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U. S. Nuclear Regulatory Commission, Region II
Mr. Richard Gibson, Project Manager
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SUBJECT: WESTINGHOUSE SAFETY BASIS STRATEGY FOR THE NEW DRY CONVERSION PROCESS

Enclosed is a copy of the Safety Basis Strategy for the Westinghouse Electric Company, LLC (WEC) Dry Conversion Process at the Columbia Fuel Fabrication Facility (CFFF). This strategy includes a major milestones schedule as well as the Baseline Design Criteria (BDC) for new process.

This strategy will provide the basis for our discussion with you on October 10, 2007. If you have any questions or concerns, please contact me at (803) 647-3338.

Sincerely,

Nancy Blair Parr

Nancy Blair Parr
Manager, Special Projects
Westinghouse Columbia Fuel Fabrication Facility

Docket 70-1151 License SNM-1107

Enclosure

SAFETY BASIS STRATEGY FOR DRY CONVERSION FACILITY

September 7, 2007

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TITLE: SAFETY BASIS STRATEGY FOR DRY CONVERSION FACILITY

REVISION NUMBER: 0

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1.0 PURPOSE

The purpose of this Safety Basis Strategy (SBS) is to document the approach for development of the safety, security and licensing documents and associated analyses to support the design, start-up and operation of the new Dry Conversion Process (DCP) at the Columbia Fuel Fabrication Facility (CFFF). This SBS is written to assure that the new process will be fully compliant with all applicable federal, state and local requirements.

2.0 DESCRIPTION OF PROPOSED ACTIVITIES

This SBS documents the strategy for the DCP at the CFFF. The DCP will consist of three operations (1) uranium processing, (2) hydrofluoric acid (HF) recovery, and (3) powder blending and packaging. The scope of this SBS includes the following list of major facilities, systems, and equipment:

- Major Facility and Common Systems
  - Building for housing processes and associated support systems
  - Process utilities – nitrogen, hydrogen, steam, process air, process ventilation
  - Utilities – electricity, instrument air, breathing air, water, chilled water, sewer, working area HVAC, support area HVAC
  - Basic process controls system and safety controls system
- Uranium processing
  - UF6 vaporizer, UO2 fluidized bed reactor, UO2 calciner, UO2 receivers and vacuum transport system
- HF Recovery
  - HF condensers, gaseous scrubbers, diversion tanks, product holding tanks and product loading system
- Powder Blending and Packaging
  - UO2/U3O8 powder hoppers, homogenizing blender, hammer mill, roll compactor, granulator mill, blended powder bulk containers and bulk container transport system
  - UO2 powder pail loading system, pail handling & packaging, overpack conveyance and pail/overpack storage

Where practicable, Green and Renewable Energy Principles will be incorporated into the engineering design.

3.0 ROLES / RESPONSIBILITIES

The EH&S DCP Project Manager is responsible for the management and direction/scope of the activities covered by this SBS.

The Environment, Health and Safety (EH&S) Engineering Manager is responsible for the development and approval of the safety documents and related analyses covered by this SBS.

The EH&S Licensing and Regulatory Programs Manager is responsible for the development and approval of the licensing documents and Integrated Safety Analysis covered by this SBS.

The EH&S Operations Manager is responsible for the development and approval of the health physics assessments covered by this SBS.

The DCP Project Manager is responsible for fully defining the scope of the proposed activities at an adequate level to support the completion of required safety basis analyses, for review and approval of the safety documents and for supporting implementation as required. The DCP Project Manager will serve as the Design Authority for this project. CFFF Operations and Engineering will also support the development, review and approval of the Safety Basis supporting documents described in this SBS. Support shall include providing the required inputs, attending project meetings, responding to questions, providing comments on drafts and approving documents within the timeframes specified by the project schedule.

4.0 SBS OVERVIEW

4.1. Goals and Objectives

The goals of the SBS are the following:

- Generate 10CFR70.64 Baseline Design Criteria (BDC) for the design of the new DCP including quality standards and records, natural phenomena hazards, fire protection, environmental and dynamic effects, chemical protection, emergency capability, utility services, inspection testing and maintenance, criticality control, instrumentation and controls. The DCP facility and system design must incorporate a defense-in-depth approach including a preference for the selection of engineered controls over administrative controls and features that enhance safety by reducing challenges to (Items Relied On For Safety) IROFS.
- Perform Environmental Report in accordance with the National Environmental Policy Act (NEPA) requirements.
- Perform chemical, radiological, environmental hazards analyses encompassing all operations associated with the DCP.
- Perform Fire Hazards Analysis (FHA) for the DCP including a description, by fire area, of the fuel loading, fire scenarios, methods of consequence analysis, the potential consequences, and a description of the mitigative controls.

