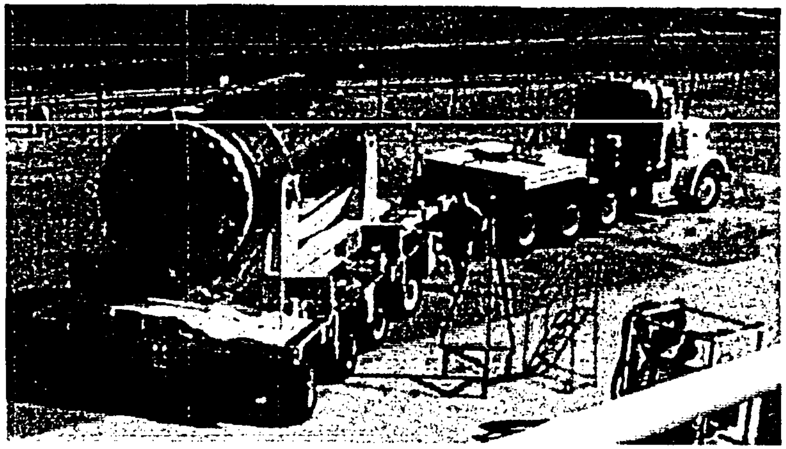


Part 50 License Amendment Request (LAR) for Dry Storage Loadings at Oconee

Presentation to the
United States Nuclear Regulatory Commission (NRC)
Rockville, MD
March 22, 2006

Enclosure 2

Purpose

- **Provide Information to the NRC Concerning:**
  - Duke's recent LAR for dry cask loading at Oconee in response to Regulatory Issue Summary (RIS) 2005-05
  - Duke's requested schedule for NRC approval of the LAR
  - Duke's schedule to resume Oconee dry storage loadings (currently suspended until the LAR is approved)
- **Discussion**
  - Obtain any NRC feedback and address initial questions
  - Determine how Duke might support the review process

Duke Representatives

- **Oconee Nuclear Site**
  - Reene' Gambrell - Regulatory Compliance
  - Carl Fago - Supervisor, Reactor Team
- **Nuclear General Office**
  - Steve Nesbit - Mgr. Spent Fuel Management
  - Joe Coletta - SFM (criticality analyst)
  - William Murphy - SFM (criticality analyst)
  - Gary Walden - SFM (lead for ONS ISFSI)

Overview

- Background (Nesbit)
- LAR Overview (Gambrell)
- Criticality Analysis (Coletta)
- Closing (Gambrell)
- Discussion (ALL)

Background

- **Pre-Submittal Meeting** (November 1, 2005)
  - **Informed NRC of Duke's Response to RIS 2005-05**
    - **Oconee dry storage systems had not been shown to meet requirement of 10 CFR 50.68(b) for subcriticality in unborated water**
    - **Planned dry storage loadings suspended**
  - **Informed NRC of Plan to Submit LAR**
    - **LAR scope: all dry storage systems used at Oconee**
    - **Technical approach: credit for fuel assembly burnup; partial soluble boron credit for SFP**
    - **Planned submittal date: March 1, 2006**
    - **Requested approval date: June 1, 2006**
  - **NRC provided feedback on LAR, technical approach, and schedule**

LAR Overview

- General
  - Submitted March 1, 2006
  - Requests Issuance of Amendment by June 1, 2006
- Criticality Analysis
- Oconee Compliance with 10 CFR 50.68(b)
  - NRC Recommendation from Pre-submittal Meeting
- Technical Specifications (TS)
  - **New 3.7.18 and Associated Bases** (Dry Spent Fuel Storage Cask Loading and Unloading)
    - Specifies minimum burnup and cooling time for fuel assemblies in dry spent fuel storage cask while in SFP
    - Covers all fuel types eligible for Oconee dry storage systems
    - Format similar to 3.7.13 for Fuel Assembly Storage (for spent fuel storage racks)

