



# NRC DSFM Experiences

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SCALE User's Workshop  
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# Overview

- NRC's DSFM/CSRAB
- Evaluation Process
- Independent, Confirmatory Calculations
- Recent SCALE uses, experience

# Who we are, what we do

- NRC's DSFM/CSRAB
- Evaluate shielding design & performance of:
  - RAM packages
  - SNF dry storage systems and ISFSIs
- Issue:
  - CoCs for RAM packages and SNF storage systems
  - Licenses for specific license ISFSIs

# Evaluation Process – Applicant’s Analysis

- Fit with design specifications
- Adequately account for:
  - Features that can affect shielding performance
    - Transport – shipment configuration, NCT, HAC
    - Storage – Operations stages, off-normal conditions, accidents
  - Different contents and contents configurations
  - Different allowable configurations of

# Evaluation Process – Independent, Confirmatory Calculations

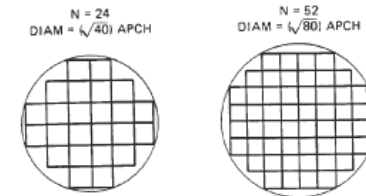
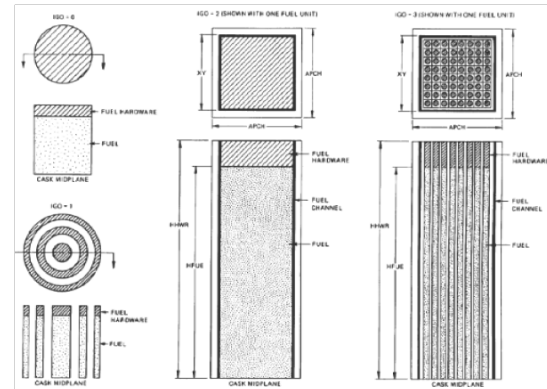
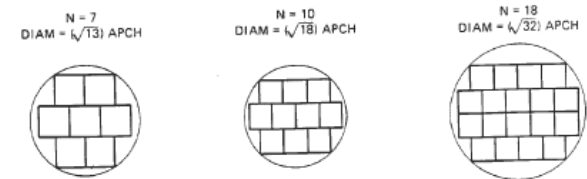
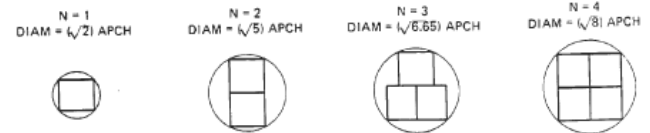
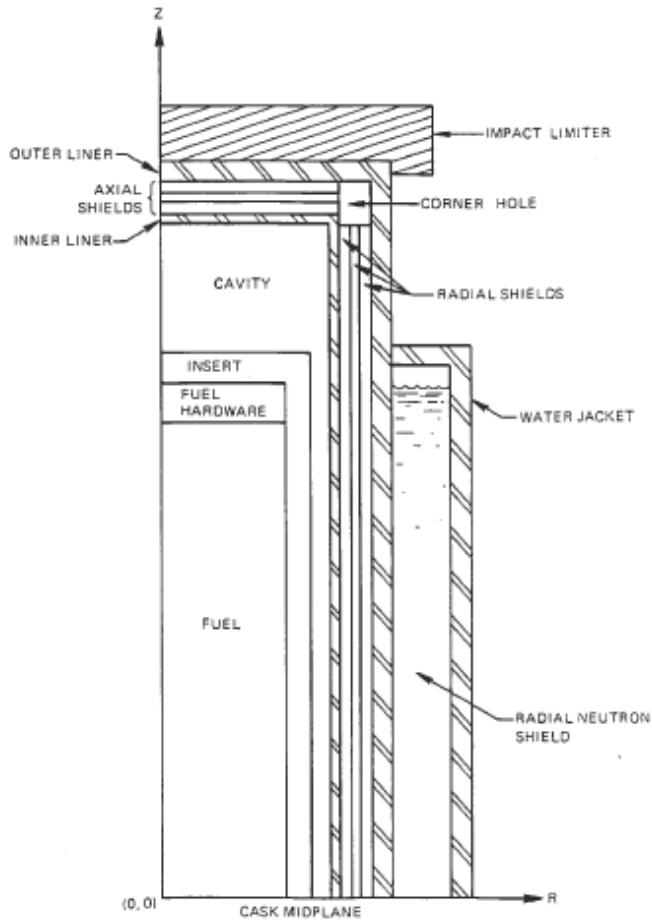
- Extent used based on:
  - Staff experience, design/contents complexity, expected dose rates/doses, margins to limits
- Helpful to:
  - Identify potential issues, determine issues need to pursue, confirm adequacy of applicant's evaluation
  - Independence to extent practical
- Independence: Different methods, codes, etc