- Perform necessary Criticality Safety Evaluations and associated calculations to support DCP design and operational activities.
- Generate accident scenarios and consequence calculations for fire/explosion, chemical, radiological, environmental accident sequences.
- Select IROFS to meet the 10CFR70.61 performance requirements.
- Select Safety Significant Controls as necessary to meet other regulatory requirements (e.g., OSHA, EPA, etc.).
- Generate the required Integrated Safety Analysis (ISA), and update existing ISA's as required (e.g., Site and Structures).
- Update the "Cost Estimate to Terminate the SNM-1107 License" and associated decommissioning and financial assurance documents.
- Complete required nuclear insurance activities.
- Generate a Pre-Fire Plan for the Facility.
- Amend the Physical Security Plan and associated implementing procedures.
- Amend the Site Emergency Plan and associated implementing procedures.
- Amend the Best Management Practices / Stormwater Pollution Prevention Plan, as necessary.
- Amend the Fundamental Nuclear Materials and Controls Plan, associated implementing procedures and material control & accounting systems.
- Assess the need for modification to existing air and liquid effluent permits.
- Provide training to the Emergency Brigade on the significant risks of the new DCP and how to respond appropriately.
- Generate criteria for conduct of a readiness assessment and operational readiness review necessary to ensure safety, security and regulatory attributes necessary for operations are complete prior to authorization of DCP startup.

5.0 SBS APPROACH

The goal of the SBS is to facilitate safe, cost effective, operational solutions for the DCP, while providing appropriate, defensible, safety basis documentation necessary to assure the safety and safeguards of the public, employees and the environment. This SBS provides a description of activities that must be considered for the DCP.

5.1. Hazard Assessment

Appropriate hazard evaluation methods will be performed to systematically identify the hazards and hazardous events related to DCP activities. These assessments will be performed by a trained leader, using a team approach, in accordance with the current revisions of the Westinghouse Integrated Safety Analysis Handbook and Procedure RA-124, "Process Hazard Analysis." A report will be generated to document these assessments.

Three hazard assessments are planned for this project. For the purpose of this SBS, the DCP project will be defined by five stages:

(1) Stage 1 - Conceptual Design

(2) Stage 2 – Preliminary Design (Proposal/Plant Specification)

(3) Stage 3 – Detailed Design

(4) Stage 4 – Equipment Procurement and Construction

(5) Stage 5 – Commissioning/Startup

The major hazards "preliminary" review will be performed once the conceptual engineering design is complete (i.e., during Stage 1).

Preliminary hazard assessments and preliminary criticality safety evaluations will be performed during Stage 2.

The process hazards analysis (PHA) will be performed once the detailed engineering design, including construction specifications and drawings, is complete (i.e., after Stage 3).

A readiness assessment and operational readiness review will be performed once construction is complete and before initial commissioning of the facility (i.e., after Stage 4).

5.2. Documentation and Analysis

These are defined in Section 4.1.

5.3. Schedule and Milestones

A baseline schedule detailing activities and durations for the DCP has been developed. The current EH&S major milestone schedule is in Appendix 1 of this document. It is noted that the milestone dates are best estimates at this time.

5.4. Change Control

A change control process will be used to manage scope changes for the EH&S activities necessary to support the DCP Project upon completion of Stage 2. Addition of new scope, significant changes to the existing scope, strategy, or assumptions outlined in this document will be documented, reviewed, and authorized by the EH&S DCP Project Manager.

5.5. Project Assumptions

Project assumptions will be identified and documented.

5.6. Project Risk Assessment

Project risks will be identified and assessed. This assessment specifically will:

- Identify project risks
- Evaluate the probability of each identified risk being realized
- Evaluate the severity (likely impact) of each identified risk
- Develop plans to mitigate adverse impacts

At this time, the project schedule has been identified as a risk. The due dates established in this SBS are based on the preliminary project schedule. Since the project is still in the conceptual planning stage, it is expected that project milestone dates may change. Changes to these dates could impact the availability of external agency support. Changes to major milestones shall be communicated in a timely manner to appropriate external agencies.

