



# **NRC Pre-Application Meeting TN-B1 Package Amendment And Letter Authorization Docket No. 9372**

November 29, 2021

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## Agenda

1. Purpose of Changes
2. Package Amendment
3. Letter Authorization
4. Proposed Schedule
5. Questions

# Purpose

## ■ Support Channeled ATRIUM 11 Fuel Transport

- ◆ Framatome recently issued a 10 CFR 71.95 Report for fuel channel side thickness exceeding maximum dimension during Browns Ferry reload
- ◆ Latest Brunswick transport experienced unacceptable vibration
- ◆ Improve shock isolating system within inner and outer container (multiple materials)
- ◆ 71.95 Report issued on exceeded fuel channel side thickness.

## ■ Miscellaneous Improvement

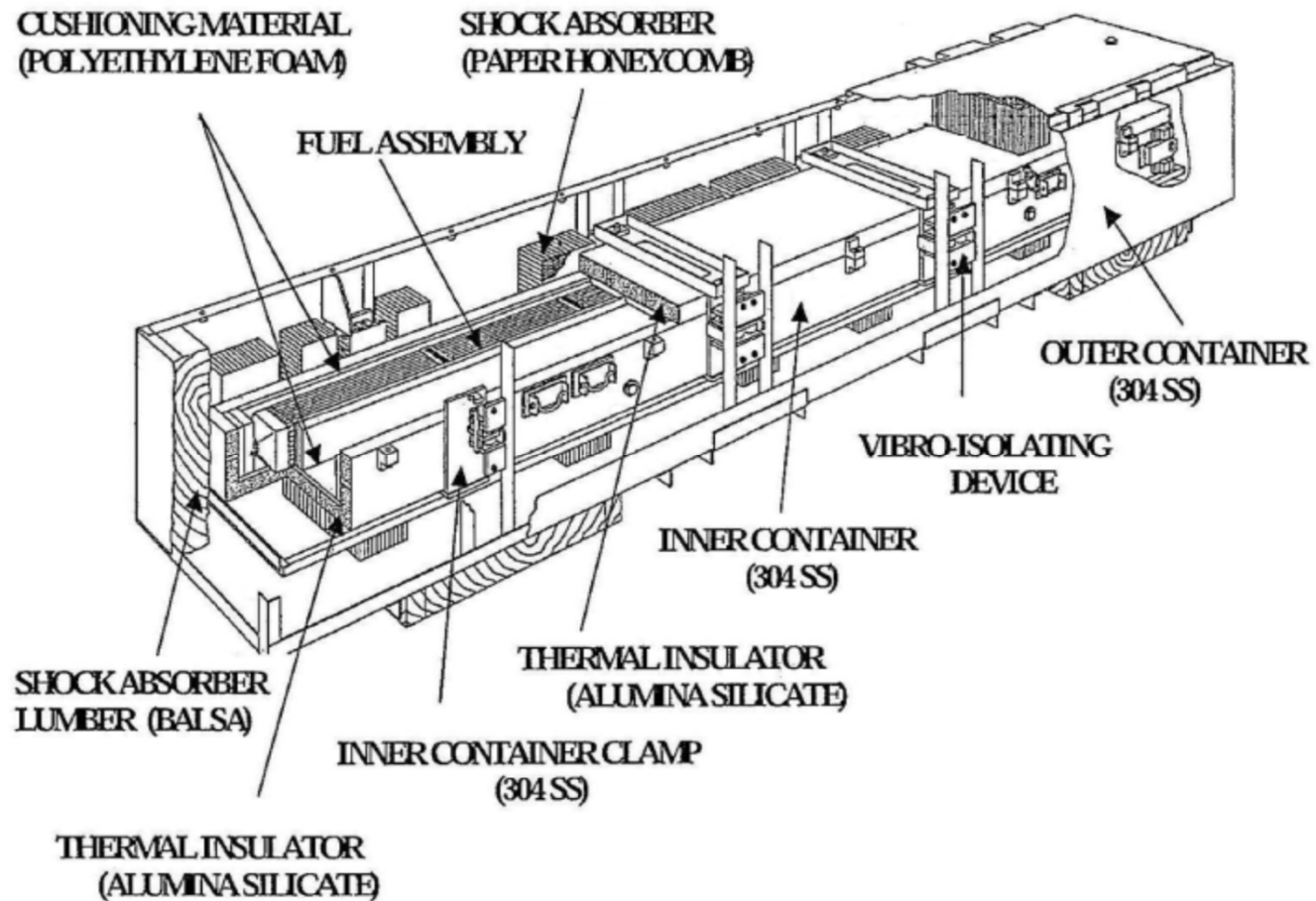
- ◆ New Criticality Evaluation to address fuel assembly rotational orientation
- ◆ Incorporate h\_poly cross section SCALE errors identified by ORNL
- ◆ Allow additional Inner and Outer container lid gasket materials
- ◆ Protective rubber strip near forklift pockets and bolsters to be made optional