# Recent SCALE Uses

- Transportation
- Storage
- Template Development

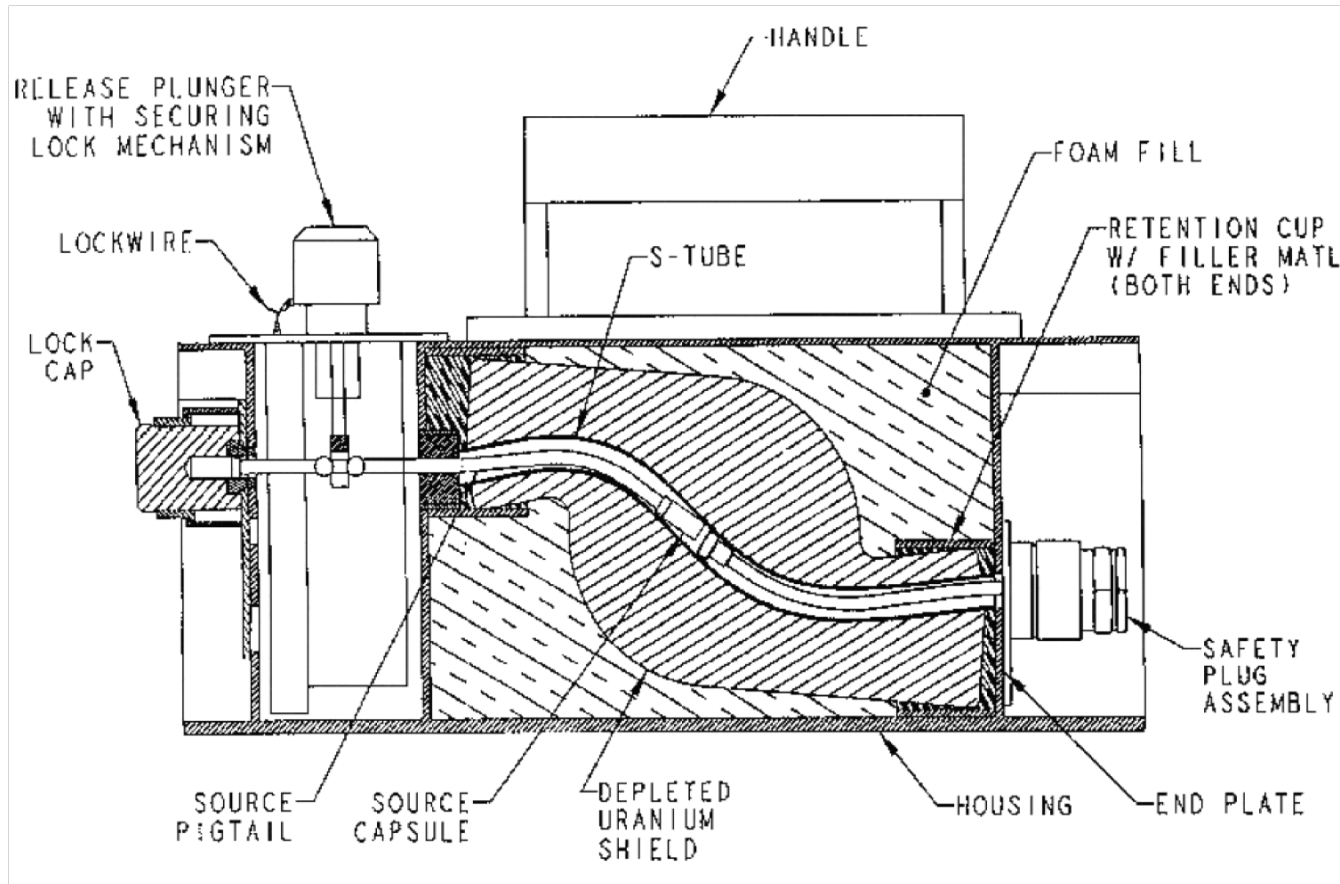
# A Brief Note - SAS4

DRNL-DWG 95-17992



Spent Fuel Package Model  
Parameters and Options

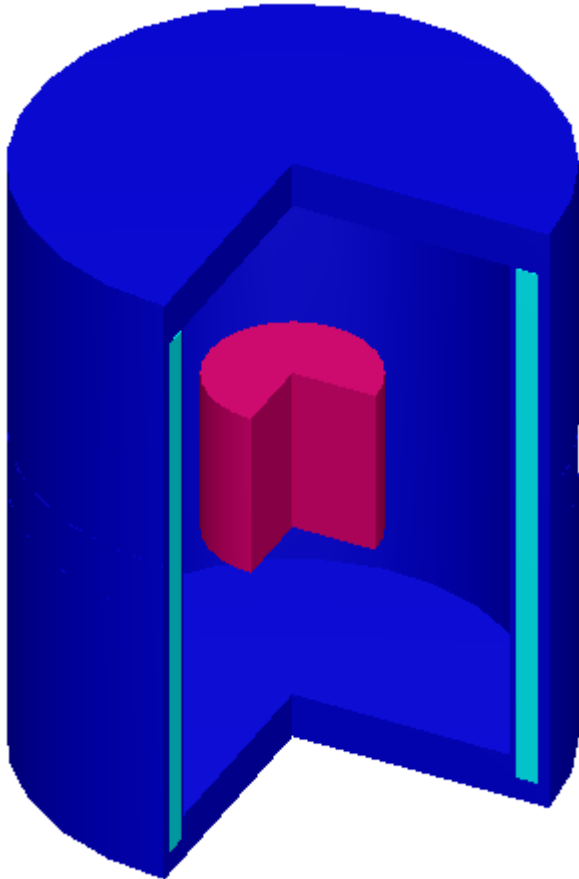
# A Brief Note – SAS4



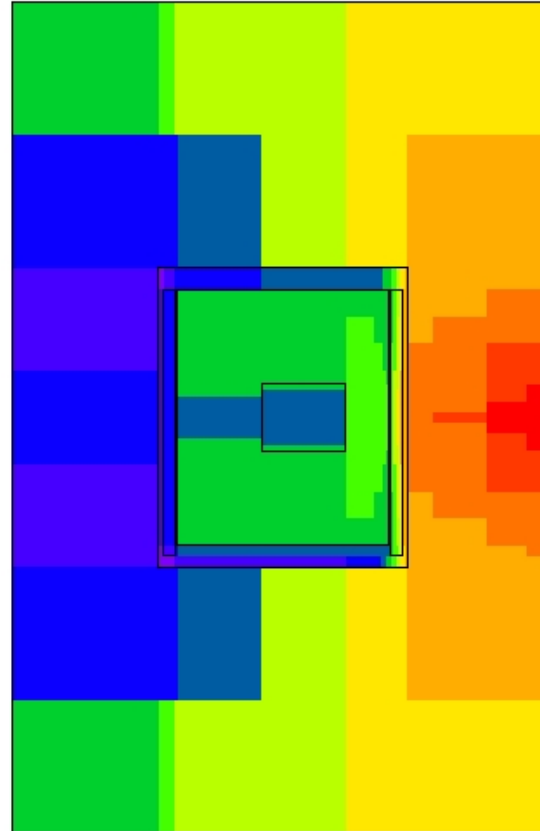
**Radiography Package  
Schematic**  
(Difficult to model in SAS4)



