UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 15, 2003

MEMORANDUM TO: Kathy Halvey Gibson, Acting Chief
Special Projects and Inspection Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

THRU: Brian W. Smith, Acting Chief
Special Projects Section
Special Projects and Inspection Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

FROM: Andrew Persinko, Sr. Nuclear Engineer
Special Projects Section
Special Projects and Inspection Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

SUBJECT: MAY 8, 2003, MEETING SUMMARY: MEETING WITH DUKE COGEMA STONE & WEBSTER TO DISCUSS THE INTEGRATED SAFETY ANALYSIS RELATED TO MIXED OXIDE FUEL FABRICATION FACILITY

On May 8, 2003, U.S. Nuclear Regulatory Commission (NRC) staff met with Duke Cogema Stone & Webster (DCS), the mixed oxide fuel fabrication facility (MFFF) applicant, to discuss the Integrated Safety Analysis (ISA) methodology that is being implemented by DCS for the MFFF as part of the safety analysis for the possession and use license, and to obtain NRC staff feedback. The meeting agenda, summary, handouts and attendance list are attached (Attachments 1, 2, 3, 4, respectively).

Docket: 70-3098

Attachments: 1. Meeting Agenda
2. Meeting Summary
3. Meeting Handouts
4. Attendance List

cc:
P. Hastings, DCS
J. Johnson, DOE
H. Porter, SCDHEC
J. Conway, DNFSB
L. Zeller, BREDL
G. Carroll, GANE
D. Curran, GANE
D. Silverman, DCS

MEETING AGENDA
MOX FUEL FABRICATION FACILITY
May 8, 2003

May 8, 2003

9:00 AM	Presentation of Integrated Safety Analysis (ISA) Methodology by Duke Cogema Stone and Webster staff
12:00 NOON	Lunch
1:00 PM	Discussion of ISA Methodology
3:00	Adjourn

Attachment 1

MEETING SUMMARY
MOX FUEL FABRICATION FACILITY
May 8, 2003

Purpose:

The purpose of the meeting was for Duke Cogema Stone and Webster (DCS) to present its Integrated Safety Analysis (ISA) methodology that is being implemented for the MOX Fuel Fabrication Facility (MFFF) as part of the safety analysis for the possession and use license, and to obtain U.S. Nuclear Regulatory Commission (NRC) staff feedback.

Meeting Summary:

DCS described the methodology that it is applying as it does the safety analysis for the possession and use license. The methodology is shown in diagrammatic form in Attachment 3. Slides used by DCS in its presentation are included as Attachment 3.

In its presentation, DCS stated that:

1. The level of detail in the ISA is comparable to a piping and instrumentation diagram (P&ID) (i.e., valves, pumps, etc.)

2. The Items Relied on For Safety (IROFS) are being identified by "workshops." There are approximately 300-500 events per workshop.

3. Fault tree analysis will be preformed for certain systems.

The NRC staff:

1 Questioned whether the IROFS would be similar to a Q-list in a nuclear power plant. DCS was not sure if this analogy was accurate.

2. Stated that DCS should review the required contents of the ISA summary, as described in 10 CFR 70.65, and assure that the process being implemented will provide the required information for the ISA summary.

3. Stated that an operator should readily know what is an IROFS in the plant.

4. Stated that DCS should, in its license application, describe the means to detect failures and make a commitment to surveillance timeframes.

5. Stated that the probability of failure on demand (PFOD) should be described as it will relate to surveillance frequencies.

The staff and DCS agreed that the details of meeting the DCS commitment to NRC Request for Additional Information (RAI) 39 should be discussed in a future meeting since the way DCS is implementing its response may be different from what the staff understood from the written response. RAI 39 relates to the supplemental likelihood analysis based on guidance in NUREG-1718, committed to by DCS.

The NRC staff concluded that:

1. The approach DCS presented was at a general, high level. At this level, the approach seemed to be reasonable.

2. Follow-up meetings should be held to discuss the ISA methodology in more detail, the format, content of the ISA summary, including the level of detail to be included in the ISA summary. When these meetings are held would be a function of when DCS plans to submit its license application.

3. A future meeting should be held to discuss DCS' implementation of its response to RAI 39. DCS should link its response to RAI 39 to the information it presented to the staff on July 26, 2001.

4. DCS should be especially careful in determining whether an IROFS constitutes a sole IROFS since it is not always obvious that an IROFS is a sole IROFS.

