



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
612 EAST LAMAR BLVD, SUITE 400  
ARLINGTON, TEXAS 76011-4125

June 17, 2008

EA-08-183

J. V. Parrish  
Chief Executive Officer  
Energy Northwest  
P.O. Box 968 (Mail Drop 1023)  
Richland, Washington 99352-0968

SUBJECT: INSPECTION REPORT NOS 050-397/08-007; 072-035/08-001 AND  
NOTICE OF VIOLATION

Dear Mr. Parrish:

This refers to the inspection conducted from April 14 through May 19, 2008, at the Columbia Generating Station. The purpose of the initial onsite inspection conducted April 14-17, 2008, was to perform a routine operational inspection of the Independent Spent Fuel Storage Installation (ISFSI) and to follow up on the hydrogen burn event that occurred during canister closure welding operations on April 8, 2008. Following implementation of corrective actions designed to prevent recurrence, a second hydrogen burn event occurred during the inspection on April 16, 2008. Your staff determined that the best course of action was to secure the canister in a safe configuration and bring in outside industry resources to determine the cause(s) of the hydrogen burn events and implement additional actions to prevent recurrence. A debrief was conducted with members of your staff on April 17, 2008. The inspection remained open as your staff conducted a Technical Issues Resolution Process to determine the cause of the hydrogen burn events and actions to prevent recurrence. Following changes to your welding process, the Resident Inspector observed the welding operations on canister serial numbers 169 and 170, which occurred without further incident on April 26 and May 1, 2008, respectively. A telephonic exit was conducted with Mr. Tom Lynch and other members of your staff on May 19, 2008. The enclosed report presents the results of the inspection.

This inspection was an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas, the inspection included reviews of the hydrogen burn events, selected examination of procedures and representative records, observations of activities, and interviews with selected personnel.

Based on the results of the inspection, the NRC has determined that a Severity Level IV violation of NRC requirements occurred. The violation was evaluated in accordance with the NRC Enforcement Policy included on the NRC's website at [www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html](http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html).

The violation is cited in the enclosed Notice of Violation (Notice) and the circumstances surrounding it are described in detail in the subject inspection report. Consistent with Section VI.A of the Enforcement policy, the violation is being cited in the Notice because the licensee failed to restore compliance within a reasonable time after a noncompliance was identified.

In addition, the NRC has determined that one additional Severity Level IV violation of NRC requirements occurred. This violation is being treated as a Non-Cited Violation (NCV), consistent with Section VI.A of the Enforcement policy. The NCV is described in the subject inspection report.

You are required to respond to this letter, as it pertains to the Notice described above, and should follow the instructions specified in the enclosed Notice when preparing your response. In addition, if you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to: the Regional Administrator, NRC Region IV; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and Mr. Zachary Dunham, Senior Resident Inspector at Columbia Generating Station. The NRC will use your response, in part, to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosures, and your response will be available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS). ADAMS is accessible from the NRC web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Sincerely,

/RA/

D. Blair Spitzberg, Ph.D., Chief  
Repository and Spent Fuel Safety Branch

Docket: 50-397  
License: NPF-21

Enclosures:

1. Notice of Violation
2. NRC Inspection Report 050-0397/08-007; 072-0035/08-001  
w/Attachments

Energy Northwest  
EA-08-183

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cc: w/enclosures  
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Energy Northwest  
EA-08-183

- 4 -

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- ROPreports**

SUNSI Review Completed: RLK ADAMS:  Yes     No    Initials: RLK  
 **Publicly Available**     Non-Publicly Available     Sensitive     **Non-Sensitive**

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RIV:DNMS/RSFS	DRP/	NMSS/SFST	SFST	ACES	D:DNMS	C:RSFS
RLKellar	RBCohen	JRHall	RTemp	GMVasquez	ATHowell	DBSpitzberg
/RA/	<b>E-VJEverett</b>	<b>E-RLKellar</b>	<b>E-RLKellar</b>	<b>E-RLKellar</b>	/RA/	/RA/
6/16/08	6/10/08	6/16/08	6/16/08	6/16/08	6/17/08	6/16/08