LAR Overview

- **Technical Specifications (Cont'd)**
  - **New 4.4** (Dry Spent Fuel Storage Cask Loading and Unloading)
    - **Specifies design features associated with criticality**
    - **Similar to 4.3 for Fuel Storage**
    - **NUHOMS®-24P and NUHOMS®-24PHB specified rather than center-to-center pitch**
  - **Revised 3.7.12 and Associated Bases** (Spent Fuel Pool Boron Concentration)
    - **Current limits maintained**
    - **Applicability revised to include when fuel assemblies are in a dry spent fuel storage cask located in the SFP**
    - **Revised B3.7.12 provides revised basis for TS**
- **Commitments**
  - **Oconee UFSAR to be updated prior to June 30, 2007**

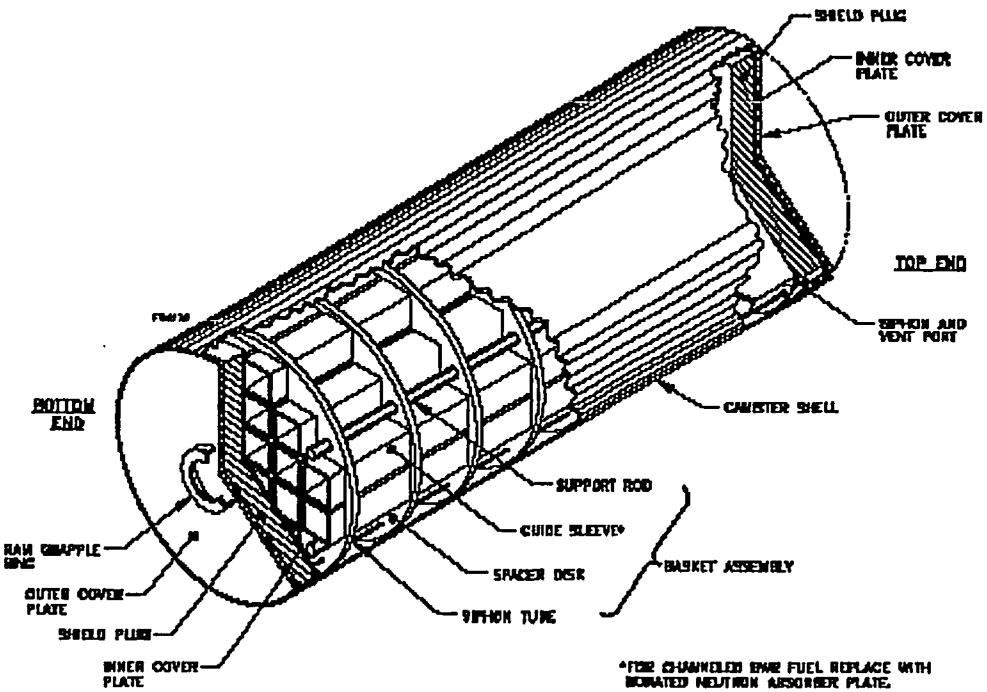
Criticality Analysis

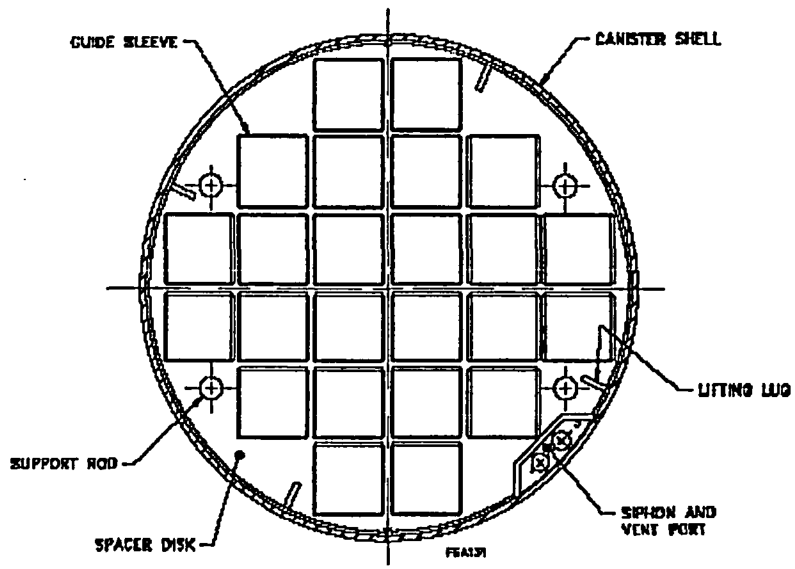
- **Addresses All Oconee Dry Fuel Storage Systems**