5. DCS should review the required contents of the ISA summary, as described in 10 CFR 70.65, and assure that the process being implemented will provide the required information for the ISA summary

DUKE COGEMA STONE&WEBSTER SLIDES
INTEGRATED SAFETY ANALYSIS METHOD FOR THE
MOX FUEL FABRICATION FACILITY
May 8, 2003

Attachment 3

DUKE COGEMA
STONE & WEBSTER

Integrated Safety Analysis Method for the MFFF

Presentation to NRC

May 2003

DUKE COGEMA
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Meeting Purpose

- Present ISA methodology that is being implemented for the MFFF
- Obtain NRC feedback

ISA Methodology
Background

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10 CFR 70

70.4 – Definitions

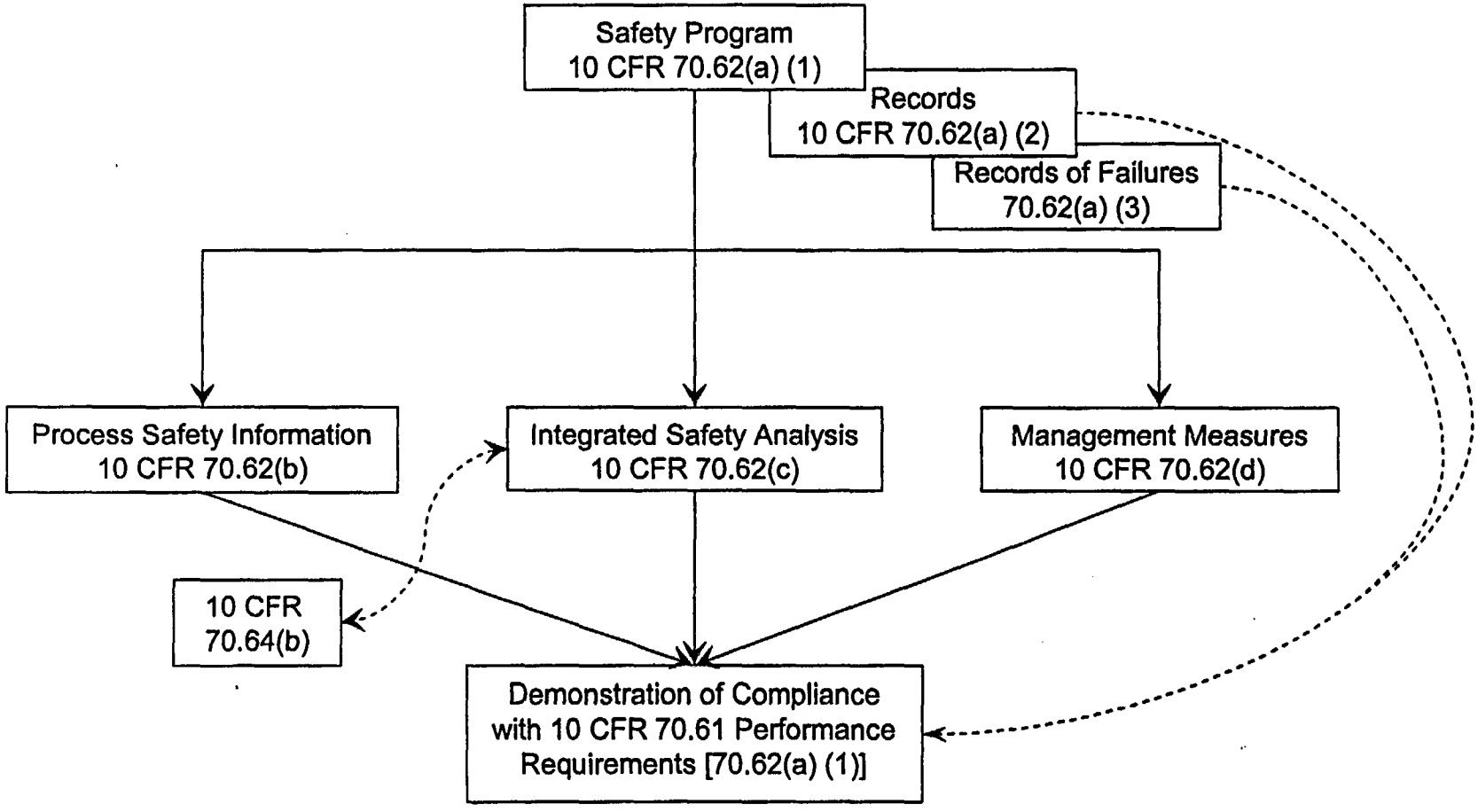
- Integrated Safety Analysis
- Items Relied on for Safety

70.61 – Performance Objectives

70.62 – Safety Program

70.64 – Baseline Design Criteria & Defense in Depth

Demonstration of Compliance with 10 CFR 70.61 Performance Requirements



Management Measures

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- 10CFR70.62(d) establishes requirement for management measures
- Provides additional assurance that IROFS are designed, implemented, and maintained in support of meeting 70.61 performance requirements
- Implementation for MFFF via QA Program (MPQAP)
- Implementation summarized in CAR (Chapter 15):
  - QA (10 CFR 50 Appendix B for MFFF)
  - Maintenance
  - Procedures
  - Incident Investigations
  - Configuration Management
  - Training & Qualifications
  - Audits and Assessments
  - Records Management

Regulatory Overview

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- 10CFR70.62 requires applicant to conduct and maintain an integrated safety analysis that identifies:
  - Radiological hazards
  - Chemical hazards
  - Facility hazards
  - Accident sequences
  - Consequences and likelihoods
  - Items relied on for safety

