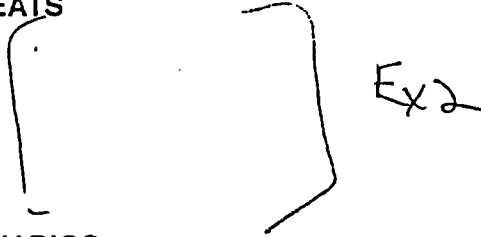


Draft 2/5/02

ELEMENTS OF VULNERABILITY ASSESSMENT FOR BREACHING SPENT FUEL DRY STORAGE SYSTEMS

THREATS



SCENARIOS

(To be developed from Threats)
(Briefing to be held on 2/11/02)

INDUCED ENVIRONMENT/LOADINGS

- Pressure vs Time
 - Temperature vs Time
 - Mass and Velocity of
 - Geometry and Physical Properties of
- Ex2

POPULATION OF DRY SPENT FUEL STORAGE CONTAINERS

- Single Barrier System Cask w/Cask Containment
- Double Barrier System Cask w/ Cask or Overpack and Canister Containment
- Number Now in Use
- Number in Future Use
- Number at a Given Site
- Materials of Construction
- Wall Thicknesses
- Containment Closure System
- Containment Internal Pressurization Environment

CONTAINED/STORED SOURCES

- Spent Fuel Type and Quantity
 - PWR
 - BWR
- Max. Initial Enrichment
- Max. Burnup
- Heat output
- GTCC Material Type and Quantity/Activity

CASK/OVERPACK BREACHING

- Cask Failure Modes (Transfer Casks are not included in current plan)
 - Gross Overpressure from
 - Crash Impact of Deformable Objects
- Ex2

Portions Ex2

E/14

Gross High Temperature/Fire
Breached Cask Opening Size/Geometry
Internal Cask Conditions Created by Cask Breach

CANISTER BREACHING

Cask/Overpack "Open" Operational Modes
Canister Failure Modes

Ex2 () All Cask Failure Modes as Continuation for Canister
Generated by Cask Breach
Breached Canister Opening Size/Geometry
Internal Canister Conditions Created by Canister Breach

DAMAGE TO CANISTER INTERIOR BASKET/CELL STRUCTURE

Crushing
Buckling
Yielding
Perforation

DAMAGE TO CONTAINED/STORED SOURCES

Intact Materials
Fuel Cladding and Crud
Spent Fuel
Other Material
Damage Products
Released Gases
Fragments
Particles
Other

DISPERSION OF SOURCES

CONSEQUENCES OF SOURCE RELEASES

Identification of Prompt Deaths
Identification of Offsite Property Damage and Cleanup Costs
Identification of Latent Deaths (?)

NOTES:

1. All assumptions used in the vulnerability assessments must be identified.
2. All elements are to be considered individually or in combination to produce the maximum bottom line consequences, except the THREATS that are only individually considered (pending confirmation from Safeguards/Security).

FILE:ElementsVulnAssess

Portion Ex2

**PROGRAM PLAN FOR
VULNERABILITY ASSESSMENT
FOR SPENT FUEL DRY STORAGE**

Purpose: Given a set of potential terrorist threats and a developed series of event scenarios, assess the vulnerability of spent fuel dry storage systems to those events in terms of potential loss of function(s) of the storage systems. If vulnerabilities are identified, additional protective measures to reduce these vulnerabilities will be identified and evaluated in support of recommended actions.

Threats: Defined threats as identified in Attachment #10 of RTA Scoping Paper to the Commission, dated 11/28/01.

Scenarios: Event scenarios will be developed from the defined threats by safeguards and security personnel for use in the vulnerability assessment.

Scope: Consideration of all spent fuel dry storage systems with a certificate of compliance or utilized under a site specific license shall be made for the vulnerability assessment.

