10 CFR 50.73(a)(2)(i)(B) ZS-2011-0599

September 6, 2011

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Zion Nuclear Power Station (ZNPS), Units 1 and 2
Facility Operating License Nos. DPR-39 and DPR-48
NRC Docket Nos. 50-295 and 50-304

Subject: Submittal of Licensee Event Report Number 2011-001-00 – Units 1 and 2, "Improper Storage of Fuel Rod Storage Canister in Spent Fuel Pool"

The enclosed Licensee Event Report (LER) is being submitted in accordance with 10 CFR 50.73, "License event report system." 10 CFR 50.73 (a) requires that a LER for qualifying events be submitted within 60 days after the discovery of the event.

There are no regulatory commitments contained in the attached report. Should you have any questions concerning this submittal, please contact Jim Ashley at (847) 379-2978.

Respectfully,

Gary W. Bouchard 9-7-11

Gary Bouchard
Decommissioning Plant Manager
Zion Nuclear Power Station

Enclosure: LER Number 2011-001-00

cc: John Hickman, U.S. NRC Senior Project Manager
Service List

FSME20
IE22

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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4. TITLE

Improper Storage of Fuel Rod Storage Canister in Spent Fuel Pool

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									Zion Station, Unit 2	05000304
07	14	2011	2011	- 001 -	00	09	06	2011	FACILITY NAME: N/A	DOCKET NUMBER: N/A

9. OPERATING MODE

Permanently Defueled

10. POWER LEVEL

N/A

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☒ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☐ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
James Ashley, Licensing Engineer	(847) 379-2978

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On July 13, 2011, during a fuel data management software program site training class, it was identified that a Fuel Rod Storage Canister (FRSC) was stored in the wrong region of the Spent Fuel Pool (SFP). A fuel reconstitution campaign was conducted in 1992. Thirteen damaged fuel rods from seven different fuel assemblies were placed in the FRSC designed by Westinghouse and stored in the SFP during that campaign. At that time the SFP contained a single region rack design with no fuel assembly storage restrictions based on initial enrichment and fuel burnup. In 1993, a new SFP rack design utilizing a two region configuration was installed. The design included Region 2 storage restrictions based on the initial fuel enrichment and fuel burnup in accordance with Permanently Defueled Technical Specification (PDTS) 3.1.3, "Spent Fuel Assembly Storage." Following installation of the new rack design, the FRSC was placed in a SFP Region 2 rack cell. The criticality analysis for the FRSC contains restrictions on the storage location based on the most limiting rod stored within the FRSC. This means that if the FRSC contains rods from a fuel assembly with SFP region storage restrictions, then those same restrictions apply to the FRSC. A review of records conducted on July 14, 2011 determined that nine of the thirteen fuel rods stored in the FRSC did not satisfy the requirements to allow Region 2 rack storage. Consequently, storage of the FRSC in SFP Region 2 since 1993 is considered a violation of Permanently Defueled Technical Specification (PDTS) 3.1.3. Upon discovery, immediate actions to relocate the FRSC to SFP Region 1 were initiated. The FRSC relocation was completed on July 20, 2011. A subsequent technical evaluation has concluded that Region 2 storage of the FRSC was within the rack design basis criticality limits.

A. Plant Operating Conditions Before The Event:

Event Date: July 14, 2011 Event Time: 1223 (Central Daylight Time)

Unit: 1 Permanently Defueled
Unit: 2 Permanently Defueled

B. Description of Event:

On July 13, 2011, during an interactive training program designed to demonstrate the functions of a fuel data management software program (TracWorks) utilized at Zion Station, select simulated fuel rod movement attempts within the Spent Fuel Pool (SFP) were prevented by the software program. The software program contains features that identify unacceptable fuel assembly/rod planned moves based on SFP rack region storage restrictions. Subsequent investigation determined that simulated fuel rod moves attempted during the classroom presentation were prevented because a partially loaded Fuel Rod Storage Canister (FRSC) located in the SFP was residing in an unacceptable region of the SFP based on contained fuel rod burnup characteristics. Improper storage of the FRSC was confirmed on July 14, 2011.

The FRSC was procured from Westinghouse in support of a 1992 fuel reconstitution campaign. The FRSC is designed to accommodate fifty two individual spent and/or fresh fuel rods in a fixed array while maintaining the fuel rack K-eff less than 0.95. The criticality analysis for the FRSC contains restrictions on the SFP storage location based on the most limiting rod stored within the FRSC. This means that if the FRSC contains rods from a fuel assembly with SFP region storage restrictions, then those same restrictions apply to the FRSC.

Thirteen damaged fuel rods were removed from seven different fuel assemblies and placed in the FRSC during the 1992 fuel reconstitution effort. The 1992 SFP rack design in which the FRSC was initially placed did not have fuel assembly storage regional restrictions. In 1993, a new SFP rack design was installed. The new design has two storage regions. Region 2 has storage restrictions based on initial fuel enrichment and discharge fuel burnup in accordance with Permanently Defueled Technical Specification (PDTS) 3.1.3, "Spent Fuel Assembly Storage." Following installation of the new rack design, the FRSC was placed in a SFP Region 2 rack cell.

