


Louisiana Energy Services Meeting on Integrated Safety Analysis

Date: February 26, 2004

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National Enrichment Facility Integrated Safety Analysis Meeting

February 26, 2004

Agenda

- Introduction
- Integrated Safety Analysis (ISA) Team Approach
- ISA Development Process
- ISA Documentation
- ISA Update Process
- Conclusions

Introduction

- Uranium Enrichment Plant
 - Three Million SWU/Year
 - Urenco Gas Centrifuge Technology
- Location
 - Southeastern New Mexico in Lea County
 - Near Eunice, New Mexico

Introduction (continued)

- National Enrichment Facility (NEF) License Application
 - Submitted December 12, 2003
- NEF License Application Requests
 - 30 Year License Period
 - 5 w/o Maximum Uranium-235 Enrichment
- Integrated Safety Analysis (ISA) Summary
 - Safety Analysis Report (SAR) Chapter 3
 - Consistent with NUREG-1520, Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility

ISA Team Approach

- NEF ISA Conducted with Two ISA Teams
 - Classified ISA Team
 - Non-Classified ISA Team
- Qualifications of each NEF ISA Team
 - Safety Specialists
 - Design Specialists
 - Operational Specialists

ISA Team Approach (continued)

- Classified ISA Team Scope
 - Centrifuge Cascades
 - Centrifuge Post Mortem
 - Centrifuge Test
 - Contingency Dump System
- Non-Classified ISA Team Scope
 - Remaining Systems
 - Examples – Tails Takeoff, UF₆ Feed

ISA Development Process

- ISA Inputs and Outputs
 - In Accordance with Applicable Quality Assurance Requirements
- Hazard Identification Utilized HAZOP Methodology
 - Considered Internal and External Events

ISA Development Process

- **HAZOP PROCESS GUIDEWORDS - Examples**
 - Less/More Heat
 - Less/More Pressure
 - High/Low Level
 - High/Low/No/Reverse Flow
 - Corrosion
 - Maintenance
 - Criticality
 - External Events
 - Construction on Site
 - Hurricane
 - Seismic

ISA Development Process (continued)

HAZOP Worksheet Example

HAZOP		DESCRIPTION : FEED PURIFICATION STATIONS AND HOT BOX			DATE : 9/12/2002	LOCATION : UF ₆ Area
GUIDEWORD	HAZARD	CAUSES	CONSEQUENCES	SAFEGUARDS	MITIGATING FACTORS	COMMENTS
MORE HEAT	Defrost Heater runaway	Heater control failure	Overheat cylinder Potential hydraulic rupture of cylinder High Consequence (Assumed)	Air return temperature hard wired trip Capillary trip	Time (50-60 hours)	High Consequence Accident Identifier - UF2-1

ISA Development Process (continued)

Risk Matrix - Used to Establish Acceptable Risk

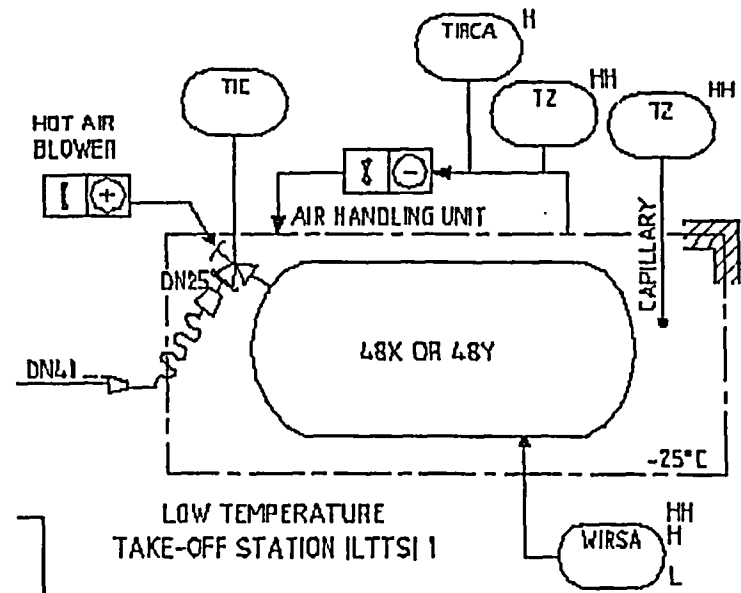
Severity of Consequences	Likelihood of Occurrence		
	Likelihood Category 1 Highly Unlikely (1)	Likelihood Category 2 Unlikely (2)	Likelihood Category 3 Not Unlikely (3)
Consequence Category 3 High (3)	Acceptable Risk 3	Unacceptable Risk 6	Unacceptable Risk 9
Consequence Category 2 Intermediate (2)	Acceptable Risk 2	Acceptable Risk 4	Unacceptable Risk 6
Consequence Category 1 Low (1)	Acceptable Risk 1	Acceptable Risk 2	Acceptable Risk 3

