

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

**NUCLEAR WASTE TECHNICAL REVIEW BOARD  
ENGINEERED BARRIER SYSTEM, TRANSPORTATION AND SYSTEMS  
JOINT PANEL MEETING**

**SUBJECT: INTERACTIONS OF REPOSITORY  
AND MULTIPLE-PURPOSE  
CANISTER (MPC) DESIGN**

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**PRESENTER'S TITLE  
AND ORGANIZATION: YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT  
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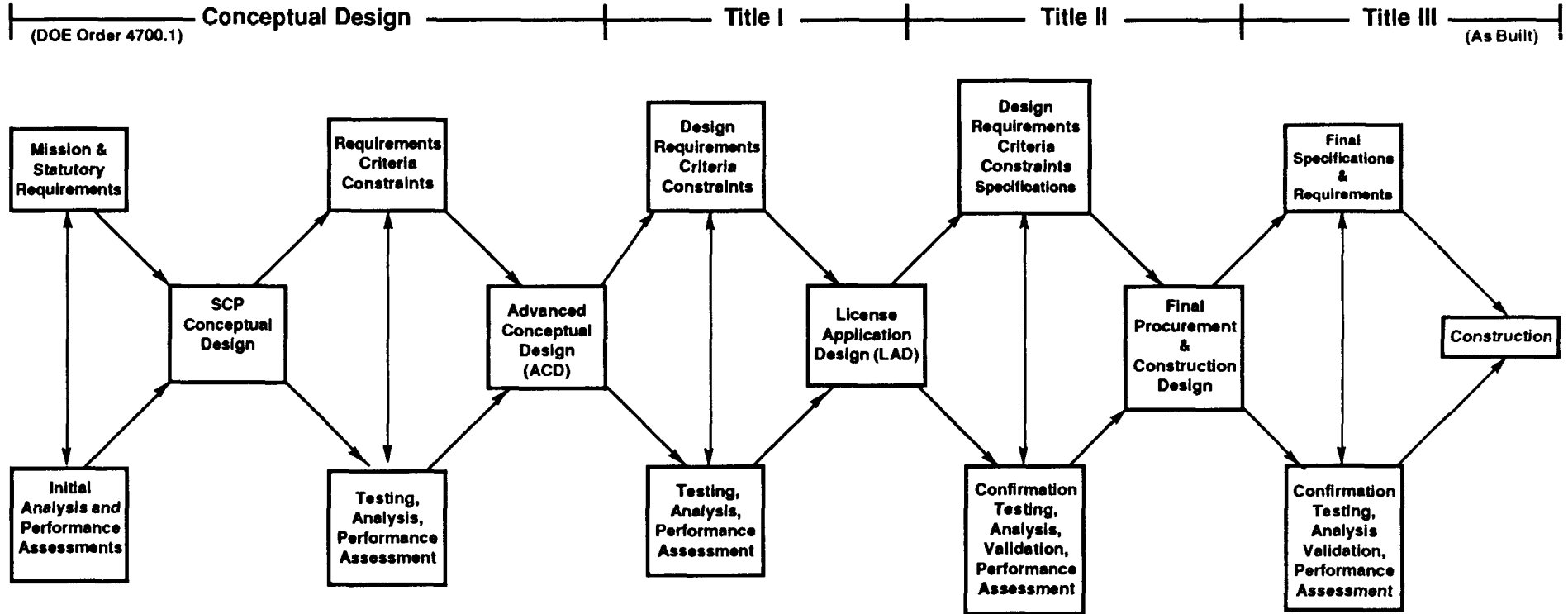
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# **Mined Geologic Disposal System (MGDS)\ Multiple-Purpose Canister (MPC) Risk**

- **The initial MPC design/acquisition process is in advance of the MGDS design/acquisition process**
  - **Many of the MGDS criteria needed to meet the 10 CFR 60 requirements will be established or validated during site characterization**
  - **Until criteria & constraints are established or validated, conservative assumptions are used**

# REPOSITORY/WASTE PACKAGE DESIGN PROCESS



\* Note: (LAD) is a Title I for those items not "important to safety" & "waste isolation" and a Title II for those items "important to safety" & "waste isolation"

# **Key MGDS Criteria/Constraints Needed to Meet 10 CFR 60**

- **Thermal Loading**
- **Criticality Control**
- **Containment**
- **Filler Materials**
- **Container Temperature**
- **Basket and Shield Plug Material**
- **Internal Interactions**
- **Unique Identification**
- **Handling and Grappling**

# **Key MGDS Criteria/Constraints Needed to Meet 10 CFR 60 (Continued)**

- **Concept of Operation**
- **Emplacement Mode**
- **Backfilling**
- **Retrieval**
- **Repository Layout and Size**
- **Drift Size**
- **Ventilation Requirements**

# Thermal Loading

- **Extensively investigated**
  - **Discussed Later**

# Criticality Control

- **"The calculated effective multiplication factor ( $k_{eff}$ ) must be sufficiently below unity to show at least a 5% margin, after allowance for the bias in the method of calculation and the uncertainty in the experiments used to validate the method of calculation"**  
**(10 CFR 60.131 (b)(7))**
  - Assume burnup credit

# Containment

- **"Containment of HLW within the waste packages will be substantially complete for a period to be determined by the Commission . . . not less than 300 nor more than 1,000 years after permanent closure of the geologic repository" (10 CFR 60.113(a)(ii)(A))**
  - **Container material will be of a qualified material whose performance will meet the NRC requirement**
  - **Closure must consist of a full-penetration weld at least equal to the minimum wall thickness such that the NRC requirement is met**
  - **Credit for containment will be provided by disposal container**



# Filler Materials

- **Filler materials could perform several functions:**
  - **Provide spent fuel rod mechanical stability**
  - **Assist in heat removal**
  - **Provide chemical buffering**
  - **Provide barrier to radionuclide migration**
  - **Assist in criticality control**
- **MPC design will allow possibility of the addition of filler materials at the repository**

# Concept of Operation

- **MPC design considered the following:**
  - **The development, emplacement, and retrieval operations, such as weight, heat output, and shielding requirements**
  - **Remote handling of waste packages throughout the repository.**
  - **Waste transport, emplacement, retrieval, and relocation equipment need to be developed for handling the anticipated MPC weight and radiation level**