# Transportation

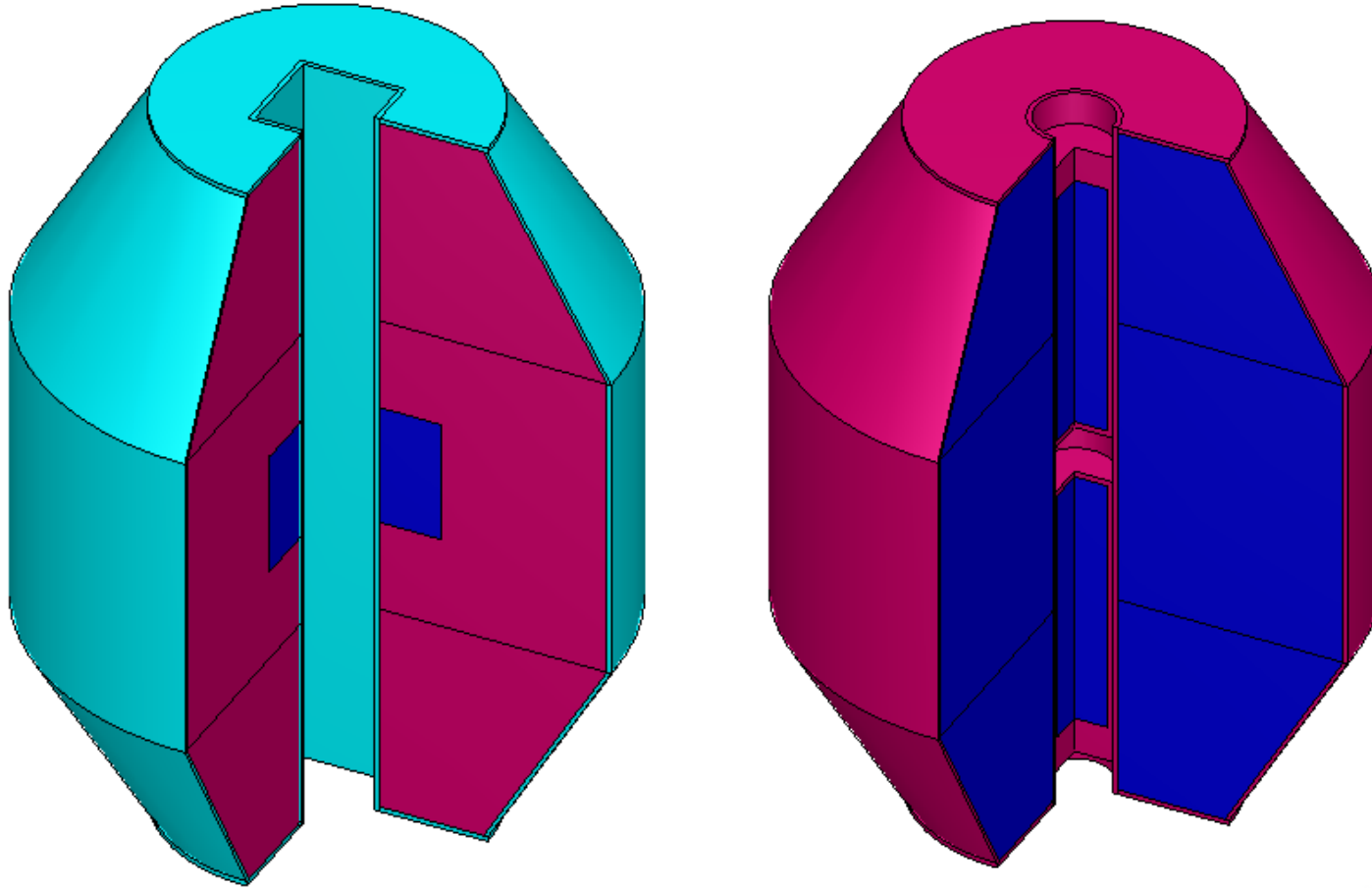


Type B Waste Package



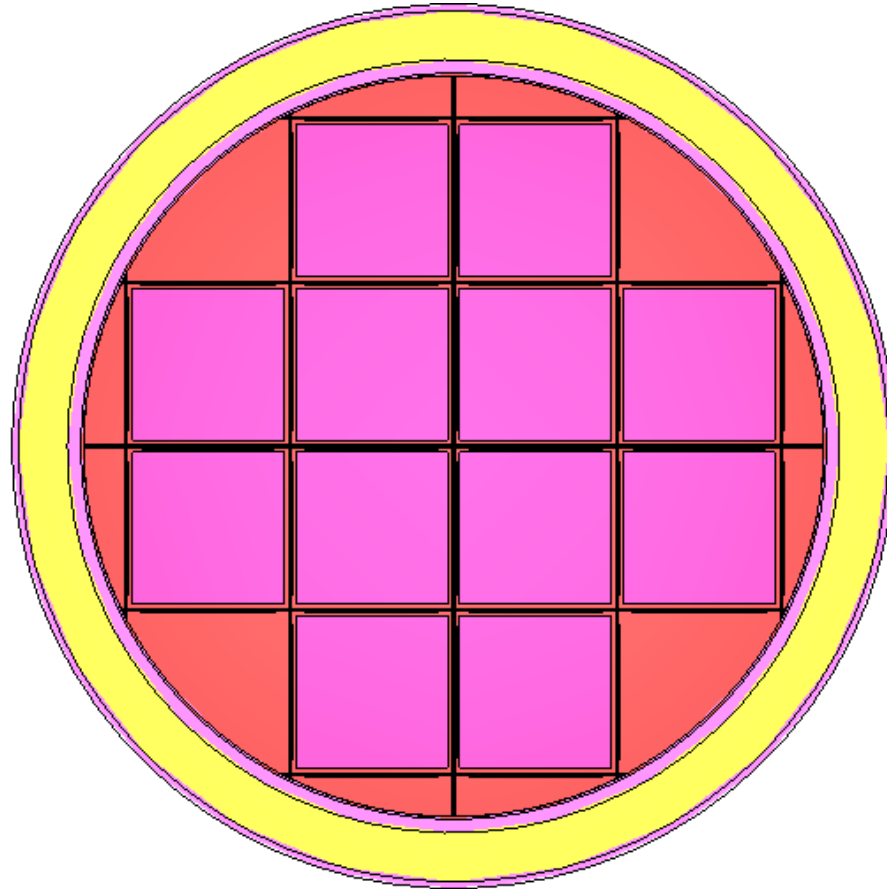
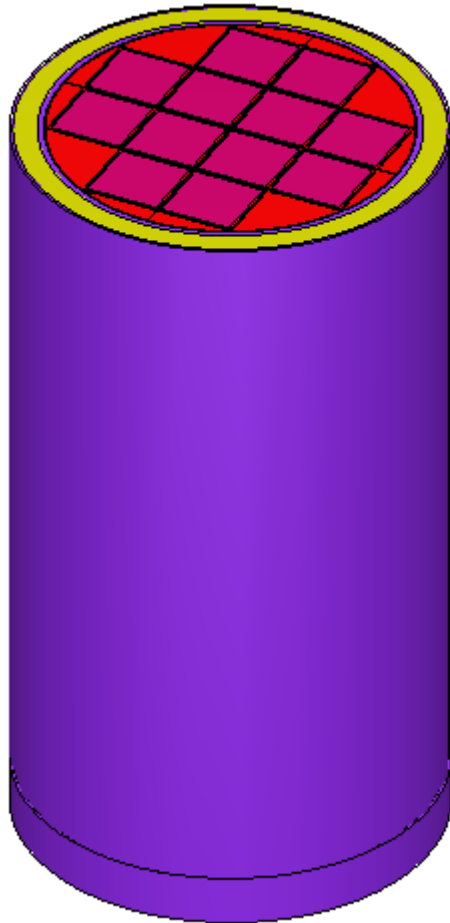
Gamma Adjoint  
Calculation