ISA Development Process (continued)

- For Each NEF Process or System
 - Identified Hazards Resulting in Consequences of Concern
 - Generated Accident Sequences
 - Identified Initiating Event Frequency
 - Determined Consequences of Potential Hazards
 - Developed Risk Index Tables

ISA Development Process (continued)

Example - Feed Purification System Defrost Heater



ISA Development Process (continued)

Excerpt From NEF SAR Risk Index Table (Defrost Heater Runaway Sequences)

Accident Identifier	Initiating Event Index	Preventive Safety Parameter 1 or IROFS 1 Failure Index	Preventive Safety Parameter 2 or IROFS 2 Failure Index	Mitigation IROFS Failure Index	Likelihood Index T Uncontrolled (U) / Controlled (C)	Likelihood Category	Consequence Category	Risk Index Uncontrolled (U) / controlled (C)	Comments and Recommendations
TT2-1	-2	N/A	N/A	N/A	-2 (U)	3	3 (T)	9 (U)	IROFS Required
TT2-1	-2	(IROFS1) -2	(IROFS2) -2	N/A	-6 (C)	1	3 (T)	3 (C)	Acceptable Risk
PB2-1	-2	N/A	N/A	N/A	-2 (U)	3	3 (T)	9 (U)	IROFS Required
PB2-1	-2	(IROFS1) -2	(IROFS2) -2	N/A	-6 (C)	1	3 (T)	3 (C)	Acceptable Risk
PT2-1	-2	N/A	N/A	N/A	-2 (U)	3	3 (T)	9 (U)	IROFS Required
PT2-1	-2	(IROFS1) -2	(IROFS2) -2	N/A	-6 (C)	1	3 (T)	3 (C)	Acceptable Risk
UF2-1	-2	N/A	N/A	N/A	-2 (U)	3	3(T)	9 (U)	IROFS Required
UF2-1	-2	(IROFS1) -2	(IROFS2) -2	N/A	-6 (C)	1	3(T)	3 (C)	Acceptable Risk

ISA Development Process (continued)

Example – Items Relied On For Safety (IROFS)

IROFS	Description of Safety Function	Reliability Management Measures
IROFS1	High Temperature Trip of Defrost Heater – Hardwired temperature switch for automatic, fail-safe, high temperature trip of cold box defrost heaters and fans at Tails Low Temperature Take-off Stations, Feed Purification Low Temperature Take-off Stations, Product Low Temperature Take-off Stations, and Product Blending Receiver Stations.	Annual Test
IROFS2	Redundant High Temperature Trip of Defrost Heater - Temperature switch for automatic, fail-safe, high temperature trip of cold box defrost heaters and fans at Tails Low Temperature Take-off Stations, Feed Purification Low Temperature Take-off Stations, Product Low Temperature Take-off Stations and Product Blending Receiver Stations. These trips to be independent and diverse, (e.g., capillary sensor) from IROFS1.	Annual Test

ISA Development Process (continued)

- Sole IROFS
 - In Some Cases, Application of Risk Index Methodology Has Shown That Only a Single IROFS is Required To Satisfy Performance Requirements of 10CFR70.61
 - Even for High Consequence Events

ISA Development Process (continued)

- Performed System Integration Assessment for Systems IROFS Interactions
 - Evaluated Effects of Fire, Internal Flooding and External Events on a Facility Basis
 - Evaluated IROFS for Negative Impacts on Other Systems or IROFS

ISA Documentation

- ISA Summary
 - Consistent with NUREG-1520
 - Includes All High and Intermediate Risk Accident Sequences
 - Includes Results of Classified and Non-Classified ISAs
 - ISA Summary, ISA Documentation, and NEF Design Maintained Consistent

ISA Documentation (continued)

- ISA Documentation Includes
 - Process Safety Information
 - ISA Team Meeting Results
 - Action Items and Resolutions
 - Calculations
 - ISA Technical Reports
 - Design Documentation
 - IROFS Information
- Maintained in Project Files

ISA Update Process

- Ensures NEF Design, ISA Summary, and ISA Documentation Maintained Consistent
- Includes All NEF Design Changes to any Process, Facility or Site Characteristic
- Process
 - Identify Potentially Risk Significant Changes
 - Review and Evaluate Potentially Risk Significant Changes
 - Update ISA Summary and ISA Documentation
- ISA Update Process Applied Through Entire Facility Life Cycle

Conclusions

- ISA
 - Consistent With NUREG-1520 and NUREG-1513
 - Consistent with NEF Design Bases
 - Demonstrates Design Meets 10 CFR 70.61, Performance requirements
 - Results Documented in ISA Summary
 - Maintained Through ISA Update Process