Criticality Safety Evaluation

for

Final Assembly

CSE-17-B, Rev. 0

August 2007

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Revision Log

Rev	Date	Revision Description/Reason
0	August 2007	Draft based on proposed license change.

Table of Contents

1.0 INTRODUCTION

This Criticality Safety Evaluation (CSE) documents the nuclear criticality safety (NCS) basis of the Final Assembly (FA) . The CSE scope covers the pressurized water reactor (PWR) assemblies currently authorized to be fabricated, handled, or stored at the Columbia Fuel Fabrication Facility (CFFF)[1] :

2.0 NORMAL CASE OPERATING CONDITIONS

2.1 PWR Assembly Types

Although PWR fuel assemblies are constructed for many customers at the CFFF, these fuel assemblies . Within these general types, . For NCS calculations,

Figure 1 depicts an example model of a typical W PWR fuel assembly.

Figure 1: Example W-PWR Fuel Assembly Model

Figure 2 depicts an example model of a typical assembly

Figure 2: Example Fuel Assembly Model

Figure 3 depicts an example model of

Figure 3: Example Fuel Assembly Model

The list of fuel assembly types currently authorized to be fabricated, stored, or handled at the CFFF, as well as associated nominal dimensions and tolerances, are documented in Reference 1. These data are reproduced below in Table 1

Table 1: PWR Master Assembly List

Table 1: PWR Master Assembly List (continued)

Reference 2 documents extensive analyses of each of these PWR fuel assembly types, with credible applications of . The results demonstrate that currently authorized to be

fabricated, stored, or handled at the CFFF. In addition, the analyses demonstrate that the maximum 95/95 k_{EFF} for which is below the 0.98 acceptance criterion for fuel assembly analyses in Final Assembly.

2.2

Figure 2:

3.0 CRITICALITY HAZARD IDENTIFICATION

3.1 Hazard Identification Method

A process hazard analysis (PHA) was performed to identify potential hazards and associated consequences of system malfunctions or operator errors such as system upset conditions. A Walk-Through of and a review of the previous Criticality Safety Evaluation[7] were used in scenario development. The PHA utilized a What If/Checklist methodology to systematically evaluate and document upset conditions considered. The PHA team consisted of . All "What Ifs" identified during the PHA as having the potential to adversely affect criticality safety are addressed within this CSE.

3.2 Hazard Identification Results

Table 3-1 below provides the resulting scenarios that were identified for evaluation within this CSE.

TABLE 3-1 Results of What If Analysis for Final Assembly

	What if…	Causes	Credible Criticality	Safeguards
1				
2				
3				
4				
5				

4.0 DOUBLE CONTINGENCY ANALYSIS

4.1 Credible Criticality Scenarios

There are no credible criticality scenarios identified in this evaluation.

4.2 Incredible Criticality Scenarios

4.2.1

4.2.2

4.2.3

4.2.4

4.3 NCS Parameters

Table 4-1: NCS Parameter Table

Nuclear Parameter	Controlled? (Y/N)	Basis	Section in which failure is analyzed
Mass			
Enrichment			
Volume			
Geometry			
Concentration or Density			
Moderation			
Interaction			
Reflection			
Absorption			

4.4 Defense Table

Not required as there are no credible criticality accident scenarios.

5.0 CRITICALITY ACCIDENT ALARM SYSTEM

This evaluation is for the processing of uranium located in a preexisting facility. The installed criticality accident alarm system covers the entire area, and no changes made which affect this coverage. Recent analysis revalidated the coverage provided by the installed detector system within the facility[8,9].

6.0 DOUBLE CONTINGENCY CONTROLS

As no credible criticality events have been identified there are no controls explicitly required for compliance with double contingency.

6.1 Passive Engineered Controls

6.2 Active Engineered Controls

None applicable

6.3 Administrative Controls

None applicable

6.4 General Requirements

7.0 BOUNDING ASSUMPTIONS

5 wt% maximum ^{235}U enrichment modeled in all pellets: This is the maximum enrichment allowed by the CFFF license.

8.0 CONCLUSIONS

This evaluation concludes that the operation will remain subcritical for credible normal and abnormal events and that this is assured through adherence to the controls identified in the CSE.

9.0 REFERENCES

[8] Westinghouse Criticality Detector Coverage Report, Part 1, NSA-TR-06-02, Rev. 0, April 2006

[9] Westinghouse Criticality Detector Coverage Report, Part 2, NSA-TR-06-06, Rev. 1, May 2006