# Transportation



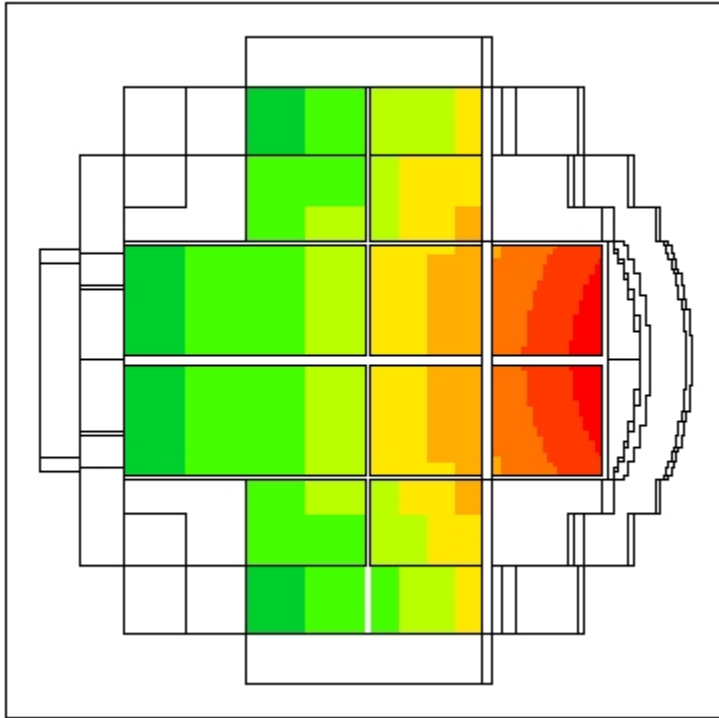
Source Package

# Storage

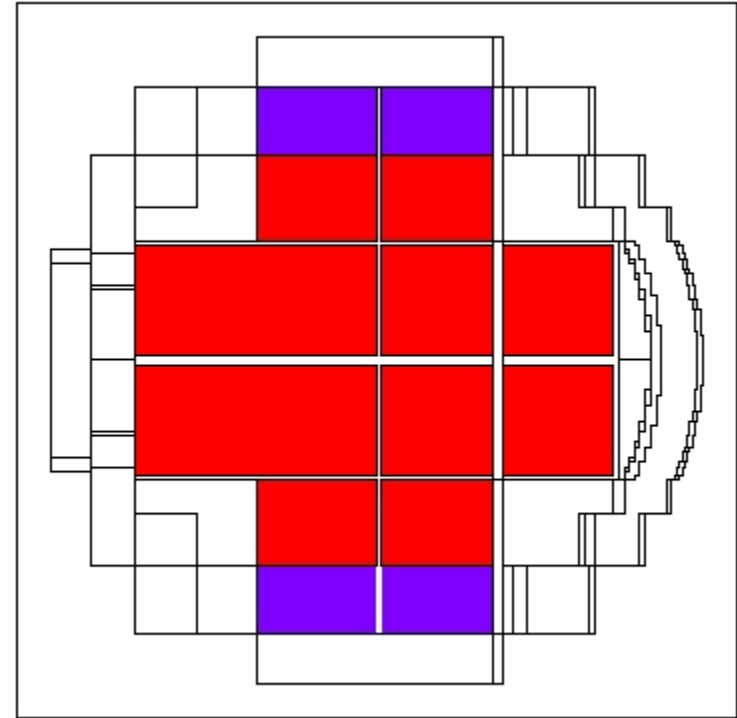


SNF Transfer System

# Storage

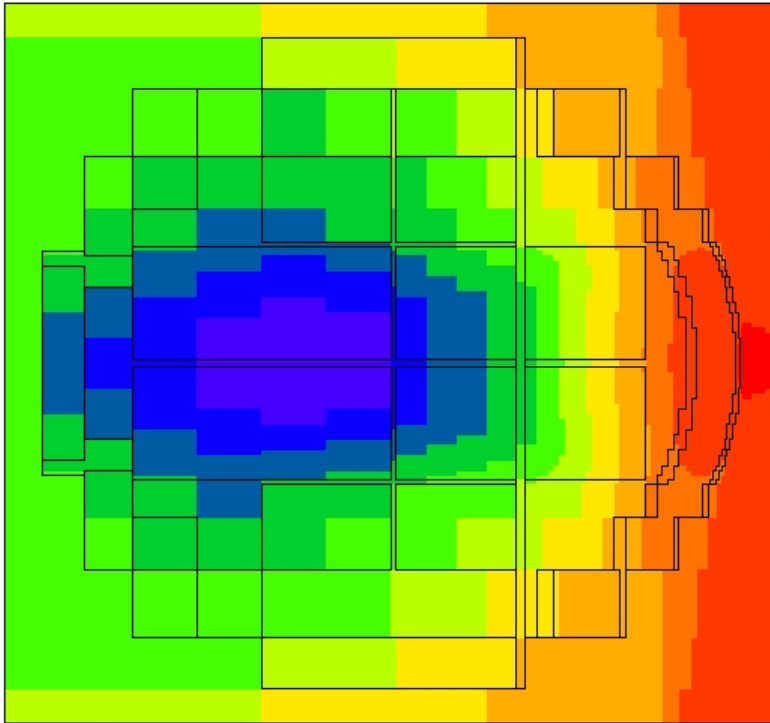