## ■ Letter Authorization

- ◆ Support March 2022 road tests utilizing enriched fuel assemblies to confirm vibration performance of multiple rubber options
- ◆ Increase allowable fuel channel side thickness
- ◆ Incorporate h\_poly cross section SCALE errors identified by ORNL
- ◆ Allow multiple rubber types within the inner container and shock isolation system

# Packaging Amendment

## ■ TN-B1 Packaging



# Packaging Amendment

- Outer Container Shock Isolator Changes



Rubber pads  
(4 assemblies  
per side)



Shock Isolators  
(4 assemblies  
per side)

# Packaging Amendment

## ■ Outer Container Shock Isolator Changes

### ◆ Shock Isolator Material

- Currently defined as natural rubber
- Change material options to include synthetic rubber by eliminating “natural”
- No primary safety function, used to maintain fuel assembly quality
- Allow size variation, square versus round

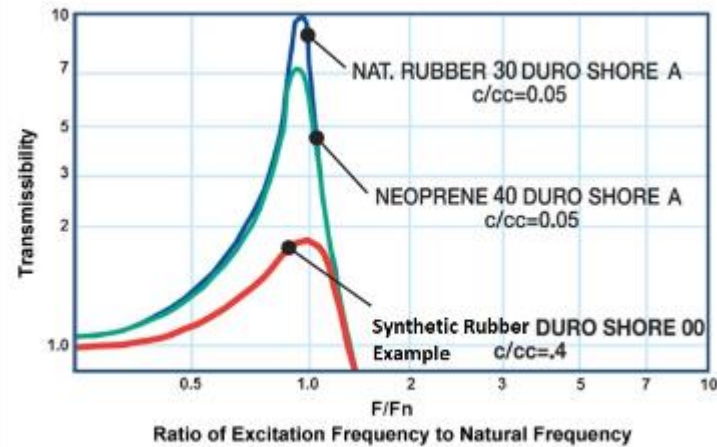
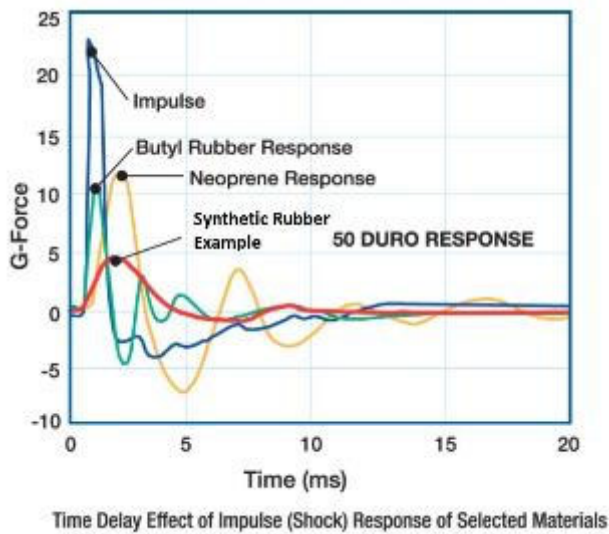
### ◆ Includes Drawing and Text Changes

- From Natural Rubber to Rubber
- SAR Drawing 105E3740, Item 9 (shock Isolator)
- SAR Drawing 105E3739, Items 7, 8, 11 (rubber pads)
- Add note to each drawing allowing size and shape variation
- Section 2.2.2, *Chemical, Galvanic, or Other Reactions* (3 places)
- Rubber to be defined as neoprene, butyl, nitrile, natural or synthetic type rubbers
- Provide table with maximum defining limits (TBD) based on fuel assembly material control program
  - For example: Bromine = 150 ppm, Chlorides = 150 ppm, Fluorides = 150 ppm, Sulfur = 350 ppm