Regulatory Overview

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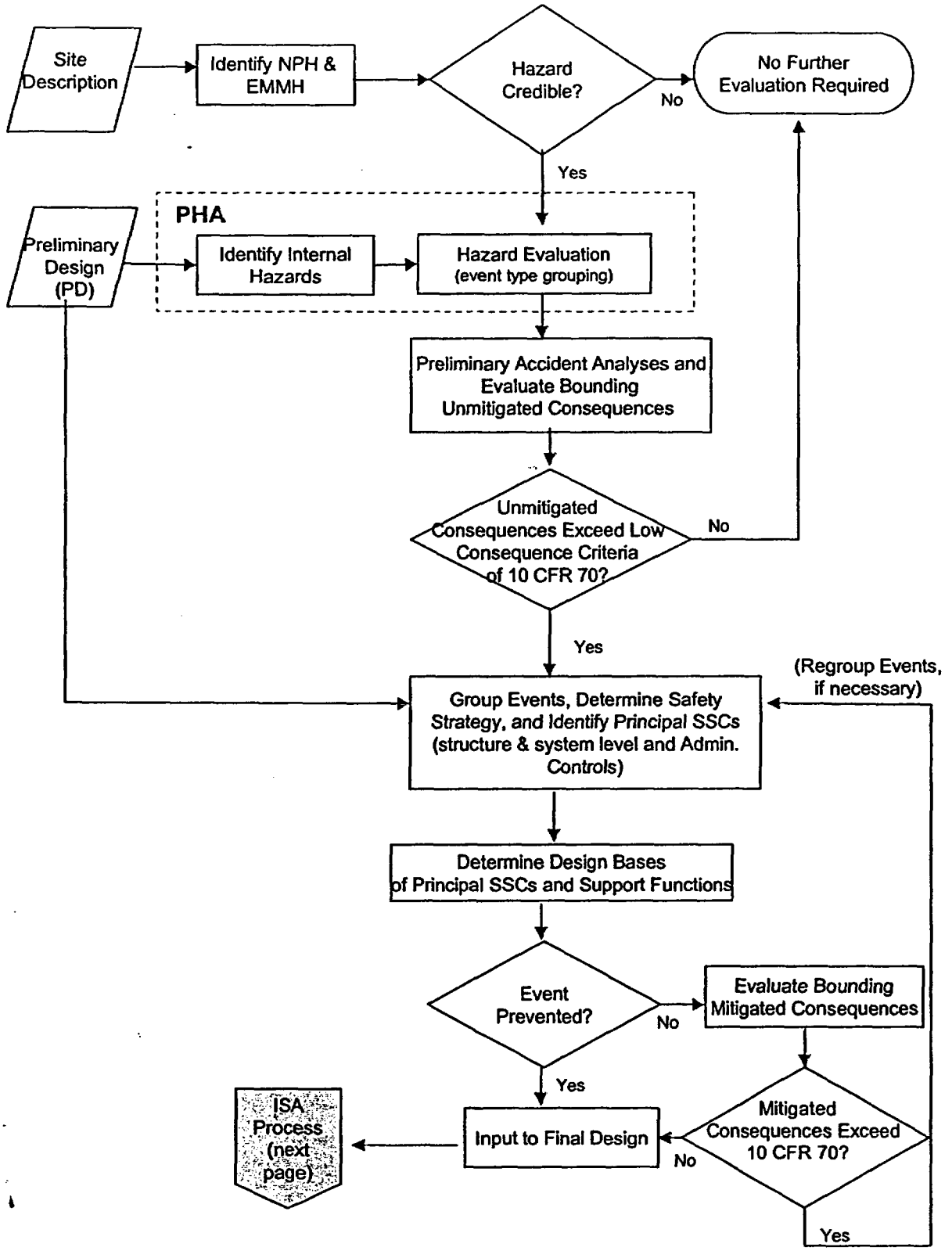
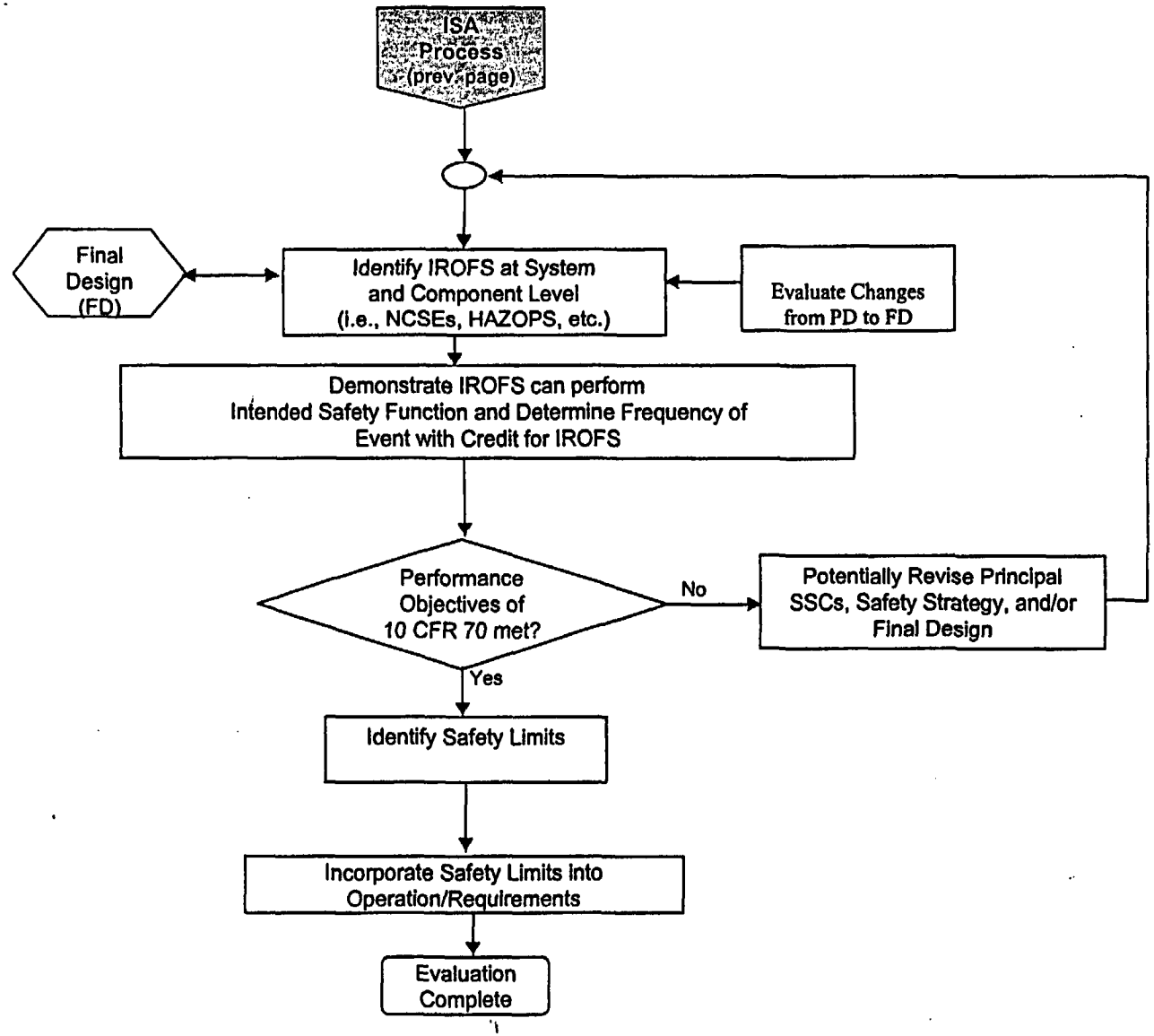
- **SA for the CAR**
  - Identify hazards and events associated with MFFF design and operations
  - Identify safety strategy and associated principal SSCs required to mitigate or prevent these events, and identify their design bases
  - Describe principal SSCs capability through commitment to codes, standards, and preliminary design
- **ISA for the LA**
  - Identify detailed event sequences as required by safety strategy within SA
  - Demonstrate IROFS are effective
  - Demonstrate event sequences satisfy the performance requirements of 10CFR70.61