License	Storage System	Soluble Boron Required During Loading?	Number of Canisters	Time Period
Site-Specific	NUHOMS®-24P	yes	40 (loaded)	1990-1996
General	NUHOMS®-24P	yes	44 (loaded)	1999-2005
General	NUHOMS®-24PHB	yes	28 (to be loaded)	2005-2009

Criticality Analysis

- **NUHOMS®-24P and NUHOMS®-24PHB Systems Have Common Basket Design** (Encl 3, Sec 2)

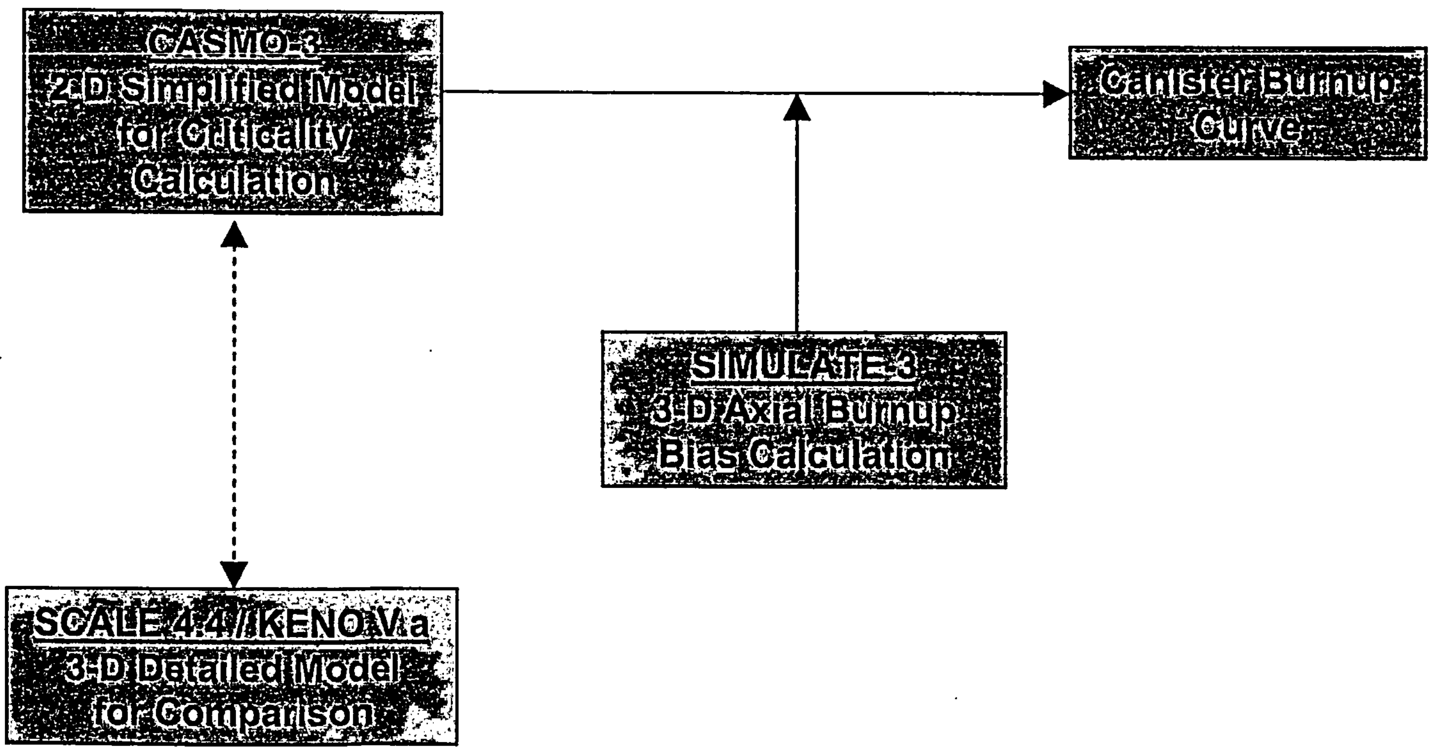




Source: NUHOMS® FSAR, Rev. 8, June 2004

Criticality Analysis

- **Roadmap to Fuel Burnup Requirements** (Encl 3, Secs 6.3 and 6.4)

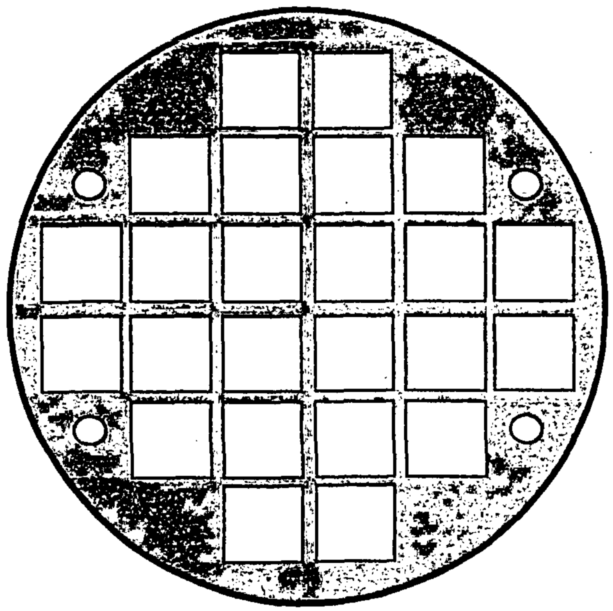


Criticality Analysis

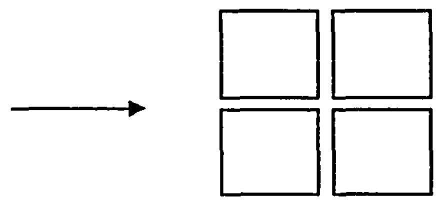
- **Codes Used for Analysis** (Encl 3, Secs 6.3 and 6.4)
  - SCALE 4.4 / KENO V.a
    - 3-D full detail canister model with fresh fuel
    - Used to demonstrate conservatism of CASMO-3 (and validate CASMO-3 2-D fresh-fuel cases)
  - CASMO-3
    - Base 2-D model calculations
    - Burnup credit computations
      - Reactor depletion
      - 2-D dry storage canister "rack" calculations with burned fuel
  - SIMULATE-3
    - 3-D axial burnup bias determination
    - Axial bias applied to 95/95 k-eff calculations where positive

Criticality Analysis

- **Geometric Models** (Encl 3, Sec 6.3)



3 different fuel assembly spacings (KENO V.a)



1 representative spacing
for infinite lattice
(CASMO-3)