Sampled Neutron Source  
Source

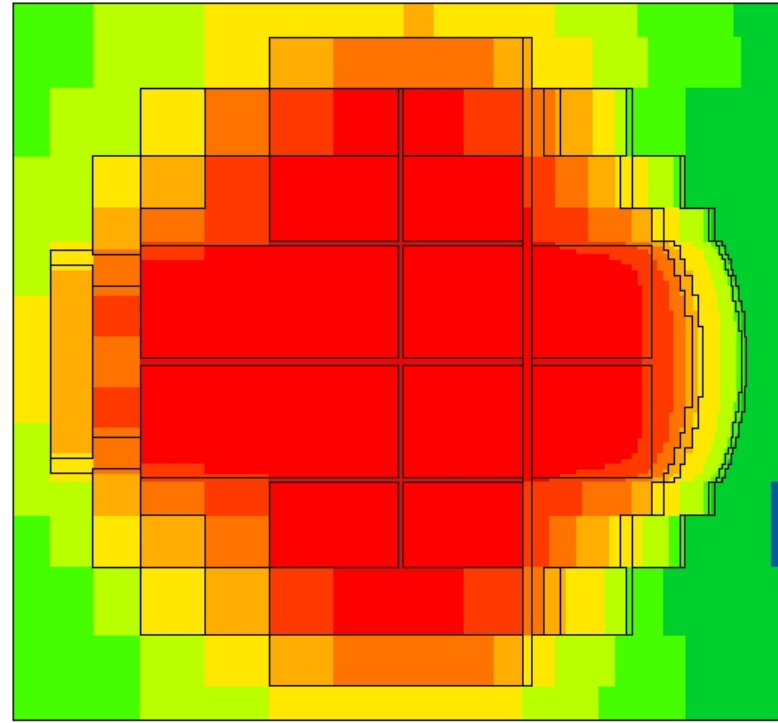


True Neutron

# Storage



Neutron Adjoint Calculation

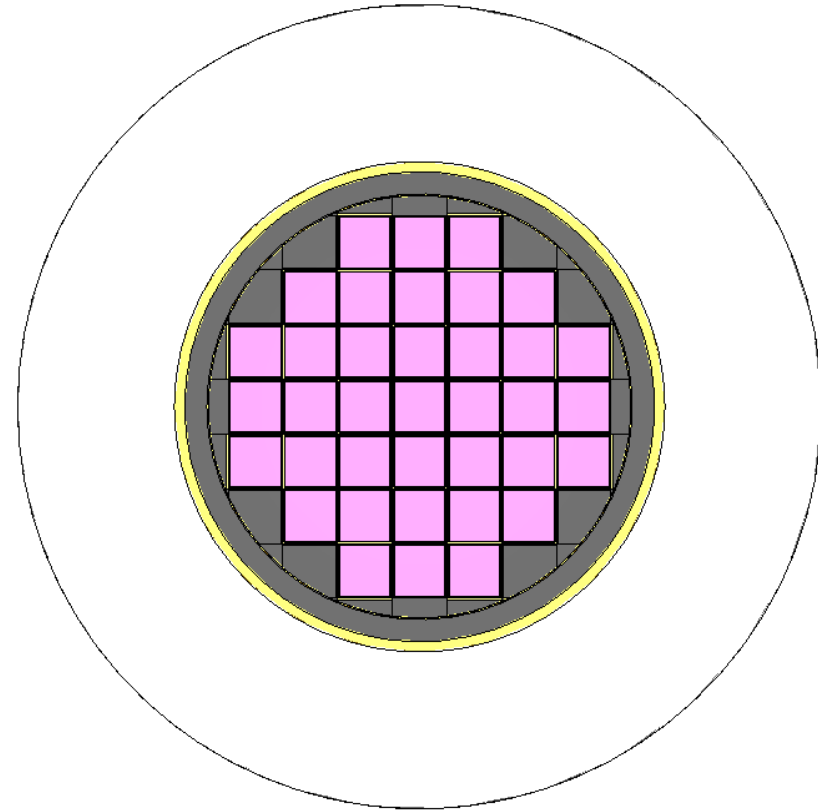
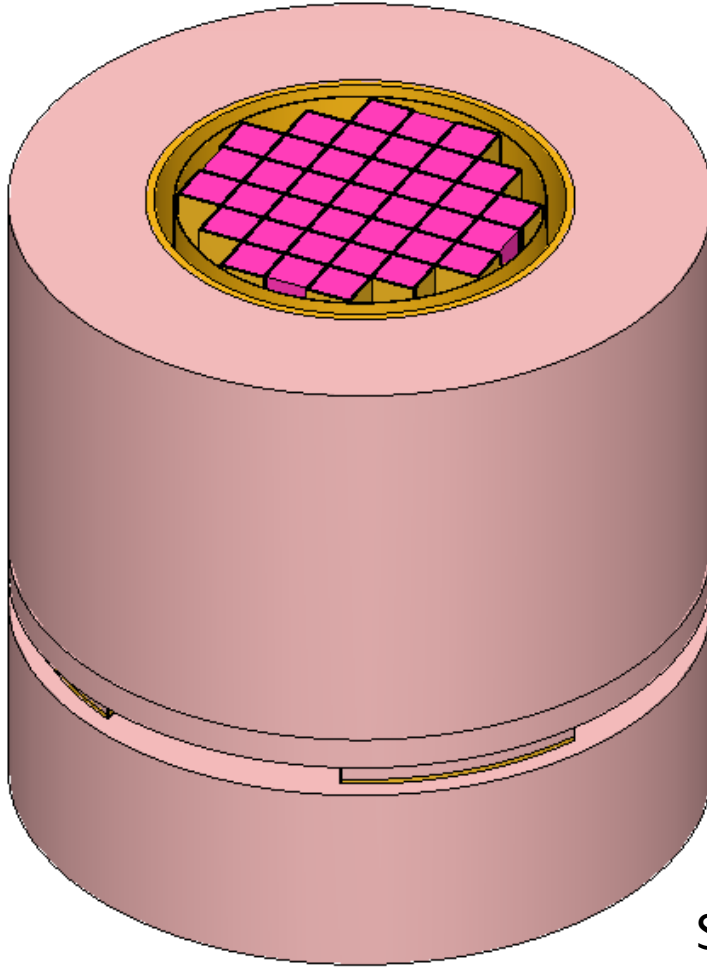