Vulnerability

Assessments: A screening process shall be developed to identify specific storage systems, vendor models, etc. that represent the types of storage systems and the worst case source term contents for that system. These will constitute the examples for which detailed assessments of vulnerability will be performed. A logic system shall be developed to allow reasonable estimates regarding the vulnerability of specific storage systems not identified for detailed assessment. Bounding concepts shall be utilized where there is a defensible basis. Preliminary screening results being developed are included in the attached matrix identifying threats and examples of storage systems to be studied in detail. The next step is to identify the analyses necessary to assess the vulnerability of each example spent fuel storage unit to each of the defined threat scenarios. Determine whether the necessary analyses will be performed by NRC staff or contractor personnel. The necessary analyses to be performed can be considered as addressing the following subject areas.

Analysis Areas:

- * Definition of environmental conditions/loadings created by the threat scenarios
- * Structural/Mechanical/Materials analyses to define any breaching of the containment/confinement boundary of the storage system
- * Materials damage analyses to determine the extent of change of conditions of the stored source materials (the use of an Expert Panel is planned)
- * Analyses to define the dispersion (RAM released and the particle size distribution)

STORAGE SYS <hr/> THREAT	Trans Nuclear TN 68 NOTE 1	Holtec HI-STORM 100 32/68 NOTE 2	BNFL-FS VSC-24 NOTE 3	TransNucWest NUHOMS 24P/52B NOTE 4
(Ex2)				
(Ex2)				
(Ex2)				
(Ex2)				
(Ex2)				

NOTE 1: Represents a combined transport and storage system with no separate overpack and canister. Vertical carbon steel vessel with bolted flanges on the confinement barrier lid that has double metallic O-ring seals with volume in-between under constant helium pressure. Body of confinement vessel is welded nickel alloy steel plate for pressure vessels. Outer shield of pressure vessel carbon steel forging for gamma shield. An outer borated polyester layer

Portions Ex2

Outline for Report on the
VULNERABILITY ASSESSMENT
FOR SPENT FUEL DRY STORAGE

I. Executive Summary

- A. Purpose and Background
- B. Analysis Results
- C. Recommendations

II. Introduction

III. Purpose

IV. Background

- A. New security environment in U.S.
- B. Independent Spent Fuel Storage Installations (ISFSIs)
 - 1. Fuel Handling and Loading
 - 2. Transfer Equipment and Transfer Operations
 - 3. Dry Storage Units
 - 4. Dry Storage Support Pad
 - 5. Monitoring and Maintenance
- C. Threat Development/Definition Process
- D. Scenario Development Process
- E. Discussion of Realistic, Bounding or Other Conditions
- F. Threat Assessment of ISFSIs Prior to 9/11/01

V. Description of New Threats (Ref: Commission Scoping Paper of 11/28/01, Attach. #10)



Ex 2

VI. Description of New Event Scenarios from New Threats Against ISFSIs

- A. (To be determined)
- B. (")
- C. (")
- D. (")
- E. (")
- F. Results of Scenarios
 - 1. Release of Radioactive Materials from a Breach During Handling/Transfer on ISFSI Site
 - 2. Release of Radioactive Materials from a Breached Storage System on ISFSI Site
- G. Scenario Assumptions
 - 1. Theft of radioactive material for diversion from ISFSI site will not occur

Portions Ex 2

**TENTATIVE SCHEDULE OF MILESTONES FOR
VULNERABILITY ASSESSMENT
OF DRY SPENT FUEL STORAGE FACILITIES**

2/15/02 - Contract Support @ SNL in place; Task 1.1: Large Plane Crash into ISFSI using two existing analytical models (for Congressional commitment by Commission) begins

2/15/02 - SNL begins Task 2.2 : Guidance Document for Modeling Source Terms

2/22/02 - Classification of Certified Storage Systems

3/1/02 - Identification/Prioritization of Storage Systems

3/15/02 - Identification of Bounding Source Terms by Storage System

3/15/02 - Threats Redefined or Threat "X" Assumptions Proceed

3/22/02 - Scenarios Provided

3/30/02 - SNL Task 1.2 : Small Plane Crash into ISFSI using two existing analytical models begins