Criticality Analysis

Duke Power®

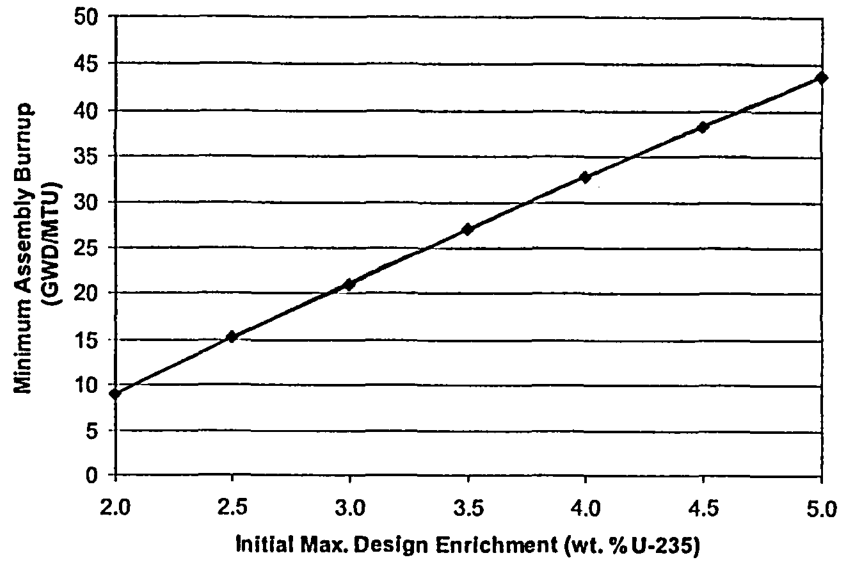
- **CASMO-3 Computational Canister Model** (Encl 3, Secs 3 and 6.2)
  - 2-D infinite lattice
    - No axial or radial canister leakage credited
  - Single representative fuel assembly spacing
    - Conservatism is demonstrated
  - Full density moderator in dry storage canister
    - Water temperature up to 150°F ("off-normal" up to 212°F)
  - Fuel designs: Mark B2-B8; B9; B10; B10L
  - Conservative reactor depletion parameters
  - Credit for 5 years post-irradiation cooling time

Criticality Analysis

- **Criticality Analysis Results** (Encl 3, Sec 6.5)
  - Criticality calculations performed per 10 CFR 50.68 (b) and Kopp guidance
    - Credit for 430 ppm soluble boron (same as current Oconee SFP licensing basis)
  - Max 95/95 k_{eff}s for normal conditions:
    - No boron – 0.9980
    - 430 ppm boron credit – 0.9264
  - Worst-case accident condition (per Kopp) is misload
    - Single 5.0 wt % unirradiated fuel assembly "misloaded" in NUHOMS®-24P/24PHB canister
    - Requires 630 ppm soluble boron (2220 ppm available)

Criticality Analysis

- **Analysis Results [continued]** (Encl 3, Sec 6.5)
  - Curve specifies minimum burnup based on maximum initial enrichment / minimum 5 years cooling time
  - Single "region" within dry storage canister
  - Applies to all eligible fuel types analyzed
  - Applicable to NUHOMS®-24P and NUHOMS®-24PHB



Criticality Analysis

- **Conservatisms in Analysis** (Encl 3, Sec 6.2)
  - Infinite lattice (radial and axial) canister model (~ 0.04 Δk)
  - Mechanical and burnup-related uncertainties (> 0.01 Δk)
  - In-reactor depletion parameters
    - Boron concentration (700 ppm)
    - Moderator temperature (630 °F)
    - Discrete BP presence (25 GWD/MTU exposure, max B_4C poison loading)
    - Fuel temperature (1054 °F)
  - Axial burnup bias (linear function of assembly burnup)
  - Most reactive eligible fuel assembly design

Closing

• Pre-Submittal Meeting	11/1/05	✓
• LAR Submitted	3/1/06	✓
• Requested NRC approval	6/1/06	
• Load 4 Dry Storage Canisters	6/19 - 8/18/06	
• Outage Preparation Starts*	8/21/06	
• Unit 1, EOC 23 Refuel Outage	Fall 2006	

* Must load 2 canisters to avoid outage impacts