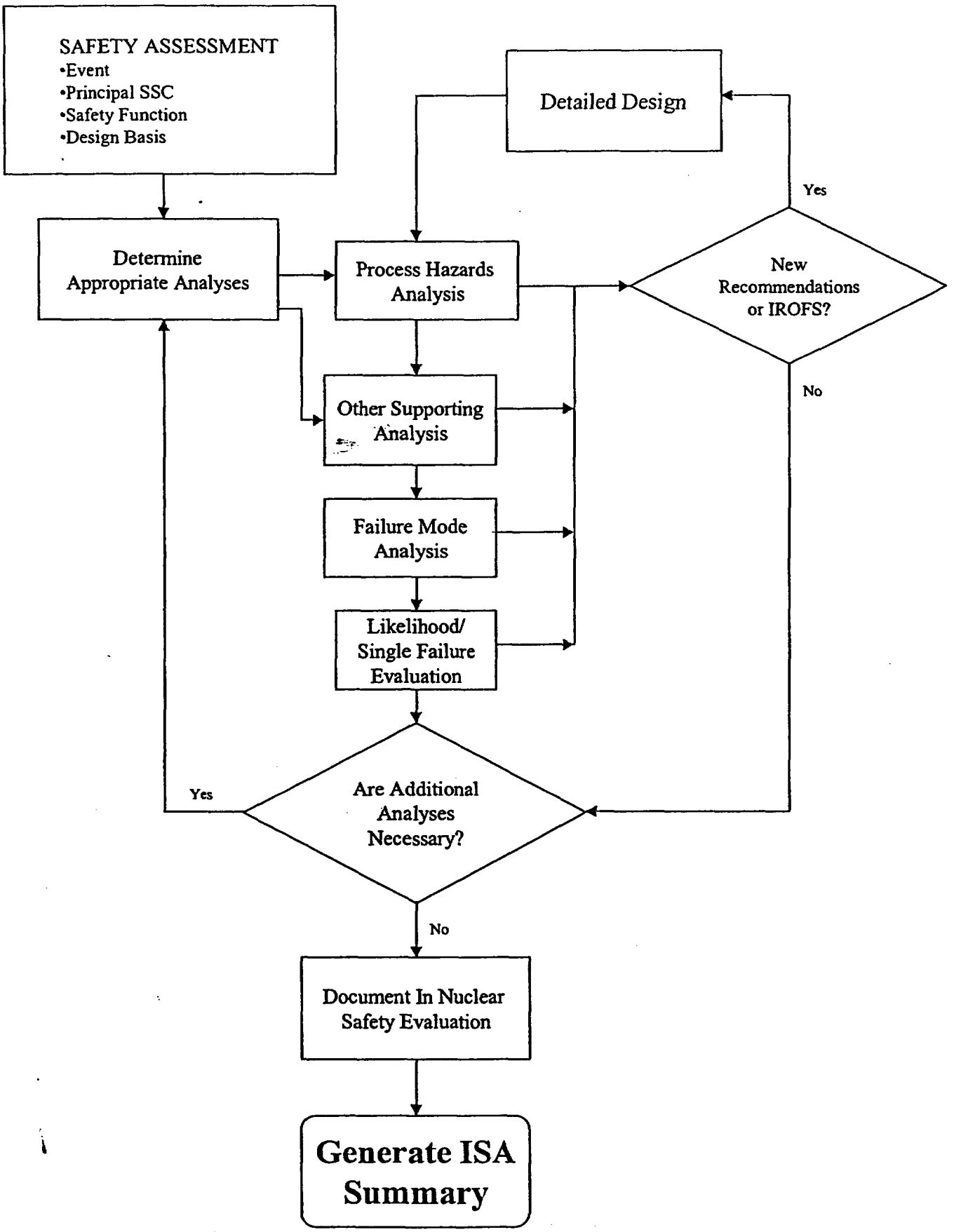
ISA Flow Chart (Safety Assessment of the Design Basis)



