Grand Gulf Nuclear Station
Radioactive Material Transportation
Regulatory Conference

December 10, 2020

WE POWER LIFE℠

ML20365A129

Introduction and Agenda

Jim Shaw
Regulatory Assurance Manager
Grand Gulf Nuclear Station

ML20365A129

Agenda

Introduction and Agenda	Jim Shaw, Regulatory Assurance Manager
Management Overview	Bob Franssen, Site Vice President – Grand Gulf
Condition Description and Event Details	Mark Travis, Radiation Protection Manager
Root Cause and Corrective Actions	Brad Cole, Senior Manager - Fleet Radiation Protection
Safety Significance	Jim Shaw, Regulatory Assurance Manager
Closing Comments	Bob Franssen, Site Vice President – Grand Gulf

Management Overview

Bob Franssen
Vice President
Grand Gulf Nuclear Station

OUR VISION

We Power Life®

OUR MISSION

We exist to operate a world-class energy business that creates sustainable value for our four stakeholders: owners, customers, employees and communities.

In support of the company's mission, we will safely and efficiently provide clean, reliable and sustainable nuclear power.

FLEET FOCUS AREAS

- PEOPLE: **BE PROFESSIONAL**
- PLANT: **FIX THE PLANT**
- PROCESS: **OPERATE AS A FLEET**

NUCLEAR EXCELLENCE MODEL

Committed to Excellence

	SAFETY	TEAMWORK	ALWAYS LEARNING	INTEGRITY	RESPECT
OUR VALUES					Strive for Excellence
OUR PRINCIPLES	Eliminate and Mitigate Risk	Engage People	Maintain a Learning Environment	Develop Strong Ownership and Accountability	Organizational Effectiveness Model
OUR TOOLS	Prevention, Detection, Correction Model	Engagement Model	Culpability Model	Own It! Model	