Based on the concerns identified during the TracWorks software training, a search of historical records was conducted. It was determined that nine of the thirteen rods stored in the FRSC had been removed from fuel assemblies that did not satisfy the restrictions required for SFP Region 2 storage at the time of rod removal. Therefore, storage of the FRSC in Region 2 of the SFP is considered a Technical Specification violation based on the restrictions for fuel assembly storage identified in PDTS 3.1.3 in conjunction with the FRSC criticality analysis restrictions that require storage of the FRSC based on the most limiting rod contained within.

C. Cause of Event

This event is attributed to the failure to recognize FRSC storage restrictions following the new SFP rack installation in 1993. The criticality analysis for the FRSC requires that for storage purposes it be treated as a fuel assembly based on the most limiting rod stored within. During the initial loading of the FRSC in 1992, the SFP rack design did not have multiple regions and therefore FRSC region storage restrictions did not apply. The new rack design installed in 1993 utilized a two region design with storage restrictions applicable to Region 2. The Region 2 storage restrictions in conjunction with the FRSC criticality analysis made Region 2 an unacceptable storage location for the FRSC. Personnel involved with the placement of the FRSC in Region 2 following the new rack installation in 1993 were contacted. They had little recollection of the event but speculated that the storage restrictions associated with FRSC were not recognized. A potential contributing factor was that the Spent Fuel Assembly Storage technical

specification identifying region storage restrictions was limited to fuel assemblies and did not address rod storage. The personnel approving storage of the FRSC in Region 2 failed to recognize that the FRSC criticality analysis required it to be treated as a fuel assembly.

It should be noted that the TracWorks fuel data management software program was not being utilized at the time the FRSC was relocated to SFP Region 2. Use of the TracWorks software program was later adopted by entering historical records into the database. The problem was not previously identified since no movement of FRSC contained rods was attempted utilizing TracWorks prior to the classroom simulated moves attempted on July 13, 2011.

D. Safety Analysis:

There were no safety consequences as a result of this event. The SFP Region 2 rack is designed to accommodate fuel of various initial enrichments which have accumulated burnups within the acceptable domain depicted in PDTS Figure 3.1.3-1, "Fuel Assembly Burnup Limits in Region 2." The high density spent fuel storage racks in Region 2 are designed to assure the effective neutron multiplication factor (K-eff) is less than or equal to 0.95 with the racks fully loaded with fuel of the highest anticipated reactivity based on the acceptable burn up domain identified in PDTS Figure 3.1.3-1 and flooded with unborated water.

In addition to the restriction on fuel assemblies stored in Region 2, a soluble boron concentration limit has been established for the SFP. The abnormal location of a fresh unirradiated fuel assembly of 4.64 weight percent U-235 enrichment in Region 2 could, in the absence of soluble boron result in exceeding a K-eff of 0.95. Rack design calculations have shown that a concentration of 160 ppm boron would be adequate to maintain K-eff less than 0.95 for this misloaded fuel assembly scenario. To allow for uncertainties and provide additional margin, a value of 500 ppm boron was selected as the minimum boron concentration of the SFP as discussed in PDTS 3.1.2, "Spent Fuel Boron Concentration." Therefore, in order for SFP rack K-eff to exceed 0.95, a misloaded fuel assembly in Region 2 concurrent with a SFP boron concentration less than 160 ppm must be present. The SFP boron concentration has been maintained above 500 ppm in accordance with Technical Specification provisions since the SFP rerack in 1993.

In addition to the rack design considerations identified above, a technical review of the FRSC criticality analysis has been performed. It was determined that significant conservatism exists in the FRSC criticality analysis. The technical review concluded that the Zion FRSC, loaded in its current configuration, could be stored in SFP Region 2 without exceeding Region 2 design limits. Therefore, although the as found FRSC storage location was in violation of the restrictions identified in the FRSC criticality analysis, the SFP storage rack K-eff did not exceed the PDTS design basis of 0.95, not crediting soluble boron, while stored in Region 2.

E. Corrective Actions:

The FRSC was determined to be stored in violation of PDTS 3.1.3 on July 14, 2011. In accordance with the provisions of PDTS 3.1.3.A.1, immediate actions were initiated to move the FRSC from Region 2 to Region 1. This activity involved the preparation and approval of move sheets authorizing the movement. Additionally, required fuel handling equipment repairs and operational checks were completed prior to initiating the FRSC move. The FRSC was successfully relocated to SFP Region 1 on July 20, 2011. Administrative controls have been established to identify the FRSC as requiring Region 1 storage.

An extent of condition investigation was also conducted. Based on a review of historical records in conjunction with a review of the TracWorks database, it was concluded that all other fuel assemblies and rods stored in SFP Region 2 are in compliance with the rack design and PDTS requirements.

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NARRATIVE

F. Previous Occurrences:

There have been no previous similar events at Zion Station.

G. Component Failure Data:

Manufacturer	Nomenclature	Model	Mfg. Part Number
N/A	N/A	N/A	N/A

Zion Nuclear Power Station, Unit 1 and 2 License Transfer Service List

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