# Packaging Amendment

## ■ Synthetic Rubber Vibration Performance



# Packaging Amendment

- Inner Container Allowable Foam Changes



Revise to  
allow multiple  
types of  
rubber on any  
side



# Packaging Amendment

## ■ Inner Container Foam Changes

### ◆ Foam Absorber Pad Under Fuel Assembly

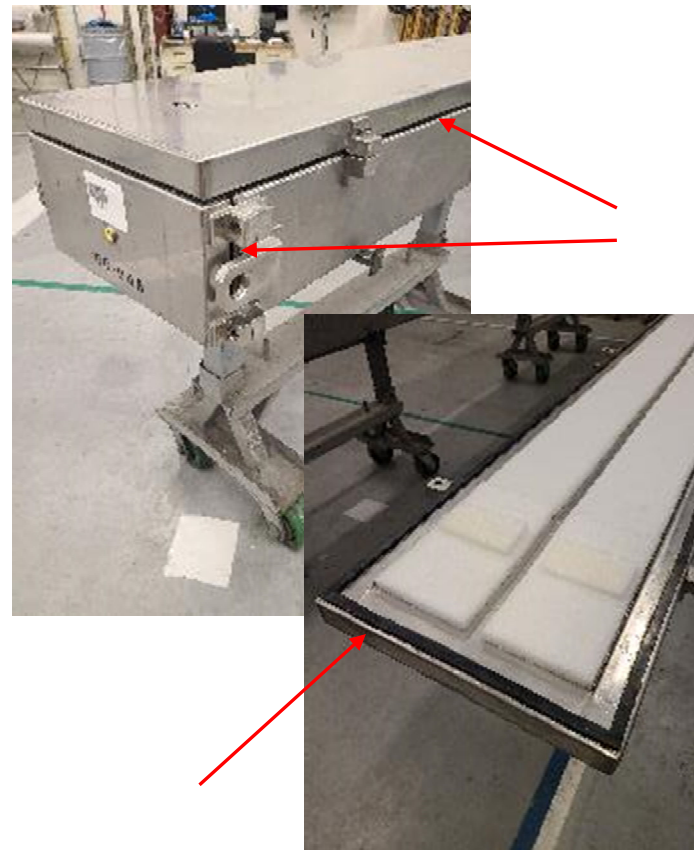
- Currently defined as Polyethylene Foam
- Change material options to include Polyethylene Foam or discontinuous strips of rubber
- Used to maintain fuel assembly quality, no change for NCT or HAC drops

### ◆ Includes Drawing and Text Change(s)

- SAR Drawing 105E3745, Item 40
- From Polyethylene Foam to Polyethylene Foam or Rubber
- Rubber to be defined as neoprene, butyl, nitrile, natural or synthetic type rubbers
- Within inner container, all foam and rubber to be limited by minimum overall thickness and a maximum density to allow for multiple vibration configurations.
- 1.2, Package Description
- 2.2, Materials / Structural
  - No effect, changes provide consistent function for vibration control
- 3.5, Thermal HAC
  - No effect, conservatively not modeled
- 6.1, Criticality Design, 6.12, *11x11 Criticality Design*
  - New maximum allowable density to be defined
- 7.4, Maintenance, Other Operations (no effective change)