Entergy

Condition Description and Event Details

Mark Travis
Radiation Protection Manager
Grand Gulf Nuclear Station

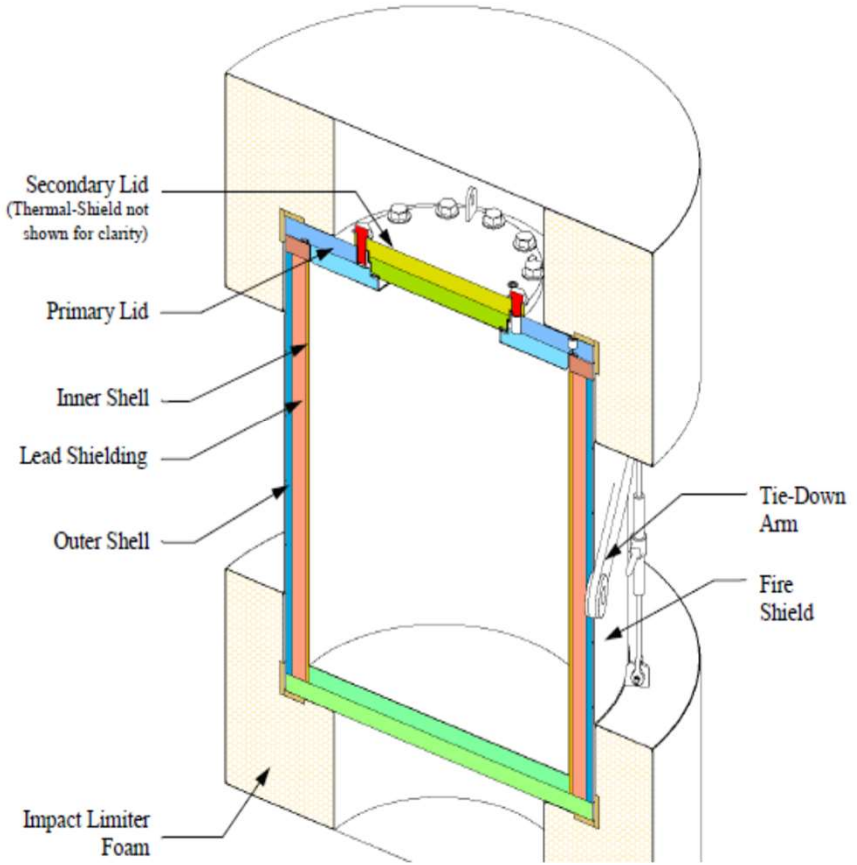
Condition Description

- On May 22, 2020, a radioactive waste shipment left Grand Gulf Nuclear Station (Grand Gulf) with incorrect radioactive material shipment marking, numbering, and provision of emergency response information. This error caused violations of federal regulations:
  - 10 CFR 71 (Compliance with 49 CFR 172)
  - 49 CFR (Transportation Characterization and Packaging Requirements)

Based on the facts that the radioactive waste was shipped in the proper cask, transported correctly and relevant information about the ERGs, Entergy's assessment is that this issue has very low safety significance.

Cask is Robust

- ✓ Designed to 10 CFR 71.71 and 10 CFR 71.73 requirements for Normal Conditions of Transport (NCT) and Hypothetical Accident Conditions (HAC)
- ✓ Approved by NRC for transport
- ✓ Outer shell - 1.5” thick steel
- ✓ Inner shell - 0.75” thick steel
- ✓ Annular space between the shells is 3.35” and is filled with lead
- ✓ Cask base is (2) 3.25” thick circular steel plates
- ✓ Cask lid is (2) 3.25” thick circular steel plates
- ✓ Top and bottom of the cask have impact limiters
- ✓ Pre-shipment leak testing is performed by a qualified test individual to assure package integrity



8-120 Type B Shipping Package

Example of Robust Cast Transportation Configuration

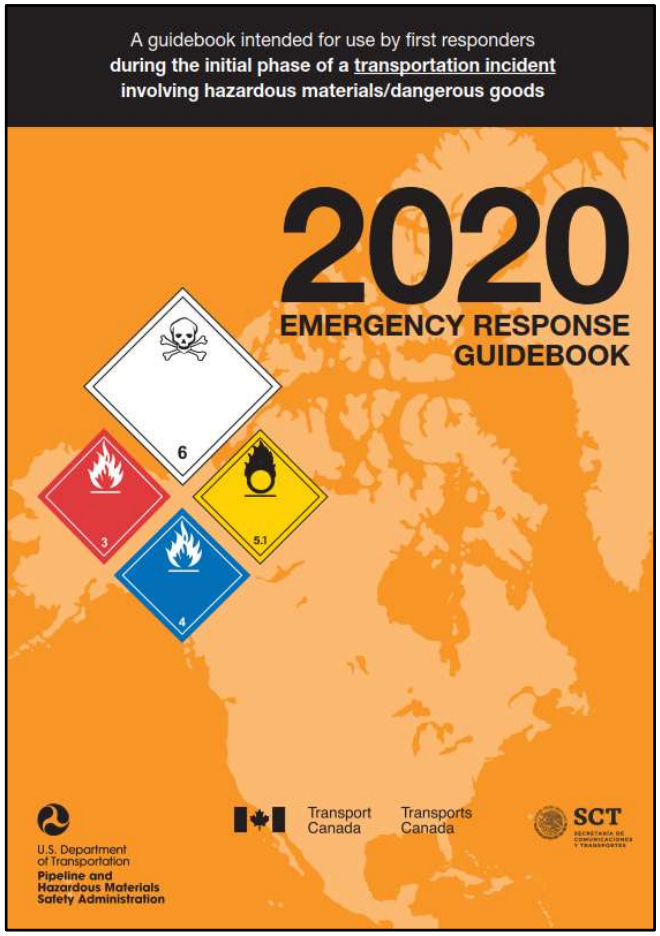
Shipment Preparation

- Package Characterization Preparation
  - ✓ Resin loaded
  - ✓ Waste stream selected
  - ✓ Container weighed and surveyed
  - ✓ Surveys used for characterization
  - ✓ Proper Shipping Name selected
- Shipping Cask Classification Preparation
  - ✓ Inspected
  - ✓ Container loaded in cask
  - ✓ Cask closed and leak tested
  - ✓ Cask surveyed
  - ✓ Shipping papers created and provided to driver