ISA Flow Chart (Later Phase of the ISA) (continued)



Development of the ISA



Main Types of Analyses

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- Process Hazards Analyses
  - Identify event sequences and IROFS
- Nuclear Safety Evaluations and Nuclear Criticality Safety Evaluations
  - Demonstrate event sequences satisfy likelihood criteria
  - Demonstrate IROFS are effective, reliable, and available
- Supporting Analyses
  - Modeling
  - Design calculations
  - Failure Modes Analyses
  - Single Failure Evaluations

Process Hazards Analyses

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- Purpose is to identify event sequences and IROFS
- Techniques based on guidance provided by AIChE Procedures
  - HAZOPs
  - What-ifs

Process Hazards Analyses – Typical Information Contained in the Analyses

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- Process Overview
- Methodology selection justification and description
- Event Sequence Description
- List of IROFS
- List of Action Items
- List of Process Safety Information

Nuclear Safety Evaluations and Supporting Analyses

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- Purpose
  - Demonstrate event sequences identified in the PrHA satisfy the performance requirements of 10CFR70.61
- How is this done?
  - Demonstrate events satisfy likelihood criteria
  - Perform a systematic and comprehensive evaluation to demonstrate IROFS are effective and can perform their safety function when needed
  - Identification of applicable management measures

Nuclear Safety Evaluations and Supporting Analyses (1 of 2)

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- Consider the following
  - Environmental conditions (temperature, chemicals, humidity, pressure, radiation fluence, etc.) that might be imposed on specific systems, structures, or components under normal, off-normal, and accident conditions
  - Protection from natural phenomena
  - Protection against chemical risks
  - Protection against fires and explosions
  - Identification of means to detect failures

Nuclear Safety Evaluations and Supporting Evaluations (2 of 2)

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- Consider the following (con't):
  - Failure modes and common mode failures
  - Loss of utilities and fail safe positions
  - Management measures
  - Safety parameters, limits and margin
  - Impact of non-safety features on IROFS ability to perform their function
  - Human Factors

Nuclear Safety Evaluations and Supporting Analyses

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- IROFS effectiveness is demonstrated through the supporting calculations and evaluations
- Event likelihood is demonstrated through the following:
  - Compliance with single failure criterion
  - Identification of means to detect failures
  - Description of applicable codes and standards
  - Commitment to 10CFR50 Appendix B QA program

Example – Radiolysis Evaluation

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- Safety Assessment Information
  - Event: Radiolysis induced explosion
  - PSSC: offgas treatment system, emergency scavenging air system
  - Safety Function: provide exhaust path, provide air for dilution
  - Design Basis: hydrogen concentration < 50% of LFL

Example – Radiolysis Evaluation (con't)