# Packaging Amendment

- Outer and Inner Container Lid Gaskets



# Packaging Amendment

## ■ Outer and Inner Container Lid Gaskets

### ◆ Gasket

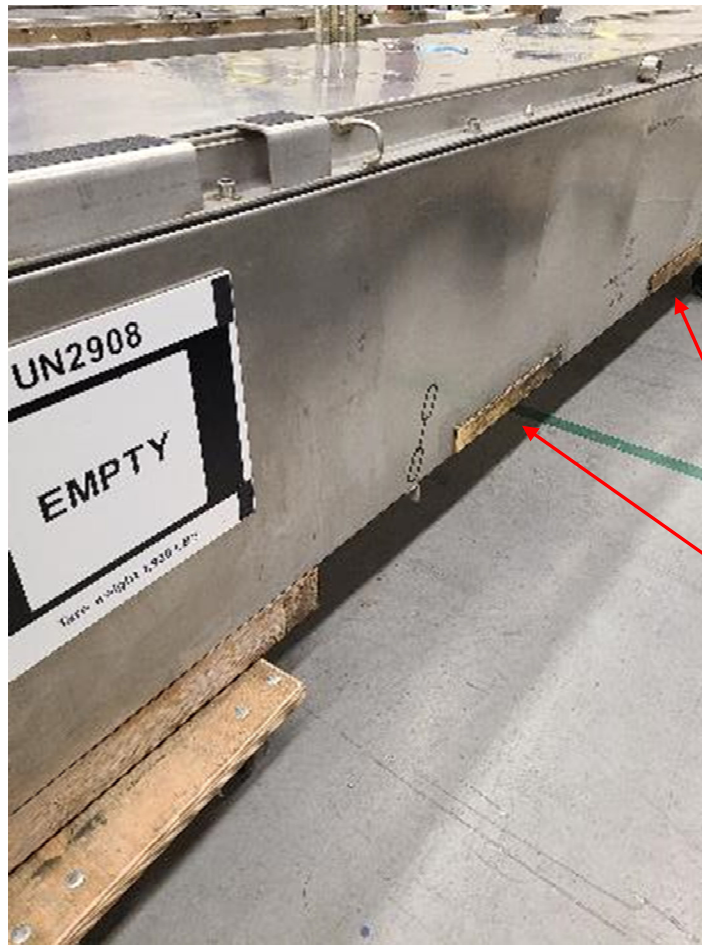
- Currently defined as Natural Rubber
- Change material options to Rubber or Neoprene
- No safety function, purpose of gasket is for dust seal not pressure retaining seal (Section 2.12.3)
- Containment boundary is the fuel assembly cladding

### ◆ Includes Drawing and Text Changes

- 105E3743, Item 12 (outer container gasket)
- 105E3743, Items 10 and 14 (inner container end lid gaskets)
- 105E3747, Items 17, 21 (inner container gaskets)
- From Natural Rubber to Rubber or Neoprene
- Material discussion in 2.2.2, *Chemical, Galvanic, or Other Reactions*
- Compression discussion in 2.12.3, *Outer Container Gasket Sealing Capability*

# Packaging Amendment

- Outer Container Protective Pad



4 Locations  
(2 per side)

# Packaging Amendment

## ■ Outer Container Protective Pads

- ◆ Protective Pad on outside of container above fork pockets and bottom of bolsters
  - Currently defined as natural rubber
  - Change material options to include rubber or neoprene
  - No safety function, clarify pads are optional
- ◆ Drawing Changes
  - 105E3738, Items 27, 28, 29, 39
  - From Natural Rubber to Rubber or Neoprene
  - Clarify Flag Note 10; Rubber pad is optional
- ◆ No Text Changes Needed

# Packaging Amendment

## ■ New Criticality Evaluations

- ◆ Fuel Assembly orientation
  - Currently, the Fuel Assembly orientation is for a single orientation and is controlled by administrative procedure for axial rotation
- ◆ Fuel Channel Side Thickness
  - Increase 11 x 11 allowable fuel channel thickness to  $\leq 0.315$  cm from  $\leq 0.254$  cm
- ◆ Incorporate h\_poly Cross Section SCALE Errors Identified by ORNL
  - Include penalty for h\_poly cross section error
- ◆ Inner Container
  - Additional materials allowed including neoprene, butyl, natural or synthetic type rubbers
  - Additional materials are bounded by polyethylene in the criticality evaluation
- ◆ Chapter 6 Changes
  - New evaluation for fuel orientation
  - Revise existing evaluation and Chapter 6 information to increase allowable channel thickness
  - Criticality evaluation to establish maximum density conservatively based on polyethelene
- ◆ New CSI value
  - CSI =1.5 (from 1.0)
  - Change is due to allowable fuel assembly rotation