Actual Cask For May 22, 2020 Shipment

As shipped

Correct marking



First Responders and Carrier required to have

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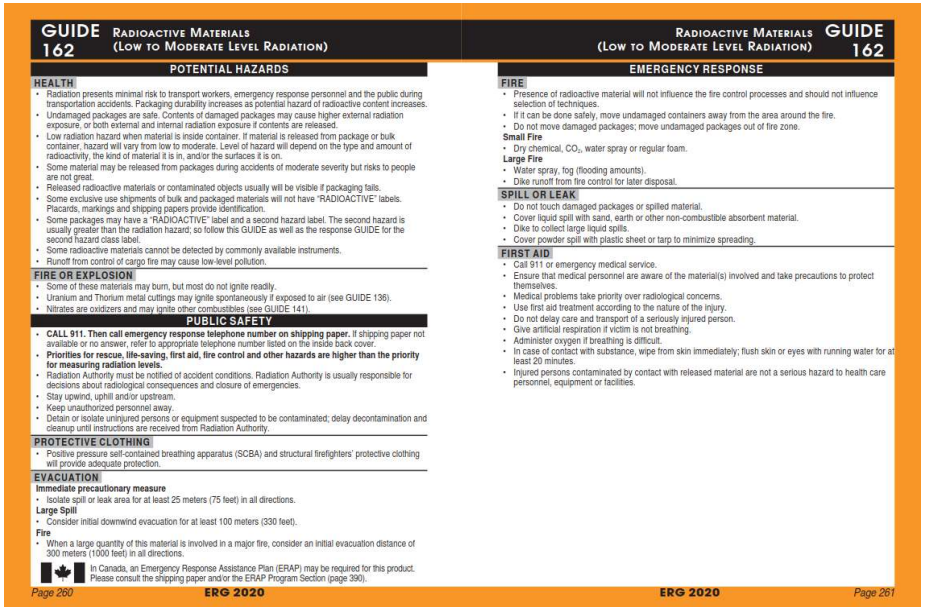
ID No.	Guide No.	Name of Material
		more than 10% Nitroglycerin
3320	157	Sodium borohydride and Sodium hydroxide solution, with not more than 12% Sodium borohydride and not more than 40% Sodium hydroxide
3321	162	Radioactive material, low specific activity (LSA-II), non fissile or fissile-excepted
3322	162	Radioactive material, low specific activity (LSA-III), non fissile or fissile-excepted



GUIDE 162 — RADIOACTIVE MATERIALS (LOW TO MODERATE LEVEL RADIATION)

POTENTIAL HAZARDS

HEALTH
- Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents. Packaging durability increases as potential hazard of radioactive content increases.
- Undamaged packages are safe. Contents of damaged packages may cause higher external radiation exposure, or both external and internal radiation exposure if contents are released.
- Low radiation hazard when material is inside container. If material is released from package or bulk container, hazard will vary from low to moderate. Level of hazard will depend on the type and amount of radioactivity, the kind of material it is in, and/or the surfaces it is on.
- Some material may be released from packages during accidents of moderate severity but risks to people are not great.
- Released radioactive materials or contaminated objects usually will be visible if packaging fails.
- Some exclusive use shipments of bulk and packaged materials will not have "RADIOACTIVE" labels. Placards, markings and shipping papers provide identification.
- Some packages may have a "RADIOACTIVE" label and a second hazard label. The second hazard is usually greater than the radiation hazard; so follow this GUIDE as well as the response GUIDE for the second hazard class label.
- Some radioactive materials cannot be detected by commonly available instruments.
- Runoff from control of cargo fire may cause low-level pollution.

FIRE OR EXPLOSION
- Some of these materials may burn, but most do not ignite readily.
- Uranium and Thorium metal cuttings may ignite spontaneously if exposed to air (see GUIDE 136).
- Nitrates are oxidizers and may ignite other combustibles (see GUIDE 141).