Neutron Forward Calculation

# Template

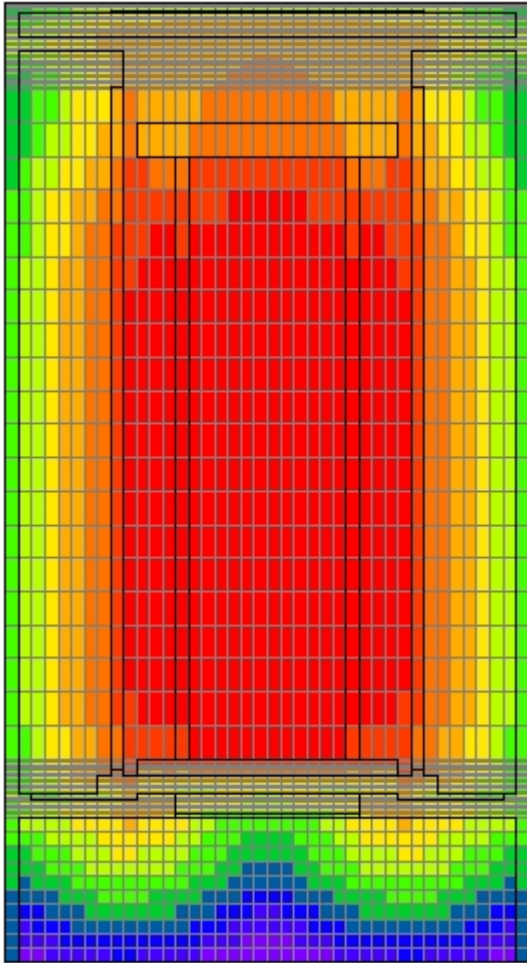
- Purpose
  - Limited time
  - Ease of use, build in options
  - SNF Transport and Storage
- Progress