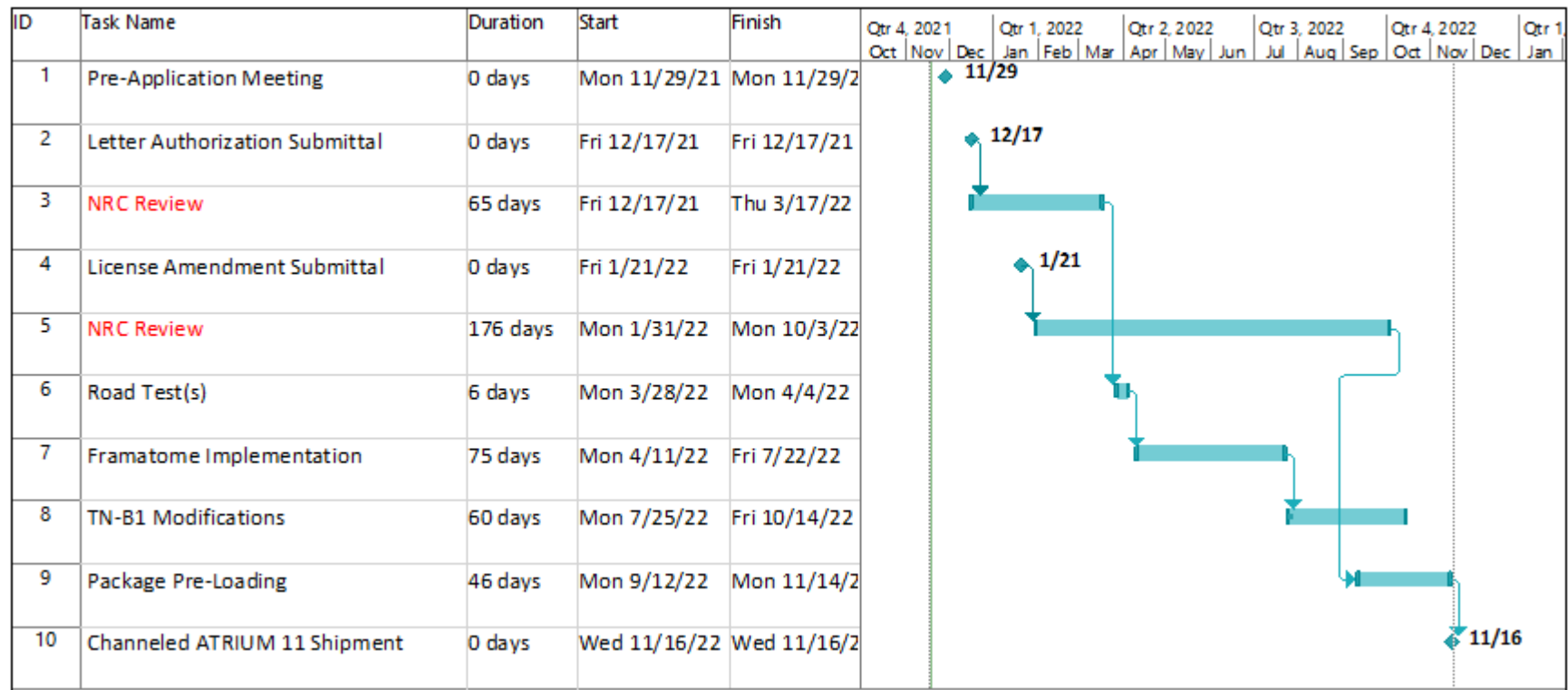


# Letter Authorization

## ■ Letter Authorization Items

- ◆ Minimum Changes Needed to Support Road Tests for Channeled 11x11 Fuel Assemblies
  - Maximum of two shipments (2<sup>nd</sup> based on results of 1<sup>st</sup> test)
  - Each shipment will include up to three TN-B1 packages each with up to two channeled fuel assemblies
    - Up to 6 channeled fuel assemblies per shipment
    - Will include additional empty packages
- ◆ Replace Shock Isolator Material and Pad Sizes
  - Change material options to include synthetic rubber by eliminating “natural”
  - Allow variable sizes for shock isolator and pads
- ◆ Inner Container Foam Absorber Pad Under Fuel Assembly
  - Change material options to include rubber
  - Criticality evaluation to establish maximum density conservatively based on polyethelene
- ◆ Fuel Channel Side Thickness
  - Increase allowable fuel channel thickness from  $\leq 0.254$  to  $\leq 0.315$  cm
  - Incorporate h\_poly cross section SCALE errors identified by ORNL
- ◆ No CSI change
  - CSI=1.0 (no change)
  - Letter Authorization does not include fuel rotation allowance

# Proposed Schedule



# Questions/Discussion

## ?

**framatome**

**Thank You**