PUBLIC SAFETY
- **CALL 911. Then call emergency response telephone number on shipping paper.** If shipping paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
- **Priorities for rescue, life-saving, first aid, fire control and other hazards are higher than the priority for measuring radiation levels.**
- Radiation Authority must be notified of accident conditions. Radiation Authority is usually responsible for decisions about radiological consequences and closure of emergencies.
- Stay upwind, uphill and/or upstream.
- Keep unauthorized personnel away.
- Detain or isolate uninjured persons or equipment suspected to be contaminated; delay decontamination and cleanup until instructions are received from Radiation Authority.

PROTECTIVE CLOTHING
- Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide adequate protection.

EVACUATION

Immediate precautionary measure
- Isolate spill or leak area for at least 25 meters (75 feet) in all directions.

Large Spill
- Consider initial downwind evacuation for at least 100 meters (330 feet).

Fire
- When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.

In Canada, an Emergency Response Assistance Plan (ERAP) may be required for this product. Please consult the shipping paper and/or the ERAP Program Section (page 390).

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RADIOACTIVE MATERIALS (LOW TO MODERATE LEVEL RADIATION) GUIDE 162

EMERGENCY RESPONSE

FIRE
- Presence of radioactive material will not influence the fire control processes and should not influence selection of techniques.
- If it can be done safely, move undamaged containers away from the area around the fire.
- Do not move damaged packages; move undamaged packages out of fire zone.

Small Fire
- Dry chemical, CO_2, water spray or regular foam.

Large Fire
- Water spray, fog (flooding amounts).
- Dike runoff from fire control for later disposal.

SPILL OR LEAK
- Do not touch damaged packages or spilled material.
- Cover liquid spill with sand, earth or other non-combustible absorbent material.
- Dike to collect large liquid spills.
- Cover powder spill with plastic sheet or tarp to minimize spreading.

FIRST AID
- Call 911 or emergency medical service.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Medical problems take priority over radiological concerns.
- Use first aid treatment according to the nature of the injury.
- Do not delay care and transport of a seriously injured person.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- In case of contact with substance, wipe from skin immediately; flush skin or eyes with running water for at least 20 minutes.
- Injured persons contaminated by contact with released material are not a serious hazard to health care personnel, equipment or facilities.

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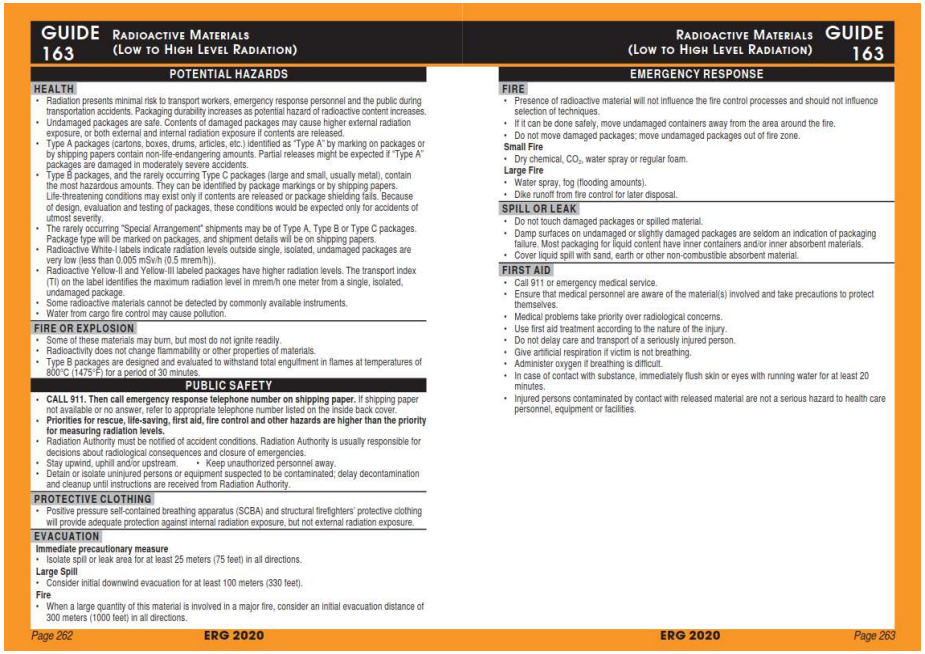
ID No.	Guide No.	Name of Material
		II), non fissile or fissile-excepted
2915	163	Radioactive material, Type A package, non-special form, non fissile or fissile-excepted
2916	163	Radioactive material, Type B(U) package, non fissile or fissile-excepted
2917	163	Radioactive material, Type B(M) package, non fissile or fissile-excepted