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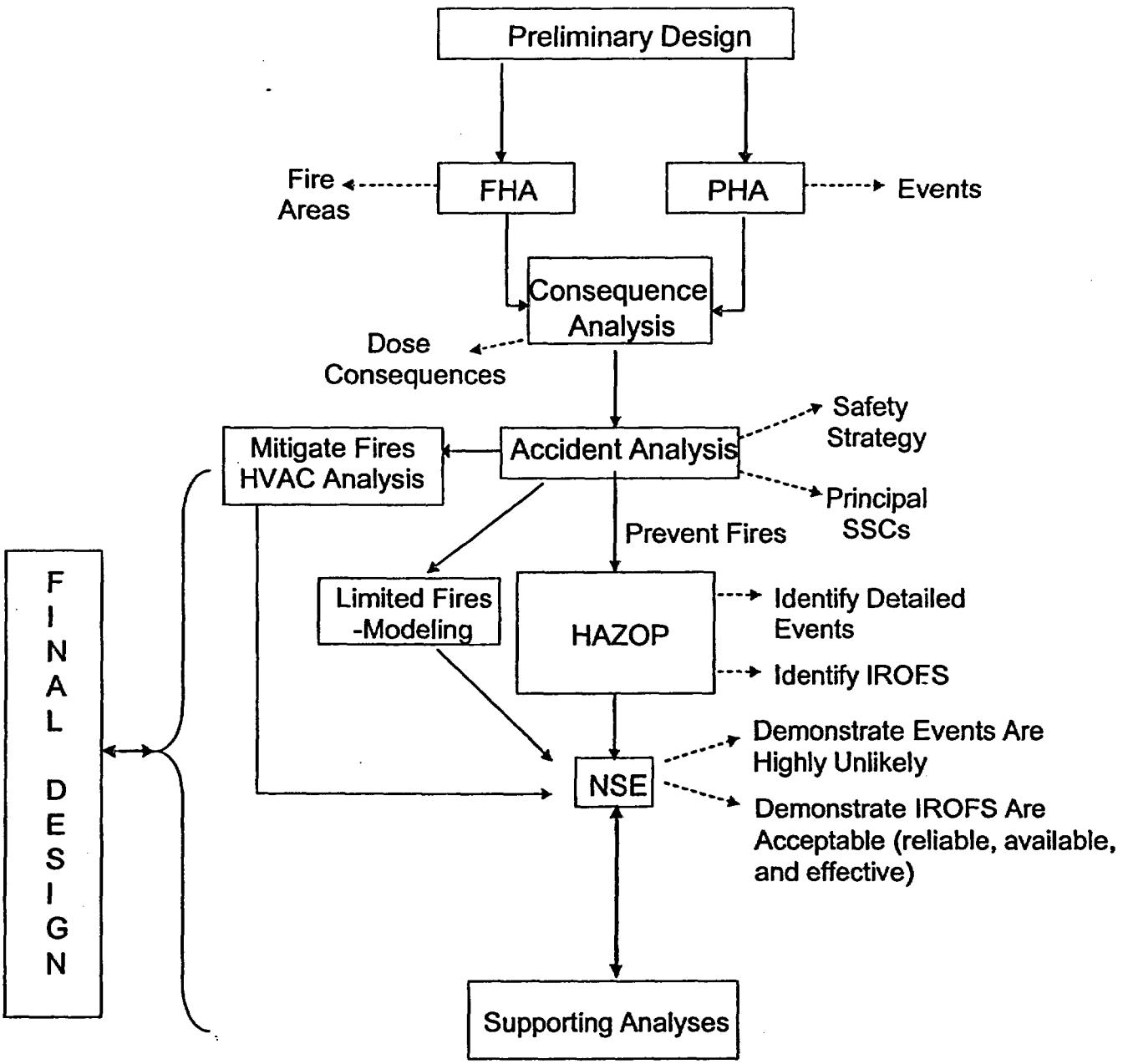
- ISA Evaluations
  - HAZOPs
  - Sizing calculations
  - Air flow and air mixing evaluations
  - LFL and time to reach LFL determination
  - Failure modes evaluation of IROFS
  - single failure evaluation of IROFS – fault tree evaluations (air lines, instrumentation)

Integrating Fire Safety into the ISA



Example – Fire Involving 3013 Transport Cask Evaluation

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- Safety Assessment Information
  - Event: Fire in the 3013 Cask Receiving Area
  - PSSC: 3013 Transport Cask, Combustible Loading Controls
  - Safety Function: withstand fire, limit combustibles
  - Design Basis: 3013 Transportation Cask Specifications

Example – Fire Involving 3013 Transport Cask Evaluation (con't)

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- ISA Evaluations
  - Fire modeling to demonstrate credible fires do not exceed 3013 cask specifications
  - Describe elements of combustible control program that are applicable to this event

Example-Fire Involving a Glovebox Evaluation

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- Safety Assessment Information
  - Event: Fire impacts a glovebox
  - PSSC: C3 and C4 confinement systems, Fire Barriers
  - Safety Function: remain operable and effectively filter release, limit fires to a single fire area
  - Design Basis: filter effectiveness of 99.99%