4/30/02 - SNL Task 2.2 Results

5/15/02 - SNL Results Report of Task 1.1

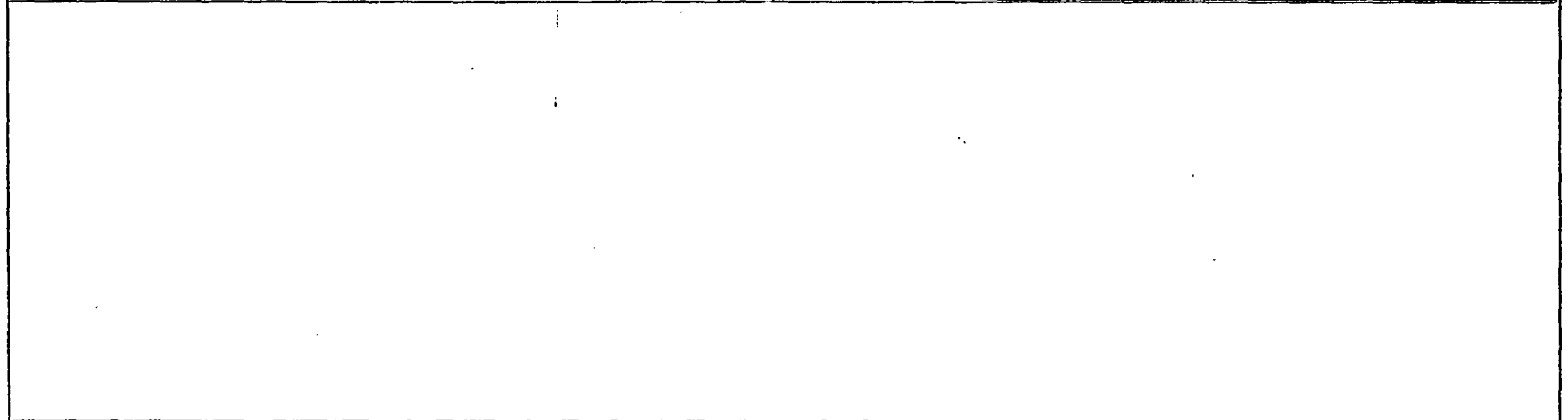
5/30/02 - SNL Task 5 : Vulnerability Assessments for Selected Storage Systems begins

10/31/02 - SNL Task 1.2 Results

12/15/03 - Issue Final Report to NMSS Office Director

FILE:VulAssSched

ID	RTA Analyses To Be Completed	Qtr 1, 2002			Qtr 2, 2002			Qtr 3, 2002			Qtr 4, 2002			Qtr 1, 2003			Qtr 2, 2003			Qtr 3, 2003			Qtr
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
1	Large Plane Crash onto ISFSI																						
2	Mechanical Analysis																						
3	Thermal Analysis																						
4	Source Term Calculation																						
5	Fission Product Transport (MELCOR or Other)																						
6	Consequence Calculation (MACCS/RADTRAD/Other)																						
7																							
8	Small Plane Crash onto ISFSI																						
9	Planes, Scenarios																						
10	Modeling (Includes MELCOR/MACCS/RADTRAD/Other)																						
11																							
12	Simplified Plane Model (For Desktop App. And Train Crash)																						
13	Model Development																						
14	Model Validation																						
15																							
16	Storage Cask Sabotage Scenario (Using HIStorm/HISar)																						
17																							
18	Storage Cask Sabotage Scenario (Using NUHOMS, NAC, TN-68, Castor)																						



Project: Storage Program Plan Date: Wed 02/13/02	Task		Milestone		External Tasks	
	Sp't		Summary		External Milestone	
	Progress		Project Summary		Deadline	