GUIDE 163 — RADIOACTIVE MATERIALS (LOW TO HIGH LEVEL RADIATION)

POTENTIAL HAZARDS

HEALTH
- Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents. Packaging durability increases as potential hazard of radioactive content increases.
- Undamaged packages are safe. Contents of damaged packages may cause higher external radiation exposure, or both external and internal radiation exposure if contents are released.
- Type A packages (cartons, boxes, drums, articles, etc.) identified as "Type A" by marking on packages or by shipping papers contain non-life-endangering amounts. Partial releases might be expected if "Type A" packages are damaged in moderately severe accidents.
- Type B packages, and the rarely occurring Type C packages (large and small, usually metal), contain the most hazardous amounts. They can be identified by package markings or by shipping papers. Life-threatening conditions may exist only if contents are released or package shielding fails. Because of design, evaluation and testing of packages, these conditions would be expected only for accidents of utmost severity.
- The rarely occurring "Special Arrangement" shipments may be of Type A, Type B or Type C packages. Package type will be marked on packages, and shipment details will be on shipping papers.
- Radioactive White-I labels indicate radiation levels outside single, isolated, undamaged packages are very low (less than 0.005 mSv/h (0.5 mrem/h)).
- Radioactive Yellow-II and Yellow-III labeled packages have higher radiation levels. The transport index (TI) on the label identifies the maximum radiation level in mrem/h one meter from a single, isolated, undamaged package.
- Some radioactive materials cannot be detected by commonly available instruments.
- Water from cargo fire control may cause pollution.

FIRE OR EXPLOSION
- Some of these materials may burn, but most do not ignite readily.
- Radioactivity does not change flammability or other properties of materials.
- Type B packages are designed and evaluated to withstand total engulfment in flames at temperatures of 800°C (1475°F) for a period of 30 minutes.

PUBLIC SAFETY
- **CALL 911. Then call emergency response telephone number on shipping paper.** If shipping paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
- **Priorities for rescue, life-saving, first aid, fire control and other hazards are higher than the priority for measuring radiation levels.**
- Radiation Authority must be notified of accident conditions. Radiation Authority is usually responsible for decisions about radiological consequences and closure of emergencies.
- Stay upwind, uphill and/or upstream. • Keep unauthorized personnel away.
- Detain or isolate uninjured persons or equipment suspected to be contaminated; delay decontamination and cleanup until instructions are received from Radiation Authority.

PROTECTIVE CLOTHING
- Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide adequate protection against internal radiation exposure, but not external radiation exposure.

EVACUATION

Immediate precautionary measure
- Isolate spill or leak area for at least 25 meters (75 feet) in all directions.

Large Spill
- Consider initial downwind evacuation for at least 100 meters (330 feet).

Fire
- When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.

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RADIOACTIVE MATERIALS (LOW TO HIGH LEVEL RADIATION) GUIDE 163

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- Water spray, fog (flooding amounts).
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SPILL OR LEAK
- Do not touch damaged packages or spilled material.
- Damp surfaces on undamaged or slightly damaged packages are seldom an indication of packaging failure. Most packaging for liquid content have inner containers and/or inner absorbent materials.
- Cover liquid spill with sand, earth or other non-combustible absorbent material.