Example - (con't)
Fire Involving a Glovebox

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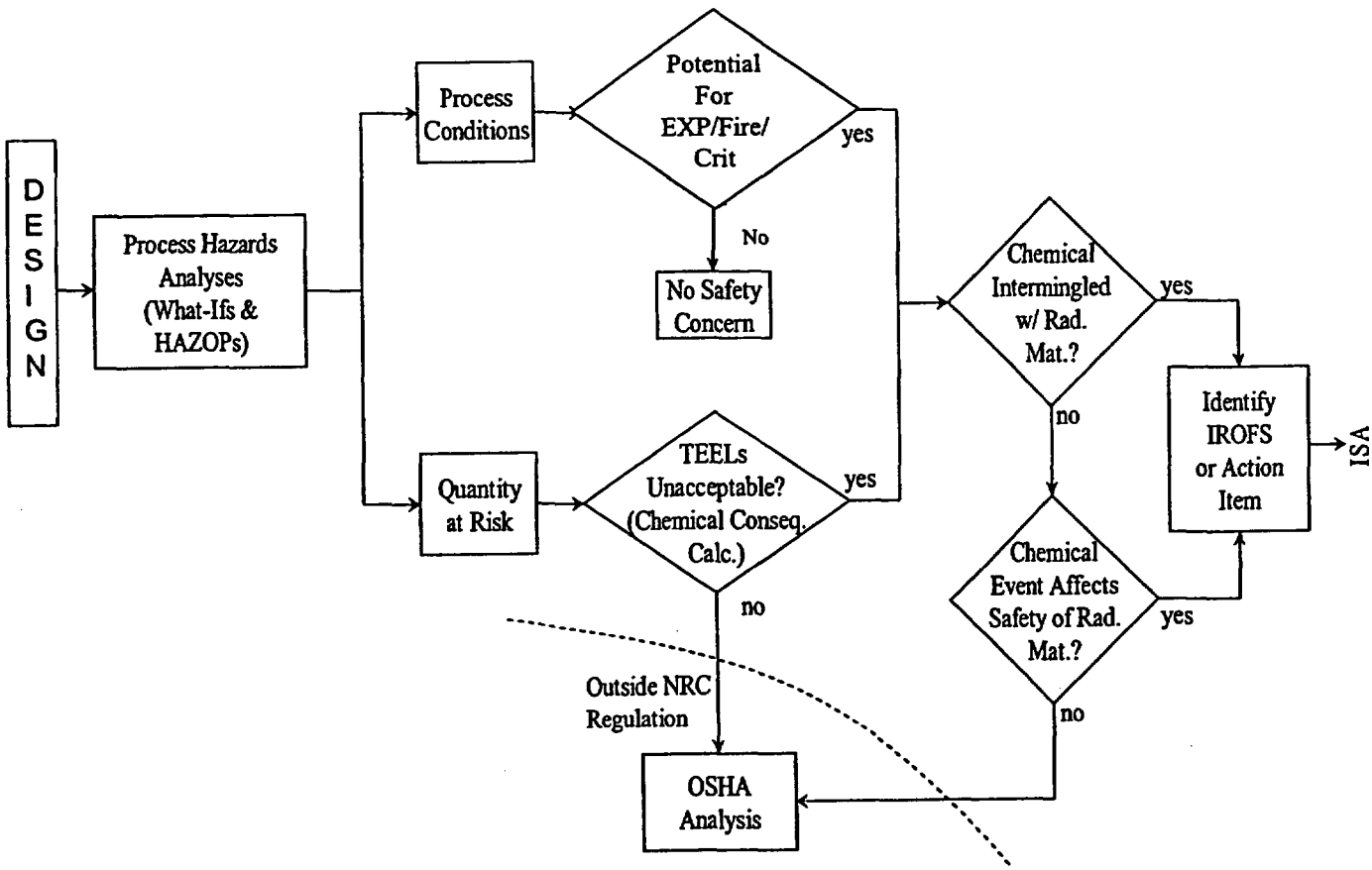
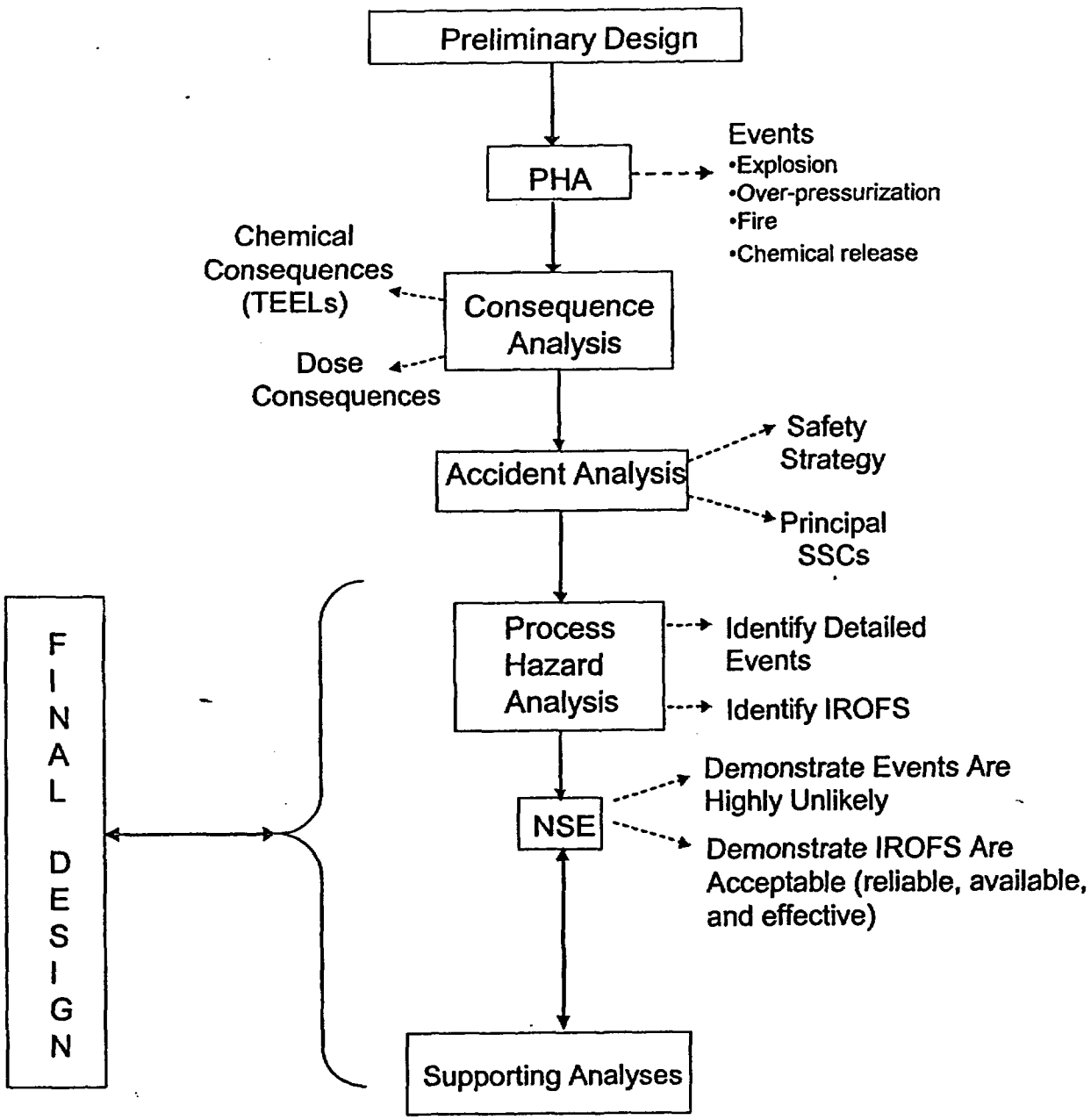
- ISA Evaluations
  - What-if analysis
  - Fire hazard analysis
  - Fire severity modeling and fire barrier analysis
  - Soot loading analysis
  - Dilution temperature and moisture analysis
  - HVAC modeling
  - Fault tree analysis

