIS**
 - **OCRWM NEEDS TO KNOW**
 - (a) **WHAT FRACTION?**
 - (b) **HOW BAD?**
 - (c) **WHAT CORRECTIVE ACTION?**
 - (d) **PERFORMANCE LIMITS, IMPACTS?**

DOE OFFICES AND ORGANIZATIONS SUPPORTING ACTIVITIES RELEVANT TO AUGUST 28-29 NWTRB ENGINEERED BARRIER SYSTEM PANEL BRIEFING

