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Hazards Analysis/NCSEs

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NCSE Development Outline

The NCS Engineer:

- Provides input into system design
- Participates on Hazards Analysis Team
- Develops process description and normal case
- Categorizes Hazards Analysis accident sequences
- Demonstrates compliance with DCP and 10 CFR 70.61 Performance Criteria for each NCS accident sequence
- Establishes & verifies implementation of controls

Design Input

NCS Engineer advises design team regarding:

- Equipment Size
- Equipment Spacing
- Other Engineered Features (e.g., safety valves, concentration monitors, etc.)
- Administrative Controls

Hazards Analysis

NCS Engineer is one of a team of Subject Matter Experts that performs the Hazards Analysis

Hazards Analysis Team includes Applicable Members from:

- Project/Design Engineering
- Process Engineering
- Nuclear Criticality Safety
- Operations
- Maintenance
- Chemical Safety
- Industrial Safety
- Radiation Protection
- Fire Protection

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Hazards Analysis

Team reviews P&IDs component-by-component and utilizes the “What-if” method to identify potential upset conditions

Use of experienced subject matter experts

“What-if” Tables

Categories of upset conditions (safety discipline of concern and consequence)

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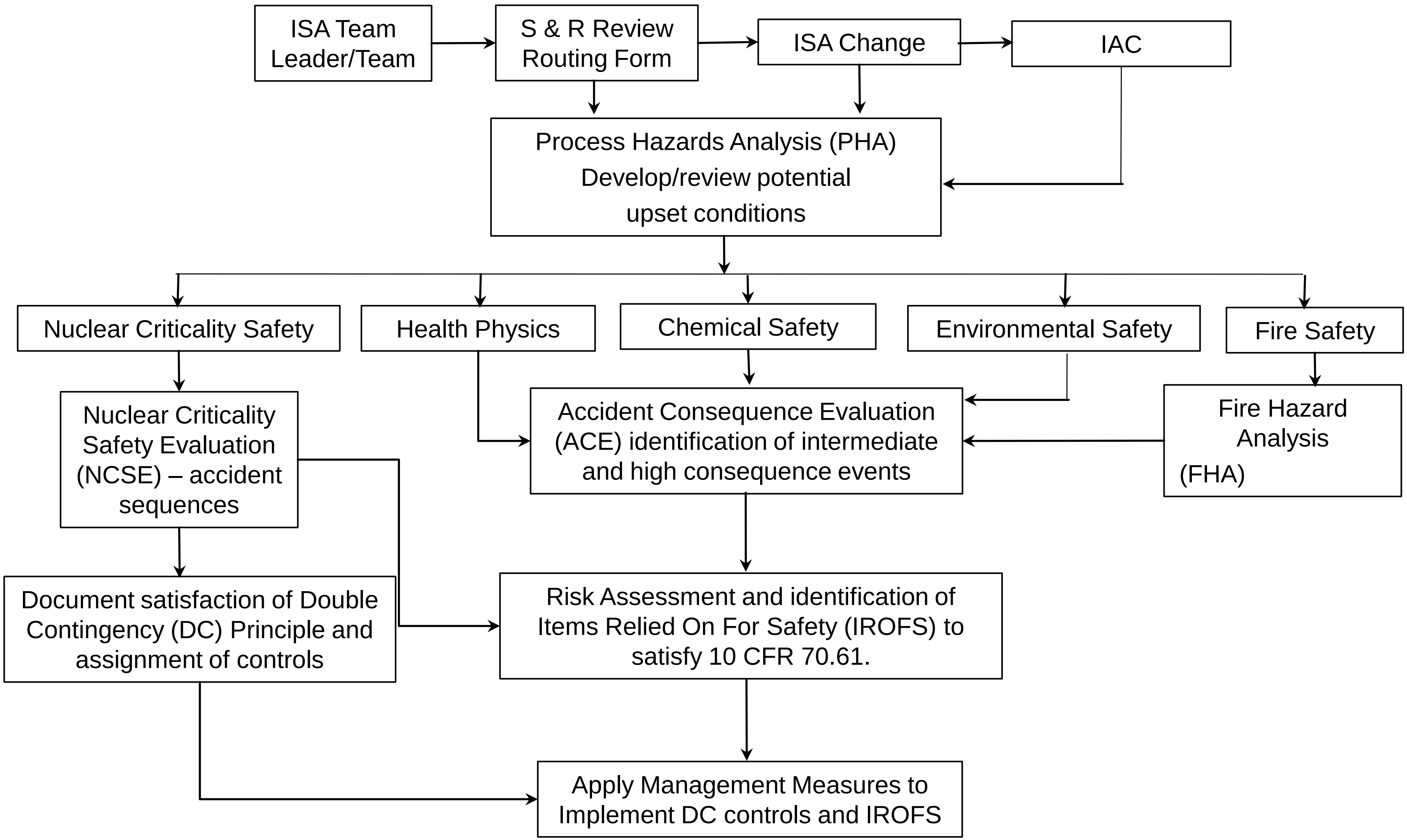
Hazards Analysis