6.0 REFERENCES

1 Integrated Safety Analysis Handbook, Revision 3, August 15, 2006
2. SNM-1107 Renewal Application, Revision 0, TBD

Appendix 1

SAFETY CASE
MAJOR MILESTONE SCHEDULE

DCP SAFETY CASE MAJOR MILESTONE SCHEDULE

CONCEPTUAL DESIGN PHASE (STAGE 1): JUNE 2007 – JANUARY 2008

EXTERNAL AGENCY ACTIONS

- Issue Notice of Intent Letter to NRC [completed 7/30/07 per LTR-RAC-07-53]
- Notify State and Local Authorities, as appropriate
- Determine actions and schedule for NPDES, stormwater, air permits, etc.
- Communicate new project to appropriate insurer agencies [completed 6/12/07]

HAZARD ASSESSMENT

- Conduct EH&S Kick-Off Meeting [completed 6/11/07]
- Environmental Report
  - Identify 3 contractors to quote on preparing the Environmental Report
  - Award contract by 12/31/07
  - Begin preparation of Environmental Report by 1/7/07
- Conceptual Design: Preliminary Hazards Review
  - Perform major hazards review [completed July 30, 2007]
  - Issue report by 9/14/07
  - Perform criticality safety scoping calculations (August – January 2008)
  - Issue Safety Basis Strategy (SBS) and Baseline Design Criteria (BDC) to NRC by 9/28/07
  - Meet with NRC to discuss SBS and BDC by 10/31/07

DESIGN PROPOSAL/PLANT SPECIFICATION PHASE (STAGE 2): JANUARY 2008 – JUNE 2008
(Note: Appropriations Request is targeted for submittal in June 2008)

EXTERNAL AGENCY ACTIONS

- Obtain NRC concurrence / acknowledgement of SBS and BDC

HAZARD ASSESSMENT

- Perform scoping consequence calculations for other safety disciplines (i.e., HF) by 2/28/08
- Complete Interim Design Review (update HA if needed) by 3/31/08
  - Develop preliminary IROFS list
- Fire Hazard Analysis
  - Perform preliminary Fire Hazards Analysis by 5/31/08
- Complete Environmental Report by 7/31/08
- Continue criticality safety scoping calculations

LICENSING & ISA

- Submit License Amendment to move CAA fence as well as Environmental Report to NRC by 7/31/08

DETAILED DESIGN PHASE (STAGE 3): JULY 2008 – JULY 2009

EXTERNAL AGENCY ACTIONS

- Provide draft ISA to NRC for review

HAZARD ASSESSMENT

- Obtain ISA Inputs from Engineering Function: Process Description, Process Theory, and Process Design & Equipment by 3/31/09
- Complete Final Fire Hazard Analysis once detailed design is complete
- Perform Radiological Dose Assessments
- Develop Item Control Strategy
- Perform Detailed Design **Haz**ard and **Op**erability (HAZOP) Analysis by 3/31/09

- Complete Criticality Safety Evaluations by 6/30/09
- Perform Layers of Protection Analysis (LOPA) by 7/31/09

- Complete Final Design Review by 7/31/09

LICENSING & ISA

- Complete draft ISA by 9/30/09

EQUIPMENT PROCUREMENT AND CONSTRUCTION PHASE (STAGE 4): JANUARY 2009 – MAY 2011

EXTERNAL AGENCY ACTIONS

- Schedule NRC Operational Readiness Review
- Obtain necessary amendments to the South Carolina Radioactive Materials License (SC-094)

HAZARD ASSESSMENT

- Plan and schedule readiness assessment and operational readiness review once construction is complete and before initial commissioning of the facility (WEC performed)

LICENSING & ISA

- Obtain necessary amendments to the Physical Security Plan
- Obtain necessary amendments to the FNMC Plan
- Obtain necessary amendments to the Site Emergency Plan
- Obtain necessary amendments to the Best Management Practices / Stormwater Pollution Prevention Plan
- Complete updates to the "Cost Estimate to Terminate the SNM-1107 License" and associated decommissioning and financial assurance documents
- Complete all Safety Analyses
- Submit ISA for approval

COMMISSIONING/STARTUP (STAGE 5): MAY 2011 – AUGUST 2011

EXTERNAL AGENCY ACTIONS

- Ensure necessary state and local authority approval of required documents

- Complete NRC Operational Readiness Review

HAZARD ASSESSMENT

- Complete readiness assessment and operational readiness review (WEC performed)

LICENSING & ISA

- NRC approval of ISA and licensing documents

RELEASE FOR PRODUCTION: AUGUST 2011

Appendix 2

BASELINE DESIGN CRITERIA

§ 70.64 Requirements for new facilities or new processes at existing facilities.