FIRST AID
- Call 911 or emergency medical service.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Medical problems take priority over radiological concerns.
- Use first aid treatment according to the nature of the injury.
- Do not delay care and transport of a seriously injured person.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
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ERG 162

GUIDE 162 RADIOACTIVE MATERIALS (LOW TO MODERATE LEVEL RADIATION)

POTENTIAL HAZARDS

HEALTH

FIRE OR EXPLOSION

PUBLIC SAFETY

PROTECTIVE CLOTHING

EVACUATION

EMERGENCY RESPONSE

FIRE

SPILL OR LEAK

FIRST AID

ERG 2020

PROTECTIVE CLOTHING

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ERG 163

GUIDE 163 RADIOACTIVE MATERIALS (LOW TO HIGH LEVEL RADIATION)

POTENTIAL HAZARDS

HEALTH

FIRE OR EXPLOSION

PUBLIC SAFETY

PROTECTIVE CLOTHING

EVACUATION

EMERGENCY RESPONSE

FIRE

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ERG 2020

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- Cover liquid spill with sand, earth or other non-combustible absorbent material.

ERG Summary

In this case, the Emergency Response Guidance provided by the Hazard Identification Number would have provided the necessary actions to first responders

ERG 162 and ERG 163 have no significant differing directions to first responders for this shipment

Because of the information from ERG 162, public safety would have been appropriately provided for this shipment

Root Cause and Corrective Actions

Brad Cole
Entergy Fleet Senior Manager
Radiation Protection

Root Cause Evaluation

Root Cause: The Grand Gulf process for preparing and shipping Type A and Type B radioactive material shipments did not include designation for risk significance and consequently the opportunity for Grand Gulf leadership to have the necessary level of added oversight and management of the shipment preparation.

Completed Corrective Actions

- Revised Fleet Radiological Risk Procedure, EN-RP-110-04

  Radioactive Shipments involving Type B packaging are now considered high risk

  - ✓ Provides visibility of work during planning that has a high-risk task
  - ✓ Requires Radiation Protection Manager approval of mitigating plan
  - ✓ Embeds mitigating strategies, where identified, in work control documents or Radiation Work Permit
  - ✓ Requires direct leadership oversight

Completed Corrective Actions

- EN-RW-102, “Radioactive Shipping Procedure”
  - Clarified the Independent Reviewer Responsibilities
  - Clarified the role and proficiency requirements to perform the independent verification sign offs during the review of technical information

Completed Corrective Actions

Procedure Revision

- ✓ Measured data will be used versus calculated data when available
- ✓ Process steps that, if performed incorrectly, could weaken barriers for public safety are required to have an independent verification
- ✓ Revised specific guidance for use of the override function of RADMAN software

Safety Significance

Jim Shaw
Regulatory Assurance Manager
Grand Gulf Nuclear Station

Safety Significance

Apparent Violation

Violation of 49 CFR 172 involving Grand Gulf Nuclear Station's failure to ensure that shipment was manifested and marked, and driver was provided with correct emergency response information