ISA Process Flow Diagram



Development of Process Description & Normal Case

Development of process description and normal case:

- Design report
- Process outline
- Discussions with Design Engineer
- Discussions with Operations Owner
- Review of P&IDs
- Review of Operating Procedures

Criticality Accident Sequences

Upset conditions grouped and criticality accident sequences addressed

Accident sequences may be addressed as “families”

Each potential criticality accident sequence is analyzed and demonstrated to satisfy DCP and 10 CFR 70.61 performance criteria

Sequences determined to be not credible are not risk indexed

DC & 10 CFR 70.61

Preferred Design Approach is Passive Engineered Controls

Control Hierarchy:

- Passive Engineered
- Active Engineered
- Enhanced Administrative
- Simple Administrative

DC & 10 CFR 70.61

Double Contingency: Process equipment and systems designed and operated such that at least two (2) unlikely, independent, and concurrent changes in process conditions are required before a criticality accident is possible

10 CFR 70.61 – Each accident sequence must be Highly Unlikely

DC & 10 CFR 70.61

Not Credible (NUREG-1520) – Any one (1) of the following:

- An external event for which the frequency of occurrence can conservatively be estimated as less than once in a million years.

- A process deviation that consists of a sequence of many unlikely human actions or errors for which there is no reason or motive, excluding intent to cause harm. In addition, no such sequence of events can ever actually have happened in any fuel cycle facility.

- Process deviations for which there is a convincing argument, based on physical laws, that the deviations are not possible, or unquestionably extremely unlikely. The validity of the argument must not be dependant on any feature of the design or materials controlled by the facility's system of IROFS or management measures.

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Criticality Safety Risk Index Table

Accident Sequence	Initiating Events/ Enabling Events (IE/EE)	IROFS Effectiveness of Protection Index (E-Enhanced, A-Active, P-Passive)	Likelihood Index T Uncontrolled/ Controlled
A-2	**Solution at >0.06 grams U-235/l in solution storage column banks E or F (IE = -2)**	**BLW-2 (-2)** **BLW-4 (A) (-3)**	**Unc T = -2** **Con T = -7**

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Criticality Safety IROFS Table

IROFS			Hazards Analysis and Risk Assessment		Management Measures Level	
Identification	**Components**	**Safety Function Description**	**Accident Sequence**	**Consequence Level**	**A**	**B**
BLW-4 (See section 4.1.2.4)	**Monitor RE-5A01 Valve HV-5A01A Valve HV-5A01B Monitor RE-5B01 Valve HV-5B01A Valve HV-5B01B**	**<u>AEC:</u> Inline monitor and associated interlocks with isolation valves provide automatic dual valve isolation when discard solution with a U-235 concentration greater than 0.06 grams/liter is detected.**	**A-2**	**High Criticality**	**X**	

Control Implementation

Control Flowdown

1.0 General Requirements

General Requirement	Verification/Justification
Area or operation is covered by the Criticality Accident Alarm System (CAAS)	Demonstration of CAAS detector coverage for BPF, Building 333, 21T-04-0521
Equipment (important to the NCSE) is identified, labeled, or tagged in the field with equipment number.	In-field inspections/walkdowns by J. Smith on 2/1/2010 verified equip. is adequately identified, labeled, or tagged.
No system connections (e.g., uranium-bearing solution lines) exist to unapproved systems or equipment	In-field inspections/walkdowns by J. Smith on 2/1/2010 verified all systems connected are approved.

2.0 Administrative Limits

Requirement as Worded in Section 7 of the NCSE	Procedure Section or Step in Which Requirement is Implemented	Wording in Procedure
TANK-5B01 shall be empty of liquid prior to performing NDA scan.	SOP 409, Section 11 (Revision 6)	6.4.1 Verify tank is empty and perform NDA scan of the tank. Record tank inspection and NDA scan results on Runsheet B-1.

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Control Implementation

Control Flowdown cont.

3.0 Configuration Controlled Equipment

CCE Item and Requirement in Section 6.2 of the NCSE	Field Measurements/ Observations	Notes/Comments
Caustic storage bank G and H shall have a maximum capacity of 815 liters.	Maximum volume of storage bank measured to be less than 815 liters.	Reference memorandum 55T-08-0347, dated 6/20/2008

4.0 Safety Related Equipment

SRE Item	SRE Number	SRE Item is included in SRE Management System	SRE Test and Set Point Analysis Verified?	Notes/Comments
Monitor RE-5A01 Valve HV-5A01A Valve HV-5A01B	N333MONITOR01 N333VALVHVA01A N333VALVHVA01A	Yes Yes Yes	Test/Analysis verified Test verified Test verified	6 month test period 6 month test period 6 month test period