(a) *Baseline design criteria.* Each prospective applicant or licensee shall address the following baseline design criteria in the design of new facilities. Each existing licensee shall address the following baseline design criteria in the design of new processes at existing facilities that require a license amendment under § 70.72. The baseline design criteria must be applied to the design of new facilities and new processes, but do not require retrofits to existing facilities or existing processes (e.g., those housing or adjacent to the new process); however, all facilities and processes must comply with the performance requirements in § 70.61. Licensees shall maintain the application of these criteria unless the analysis performed pursuant to § 70.62(c) demonstrates that a given item is not relied on for safety or does not require adherence to the specified criteria.

(1) Quality standards and records. The design must be developed and implemented in accordance with management measures, to provide adequate assurance that items relied on for safety will be available and reliable to perform their function when needed. Appropriate records of these items must be maintained by or under the control of the licensee throughout the life of the facility.

Quality standards and records shall be generated and maintained in accordance with the commitments in the CFFF SNM-1107 License Renewal Application, specifically Sections 3.3, "Quality Assurance" and Section 3.9, "Record Keeping and Reporting." In addition, the design development and implementation shall adhere to the CFFF, Regulatory Component Quality Policy (QP) Manual.

(2) Natural phenomena hazards. The design must provide for adequate protection against natural phenomena with consideration of the most severe documented historical events for the site.

The Baseline Design Criteria for Natural Phenomena Hazards (NPH) are contained in "*Seismic Design Methodology; Also including other NPH Design Recommendations for the Westinghouse Columbia DCP Facility*," dated June 4, 2007, by David C. Crone, PE. Seismic design criteria included in the above cited document shall be considered preliminary at this time. Westinghouse has contracted engineering seismology and geotechnical earthquake engineering consulting services. A final peer reviewed report in general conformance with ANS 2.27, "*Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments,*" is expected late October, 2007. Findings of this study will be used as the seismic design basis of the DCP facility and will become a part of the ISA and Licensing documents.

(3) Fire protection. The design must provide for adequate protection against fires and explosions.

The Dry Conversion Process shall adhere to all commitments in the CFFF SNM-1107 License Renewal Application, Chapter 8.0, "Fire Safety Program" and Chapter 4, "Integrated Safety Analysis" to provide adequate protection against fires and explosions that could affect the safety of licensed materials and thus present an increased radiological risk. The radiological consequences of fires shall also be considered, and appropriate safety controls to protect workers, the public and the environment shall be instituted.

The facility design shall include information on building construction, fire areas, life safety, ventilation and electrical system design. The fire protection systems shall include fire detection, alarm, and suppression systems; portable extinguishers; water supplies; and emergency response organizations.

To that end, the facility shall meet the requirements for National Fire Protection Association, NFPA, 801 "*Standard for Fire Protection for Facilities Handling Radioactive Materials,*" latest edition. This standard specifies the following fire safety management measures, including fire prevention; inspection, testing, and maintenance of fire protection systems; emergency response organization qualifications, drills and training; and pre-fire plans. Other specific NFPA standards that shall be followed include:

- NFPA 10, "Standard for Portable Fire Extinguishers"

- NFPA 13, "Standard for the Installation of Sprinkler Systems"
- NFPA 15, "Standard for Water Spray Fixed Systems for Fire Protection"
- NFPA 20, "Standard for the Installation of Stationary Pumps for Fire Protection"
- NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems"
- NFPA 30, "Flammable and Combustible Liquids Code"
- NFPA 54, "National Fuel Gas Code"
- NFPA 70, "National Electrical Code®"
- NFPA 70E, "Standard for Electrical Safety in the Workplace" (Part 1 only)
- NFPA 72E, "National Fire Alarm Code®"
- NFPA 101, "Life Safety Code®"
- NFPA 220, "Standard on Types of Building Construction"
- NFPA 600, "Standard on Industrial Fire Brigades"

(4) Environmental and dynamic effects. The design must provide for adequate protection from environmental conditions and dynamic effects associated with normal operations, maintenance, testing, and postulated accidents that could lead to loss of safety functions.