Chemical Analysis Methodology



Integrating Chemical Safety into the ISA



Example – Events Involving Hazardous Chemicals and Radioactive Material

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- Safety Assessment Information
  - Bounding Chemical Consequence Evaluation
- Additional ISA Analyses
  - HAZOPs
  - Chemical consequence modeling

Conclusion

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- Implementation of Described ISA Methodology;
  - Ensures that the ISA and SA are integrated
  - Demonstrates that the requirements of 10CFR70.62(c) are satisfied
  - Demonstrates that the performance criteria of 10CFR70.61 are satisfied

MEETING ATTENDEES

NAME	AFFILIATION
Andrew Persinko	Nuclear Regulatory Commission (NRC)
Rex Wescott	NRC
Joseph Giitter	NRC
Brian Smith	NRC
John Hull	NRC
Joel Kramer	NRC
Sharon Steele	NRC
Fred Burrows	NRC
Kathy Gibson	NRC
David Brown	NRC
Ken Ashe	Duke Cogema Stone & Webster (DCS)
Bob Ihde	DCS
Peter Hastings	DCS
Gary Kaplan	DCS
David Alberstein	Department of Energy (DOE)
Jamie Johnson	DOE
Geoffrey Kaiser	SAIC
Don Williams	ORNL
Herb Feinroth	Gamma Engineering
Jim Clark	J.R. Clark Associates
Junchi Kurakami	Japan Nuclear Fuel Cycle Development Institute

July 15, 2003

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THRU: Brian W. Smith, Acting Chief /RA/
Special Projects Section
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Division of Fuel Cycle Safety
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FROM: Andrew Persinko, Sr. Nuclear Engineer /RA/
Special Projects Section
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