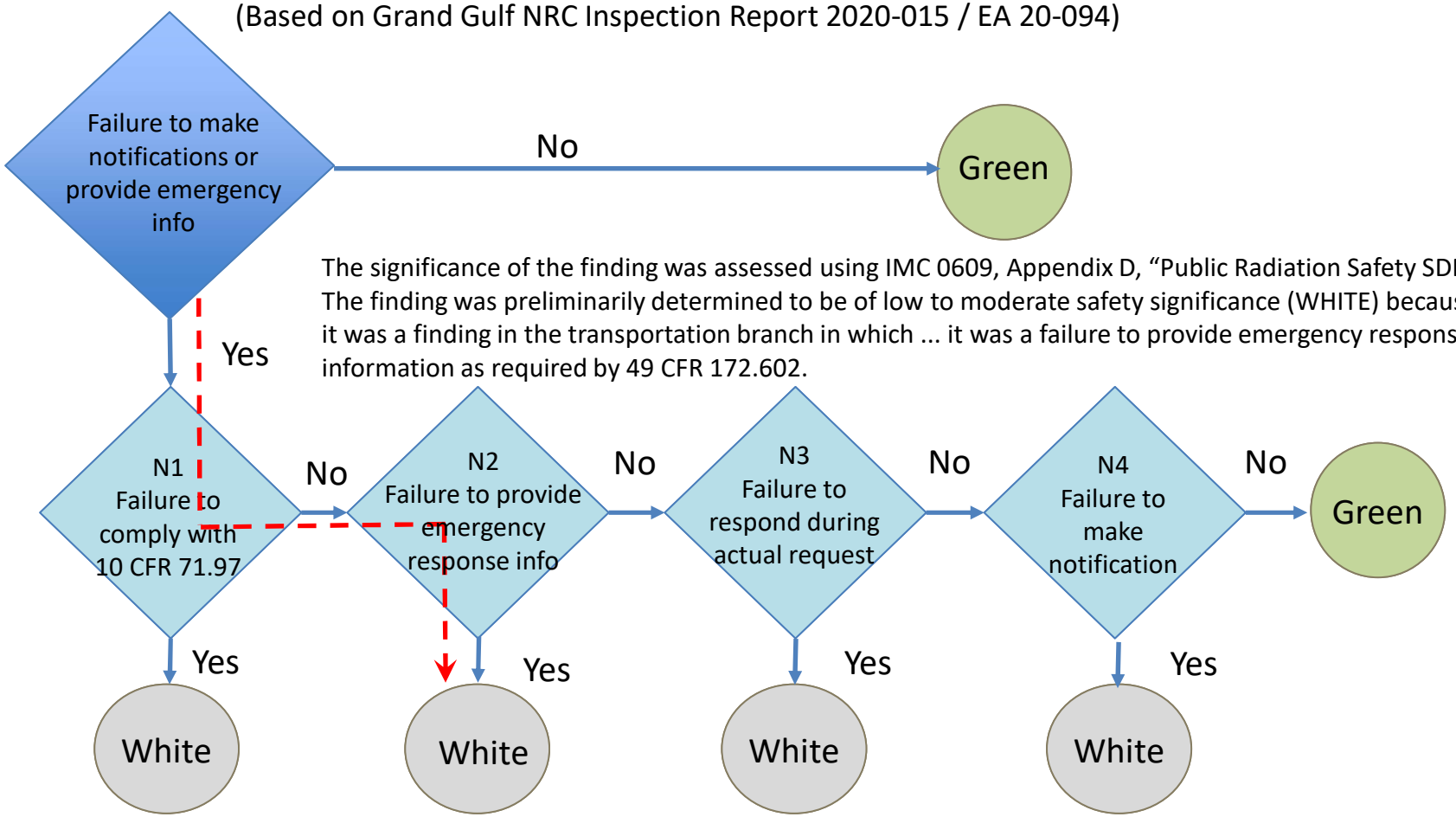
Safety Significance

Assessed under the NRC's Reactor Oversight Process (ROP)
Public Radiation Safety Significance Determination Process (SDP)

- Transportation branch of the logic diagram focuses on the licensee's radioactive material packaging and transportation program
  - Assesses the licensee's ability to safely transport radioactive material on public roadways in accordance with regulations
  - The regulatory basis for the transportation program is contained in 10 CFR Parts 20, 61, and 71, and Department of Transportation regulations contained in 49 CFR Parts 170-189

NRC Preliminary Significance Assessment

(Based on Grand Gulf NRC Inspection Report 2020-015 / EA 20-094)



The significance of the finding was assessed using IMC 0609, Appendix D, "Public Radiation Safety SDP." The finding was preliminarily determined to be of low to moderate safety significance (WHITE) because it was a finding in the transportation branch in which ... it was a failure to provide emergency response information as required by 49 CFR 172.602.

For Block N2, if the licensee fails to provide the required emergency response information to the shipment carrier (the shipment leaves the Licensee's facility and control without the required information), the finding is WHITE. If the carrier misplaces or loses the information (beyond the licensee's control), the finding is GREEN.