# Template

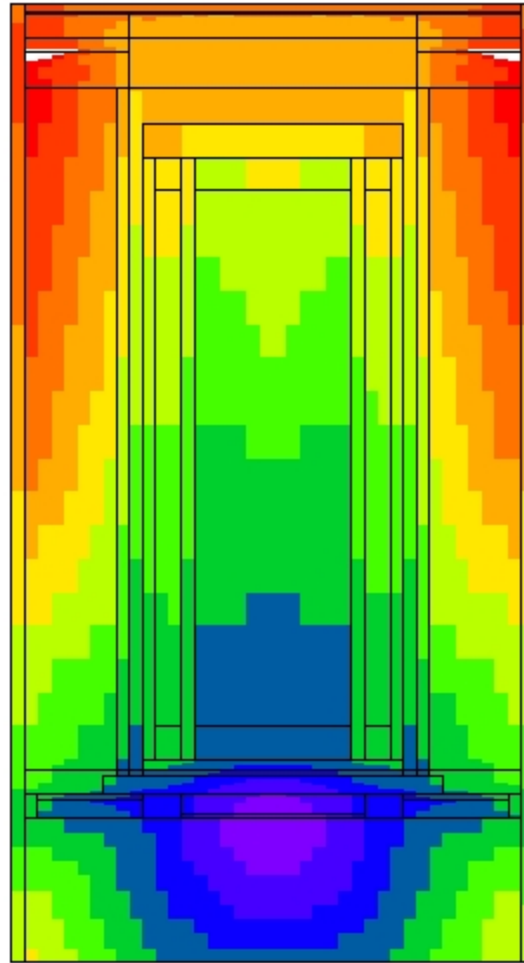


Storage Cask On  
Storage Pad

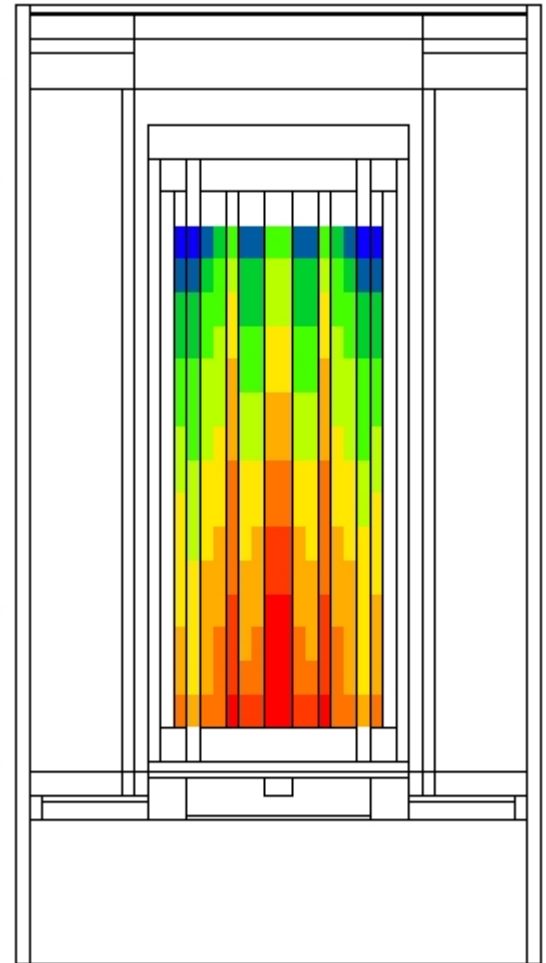
# Template



Total  $\gamma$  flux – Forward Calculation



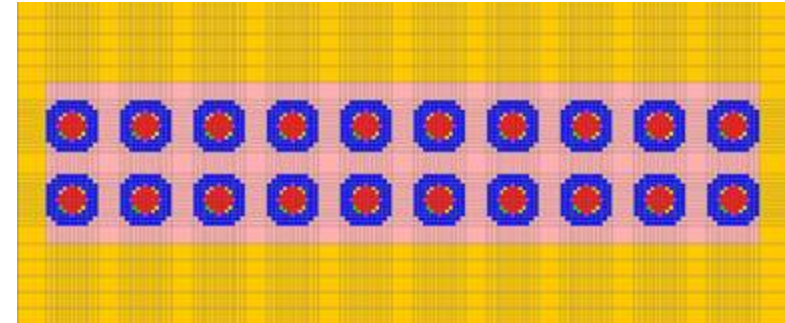
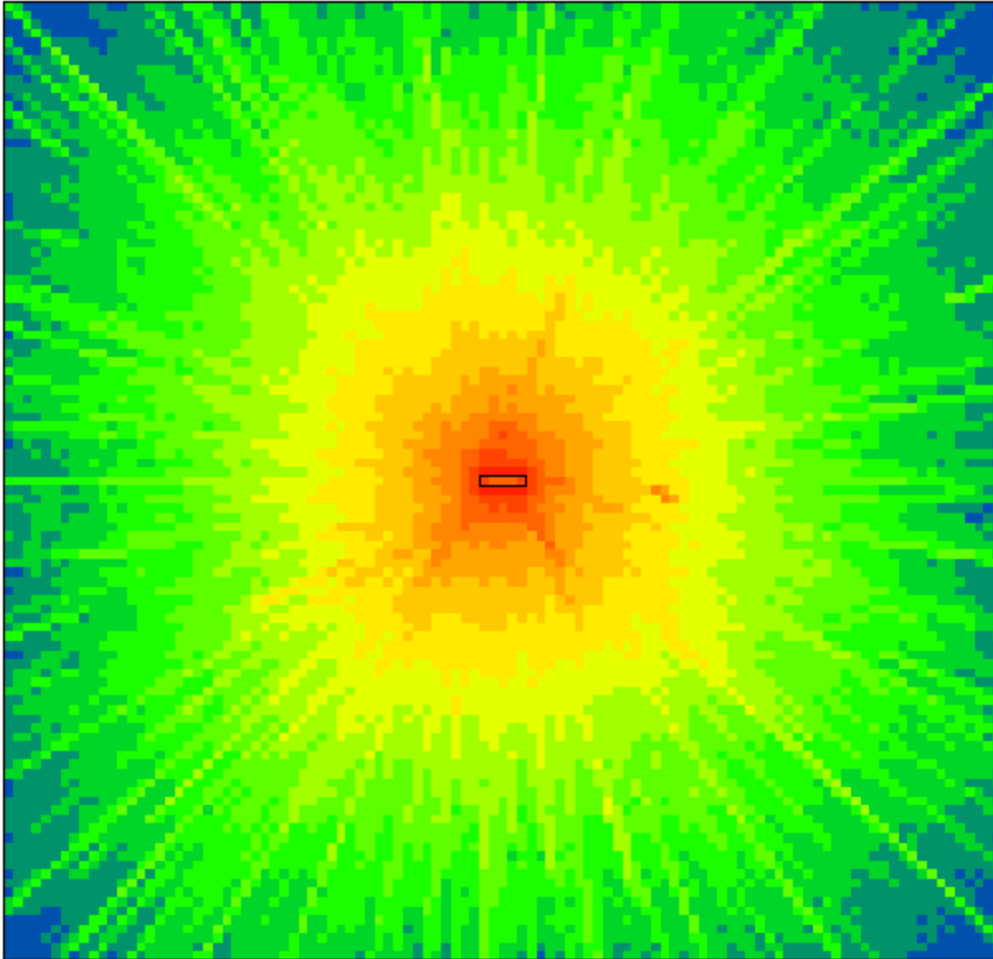
Importance Map of one  $\gamma$  Energy Group



Sampled  $\gamma$  Source Map



# Template



Cask Array and Dose Rate Map

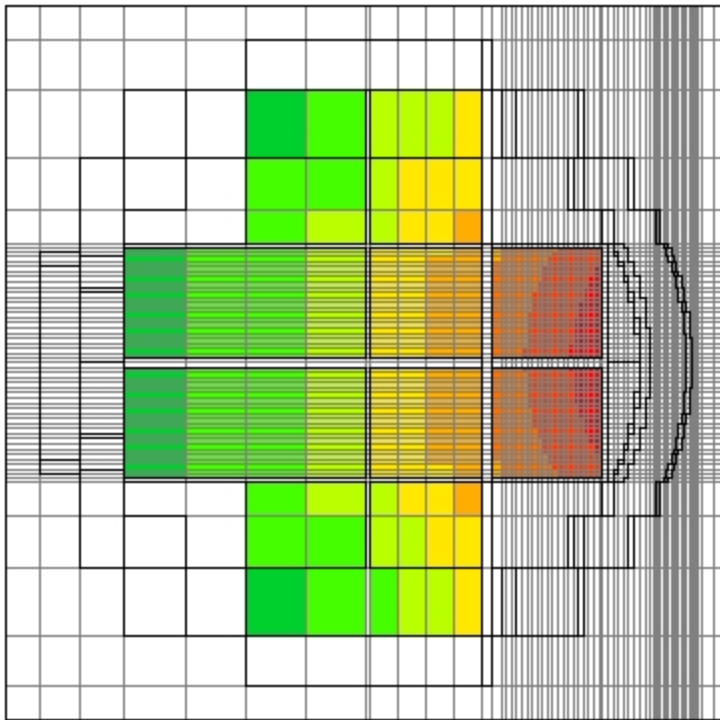
# QUESTIONS?

# Acronyms

- DSFM – Division of Spent Fuel Management
- CSRAB – Criticality, Shielding, and Risk Assessment Branch
- RAM – Radioactive Material
- SNF – Spent Nuclear Fuel
- ISFSI – Independent Spent Fuel Storage Installation
- CoC – Certificate of Compliance
- NCT – Normal Conditions of Transport
- HAC – Hypothetical Accident Conditions

# Extra Slides





Sampled Neutron Source  
with Mesh