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## NOTICE OF VIOLATION

Energy Northwest  
Columbia Generating Station

Docket Nos. 050-00397; 072-00035  
License No. NPF-21  
EA-08-183

During an NRC inspection conducted from April 14 through May 19, 2008, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

10 CFR 72.210 provides, in part, a general license for the storage of spent fuel in an independent spent fuel storage installation (ISFSI) at power reactor sites, to persons authorized to operate nuclear power reactors under 10 CFR Part 50. This general license is limited to storage of spent fuel in casks approved under the provisions of 10 CFR Part 72.

Certificate of Compliance (CoC) 1014, for the HI-STORM Cask System was issued in accordance with 10 CFR 72.238. The certificate states, in part, that it is conditional upon fulfilling the requirements of 10 CFR Part 72, as applicable, and the attached Appendix A (Technical Specification) and Appendix B (Approved Contents and Design Features).

Section 3.8 of CoC 1014, Appendix B, requires, in part, that during the Multi-Purpose Canister (MPC) lid-to-shell welding operations, combustible gas monitoring of the space under the MPC lid be performed to ensure that no combustible gas mixture is present in the welding area.

Contrary to the above, on April 8, 2008, and again on April 16, 2008 the licensee did not effectively monitor combustible gas concentrations under the MPC lid during the MPC lid-to-shell welding operations to ensure that no combustible gas mixture was present in the welding area. Specifically, on April 8, 2008, after the root pass of the lid-to-shell weld had been completed and work was being done on the next weld layer, the licensee elected to suspend combustible gas concentration monitoring; and on April 16, 2008, the position of the licensee's explosive gas monitor relative to the MPC vent port did not effectively detect combustible gas concentrations. Both of these situations resulted in hydrogen burn events.

This is a Severity Level IV violation (Supplement VI).

Pursuant to the provisions of 10 CFR 2.201, Energy Northwest is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001 with a copy to the Regional Administrator, Region IV, and a copy to the NRC Resident Inspector at the facility that is the subject of this Notice, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation; EA-08-183," and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response.

Enclosure 1

If an adequate reply is not received within the time specified in this Notice, an order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at [www.nrc.gov/reading-rm/pdr.html](http://www.nrc.gov/reading-rm/pdr.html) or [www.nrc.gov/reading-rm/adams.html](http://www.nrc.gov/reading-rm/adams.html), to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days.

Dated this 17<sup>th</sup> day of June 2008

**ENCLOSURE**

U. S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Docket Nos: 050-00397; 072-00035  
License No.: NPF-21  
Report Nos.: 050-0397/08-007; 072-0035/08-001  
Licensee: Energy Northwest  
Facility: Columbia Generating Station  
Location: Richland, Washington  
Dates: April 14 through May 19, 2008  
Inspectors: Ray Kellar, P.E., ISFSI Inspector, Repository and Spent Fuel Safety Branch  
Ron Cohen, Resident Inspector, Projects Branch A  
  
Approved By: D. Blair Spitzberg, Ph.D, Chief  
Repository and Spent Fuel Safety Branch  
  
Attachments: Supplemental Information  
Loaded HI-STORM 100S Casks at the Columbia Generating Station ISFSI



## **EXECUTIVE SUMMARY**

Columbia Generating Station  
NRC Inspection Report Nos. 050-0397/08-007; 072-0035/08-001