Entergy's Assessment of Significance

IMC 0609, Appendix D, Section VII: Failure to provide these required notifications could seriously hamper or prevent the ability of the federal, state and local agencies to adequately respond as needed to transportation events and accidents. By hampering or preventing this regulatory response, the public health and safety could be negatively impacted.

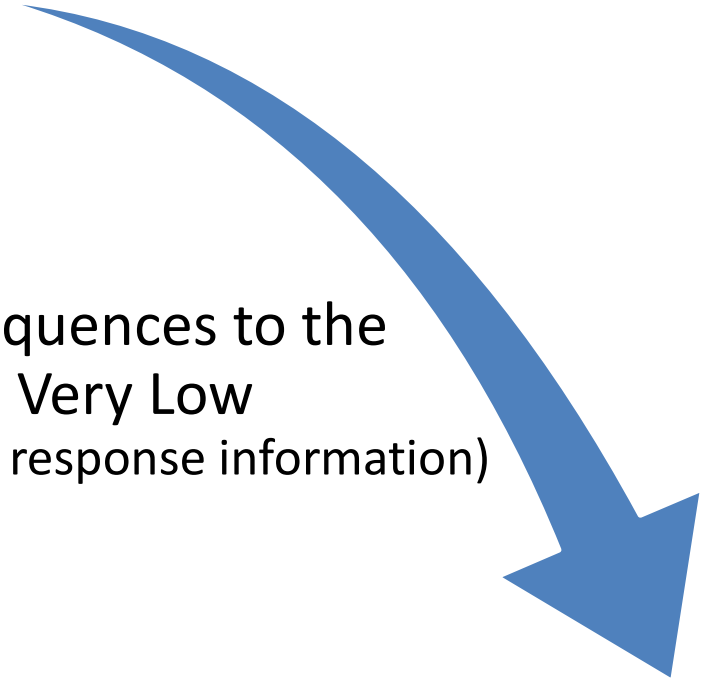
Entergy's Assessment:
Entergy provided sufficient information that would not seriously hamper or prevent an adequate response to a transportation event or accident. The public health and safety was not and would not have been negatively impacted.

Safety Significance is Very Low

Enforcement Perspective

Possibility of a Release of Radioactivity was Very Low
(robust, correct cask used)

Potential Consequences to the Public was Very Low
(acceptable emergency response information)



Grand Gulf - May 22, 2020
Radioactive Waste Shipment

Public Confidence Maintained For this Shipment

Possibility of a Release of Radioactivity was Very Low

- ✓ Package meets requirements of 10 CFR 71.71 and 71.73
- ✓ Properly tested and packaged as Type B
- ✓ Properly placarded
- ✓ Category II requirements met
- ✓ Radiation limits not exceeded
- ✓ No breach in transit – safely transported
- ✓ No Certificate of Compliance issues

Potential Consequences to the Public was Very Low

- ✓ Assessed the significance of the impact to public health and safety (IMC 0609, Appendix D)
- ✓ Potential impact is very low based on package testing and qualification
- ✓ Qualification encompass potential scenarios that impact public safety
- ✓ Cask is accepted and certified by the NRC
- ✓ The Emergency Response telephone number was provided with the shipment
- ✓ Actual emergency response would likely not have been impacted due to the similarities of the ERGs in this instance

Public Confidence Maintained For This Shipment

- ✓ Emergency Response Information in ERG 162 and ERG 163 very similar with no significant differing direction to first responders
- ✓ Possibility of a Release of Radioactivity was Very Low
- ✓ Potential Consequences to the Public was Very Low
- ✓ Shipment arrived safely in correct package with no actual consequences
- ✓ IMC 0609, Appendix D – should be assessed as very low safety significance

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Entergy's view is that the significance of the apparent violations at Grand Gulf should be assessed as one finding of very low safety significance (GREEN)

Closing Remarks

Bob Franssen
Vice President
Grand Gulf Nuclear Station