# FUEL FACILITY VIEWS ON COMPARING ISAs to PRAs

Presented by Charles M. Vaughan, NEI

ACRS Subcommittee

January 11, 2011

NEI
NUCLEAR ENERGY INSTITUTE

# Introduction

- Industry appreciates the opportunity to contribute publically to the NRC effort
- Industry agrees with the background discussion of ISA development and the role of ISAs in the regulated safety environment
- Industry is concerned over the suggestion of the potential use of PRA techniques for a yet to be developed Significance Determination Process (SDP)

NEI

# Part 40, 70,76 Facilities

- Broad spectrum of facilities and activities
- Significant Diversity – Little synergy in small numbers
  - U Conversion (1)
  - DU De-conversion (1 *pending)*
  - LWR Fuel Fabrication Facilities (3)
  - Cat I Fuel Cycle Facilities (2)
  - Enrichment – Diffusion (1)
  - Enrichment – Gas Centrifuge (3), (1 *pending*)
  - Enrichment – Laser (1 *pending*)
- Sequential, Stepwise processes
- Not required to run through failures
- Items Relied on for Safety (IROFS) designed to stop accident sequences before they develop

NEI

# ISA Methodology

- Systematic identification and evaluation of accident sequences
- Using tools with extensive, long term application by the chemical industry (HAZOP, Fault & Event Trees, What-If, Risk Index)
- Risk Index is based on operational experience
- IROFS identified and implemented to meet §70.61 performance requirements
- Management Measures are assigned to assure IROFS remain in place and functional
- Provides current and adequate safety basis information for each facility and includes a feedback loop

NEI

# PRA Methodology

- Identification of potential accident scenarios
- Estimates frequencies and consequences to produce risk matrix
- Useful where risk must be accumulated
  - i.e. "sum all accident sequences that can lead to *X* expressed as a frequency of some outcome"
- Accuracy dependent on the accuracy and inclusiveness of the supporting data base
- Extensive time and resources applied to reactors

NEI

# ISA Appropriateness

- ISAs demonstrate that the performance requirements of 10 CFR 70.61 are met
- Fuel Cycle Facility operations simplistic in nature from an integration viewpoint (i.e. little or no domino effect for accident sequences)
- Fuel Cycle Facility source terms are small relative to power reactors - accidents result in minimal or negligible impact to offsite members of the public
- Fuel Cycle Facility accidents have ranked low on the INES Reporting Scale – predominantly chemical risks

NEI

# INES Reporting Scale

| | |
|---|---|
| 7 – Major Accident | Chernobyl |
| 6 – Serious Accident | Kyshtym at Mayak |
| 5 – Accident with wider consequences | Three Mile Island |
| 4 – Accident with local consequences | Tokaimura Criticality, Kerr McGee UF6 (*chemical*) |
| 3 – Serious Incident | |
| 2 – Incident | |
| 1 – Anomaly | |
| 0 – Deviation (No Safety Significance) | |

Steps Approximately 10X

on seriousness scale

NEI

# Justification for Use of ISA at Fuel Cycle Facilities

- ISAs have been found to be acceptable to meet performance requirements of 10 CFR 70.61
- Source terms are small relative to power reactors; accidents result in minimal or negligible impact to offsite members of the public
- Significant amount of resources expended by Industry and NRC to meet existing regulations
- Simplistic, sequential processes without domino effect
- ISA Methodology adheres to a Risk Informed Performance Based Philosophy

NEI

# Industry Summary

- ISA Methodology acceptable to meet 10 CFR 70.61 Performance Requirements
- ISAs are routinely updated, always contain a current basis of safety, and include a feedback loop for identifying and correcting deficiencies
- ISAs were not performed to produce risk matrix – only to demonstrate meeting performance requirements
- ISA Methodology relies on conservative safety assumptions
- Accident significance is small when compared to reactors (INES ranks three orders of magnitude less)
- Mixing of ISA and PRA techniques at these facilities is not advisable
- Significance Determination Process should be simplistic in nature and commensurate with the facility risk profile

NEI

# Acronyms

- ISA – Integrated Safety Analysis
- PRA – Probabilistic Risk Assessment
- SDP – Significance Determination Process
- IROFS – Items Relied on for Safety
- INES – International Nuclear and Radiological Event Scale

NEI