The Dry Conversion Process shall adhere to all commitments in the CFFF SNM-1107 License Renewal Application, Chapter 10.0, "Environmental Protection," Chapter 5.0, "Radiation Safety Program," and Chapter 4, "Integrated Safety Analysis" to assure that radioactive and nonradioactive releases (gaseous, liquid, solid) to the environment remain As Low As Reasonably Achievable (ALARA). In addition, an Environmental Report shall be prepared in accordance with NRC regulations 10CFR51.45, 10CFR51.60 and associated guidance in NUREG 1748, Aug. 2003.

(5) Chemical protection. The design must provide for adequate protection against chemical risks produced from licensed material, facility conditions which affect the safety of licensed material, and hazardous chemicals produced from licensed material.

The Dry Conversion Process shall adhere to all commitments in the CFFF SNM-1107 License Renewal Application, Chapter 7.0, "Chemical Safety Program" and Chapter 4, "Integrated Safety Analysis" to provide adequate protection against chemical hazards related to the storage, handling and processing of licensed materials and chemicals produced from licensed materials.

(6) Emergency capability. The design must provide for emergency capability to maintain control of:

(i) Licensed material and hazardous chemicals produced from licensed material;

(ii) Evacuation of on-site personnel; and

(iii) Onsite emergency facilities and services that facilitate the use of available offsite services.

The Dry Conversion Process shall adhere to all commitments in the CFFF SNM-1107 License Renewal Application, Chapter 9.0, "Emergency Management Program" and in the Site Emergency Plan.

(7) Utility services. The design must provide for continued operation of essential utility services.

The Dry Conversion Process shall adhere to all CFFF plant standards to identify, design and ensure continued operation of essential utility services in addition to the requirements of the CFFF SNM-1107 License Renewal Application, Section 1.1.2.1, "Site Utilities and Services."

(8) Inspection, testing, and maintenance. The design of items relied on for safety must provide for adequate inspection, testing, and maintenance, to ensure their availability and reliability to perform their function when needed.

The Dry Conversion Process shall adhere to all commitments in the CFFF SNM-1107 License Renewal Application, Section 3.2, "Maintenance" and Section 3.3, "Quality Assurance" to assure the availability and reliability of Items Relied On For Safety (IROFS).

(9) Criticality control. The design must provide for criticality control including adherence to the double contingency principle.

The Dry Conversion Process shall adhere to applicable American Nuclear Society (ANS) standards and the commitments in the CFFF SNM-1107 License Renewal Application, Chapter 6.0, "Nuclear Criticality Safety Program" and Chapter 4, "Integrated Safety Analysis."

(10) Instrumentation and controls. The design must provide for inclusion of instrumentation and control systems to monitor and control the behavior of items relied on for safety.

The I&C design shall follow WEC standards FSS-012 "Control System Design for Safety Significant Control Applications" and FSS-006 "Electrical, Instrumentation, and Control Equipment Suppliers" as related to the implementation of a safety Programmable Logic Controller (PLC).

In addition, the Dry Conversion Process shall include instrumentation and control systems to monitor and control the behavior of Items Relied on for Safety (IROFS) as stated in the CFFF SNM-1107 License Renewal Application, Section 1.1.2.1 (g), "Instrumentation and Control Systems."

(b) Facility and system design and facility layout must be based on defense-in-depth practices.[1] The design must incorporate, to the extent practicable:

(1) Preference for the selection of engineered controls over administrative controls to increase overall system reliability; and

(2) Features that enhance safety by reducing challenges to items relied on for safety.

[1] As used in § 70.64, Requirements for new facilities or new processes at existing facilities, defense-in-depth practices means a design philosophy, applied from the outset and through completion of the design, that is based on providing successive levels of protection such that health and safety will not be wholly dependent upon any single element of the design, construction, maintenance, or operation of the facility. The net effect of incorporating defense-in-depth practices is a conservatively designed facility and system that will exhibit greater tolerance to failures and external challenges. The risk insights obtained through performance of the integrated safety analysis can be then used to supplement the final design by focusing attention on the prevention and mitigation of the higher-risk potential accidents.

The design, systems and layout of the Dry Conversion Process shall be based on defense-in-depth practices as stated in the CFFF SNM-1107 License Renewal Application, Section 1.1.2.1 (f), "Defense-in-Depth Design."