An inspection of the Columbia Generating Station (CGS) Independent Spent Fuel Storage Installation (ISFSI) facility in Richland, Washington was conducted from April 14, 2008 through May 19, 2008. A routine operational inspection of ISFSI activities was conducted to verify that the ISFSI was being maintained in compliance with the applicable requirements of the Certificate of Compliance (CoC), Final Safety Analysis Report (FSAR), and 10 CFR Part 72. Additionally, a follow up inspection of the hydrogen burn event that had occurred during the welding operations on April 8, 2008, was arranged. A second hydrogen burn event occurred on April 16, 2008, during the routine operational inspection. The licensee determined that the best course of action was to secure the canister in a safe configuration and bring in outside industry resources to determine the cause(s) of the hydrogen burn events and implement actions to prevent recurrence. A debrief was conducted with the licensee on April 17, 2008. The inspection remained open as the licensee conducted a Technical Issues Resolution Process to determine the cause of the hydrogen burn events and actions to prevent recurrence. Following changes to the welding process, the Resident Inspector observed the welding operations on canister serial numbers 169 and 170, which occurred without further incident on April 26 and May 1, 2008, respectively.

### **Operation of an ISFSI (60855.1)**

- Two hydrogen burn events occurred during welding of the MPC lid-to-shell welds on canister serial numbers 168 and 169. During the welding operations for canister serial number 168 the licensee elected to suspend combustible gas monitoring after the completion of the root pass weld. A hydrogen ignition event occurred on this canister after the suspension of the combustible gas monitoring. Following this event the licensee implemented procedure changes to require combustible gas monitoring during the entire MPC lid-to-shell weld process. Despite this and other corrective actions, the combustible gas monitoring configuration was ineffective in determining the presence of combustible gases and a second hydrogen burn event occurred during welding operations on the next canister loaded, MPC canister serial number 169. Following the second hydrogen burn event, the licensee placed the MPC in a safe configuration and brought in individuals with outside industry experience to determine the causes of the hydrogen burn events and determine corrective actions to prevent recurrence. The licensee implemented changes to introduce an inert gas (argon) beneath the MPC lid during the lid-to-shell welding process and to relocate the explosive gas monitor sampling point to the vicinity of the MPC vent port. The completion of the MPC lid-to-shell weld on canister serial numbers 169 and 170 occurred without further incident. A Notice of Violation is being issued, consistent with Section VI.A.1 of the NRC Enforcement Policy for failure to monitor combustible gas concentrations during the MPC lid-to-shell weld. (Section 1.2.a)
- The licensee procedures contained sufficient information to select and load spent fuel assemblies into storage in compliance with CoC, Appendix B requirements. Selected fuel assemblies were verified by the inspector to meet the CoC, Appendix B requirements. (Section 1.2.b)

- The licensee was performing radiological surveys of canister contamination and cask dose rates in accordance with the Technical Specification requirements. Result of surveys performed for selected canisters and casks were well below the Technical Specification limits. (Section 1.2.c)
- The licensee was meeting the Technical Specification requirements for daily monitoring of temperature readings of the cask outlet vents and ambient air. All of the selected daily temperature readings reviewed were found to be below the Technical Specification and licensee specified maximum temperature limits. (Section 1.2.d)
- The ISFSI related condition reports sampled from the licensee's corrective action system adequately addressed the identified deficiencies and provided appropriate corrective actions. (Section 1.2.e)
- The licensee was meeting the requirements of 10 CFR 72.176 for conducting periodic audits of the ISFSI program. Deficiencies discovered during the audits were entered into the licensee corrective action program for evaluation, as appropriate. (Section 1.2.f)

#### **72.48 Evaluations (60857)**

- The licensee 10 CFR 72.48 screenings and the single 10 CFR 72.48 evaluation had been performed in accordance with the requirements of 10 CFR 72.48(c). However, the licensee did not perform a 10 CFR 72.48(c) review of the changes to the written evaluations contained in Section 1.1.2 of the "Energy Northwest Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation," as required by 10 CFR 72.212(b)(2)(ii). This violation is being treated as a Non-Cited Violation, consistent with Section VI.A.1 of the NRC Enforcement Policy. (Section 2.2)

#### **Follow-up (IP 92701)**

- Inspection Follow-up Item (IFI) 72-35/0401-01 associated with the review of 10 CFR 72.212(b) changes necessary to support the inclusion of the hydrogen water chemistry project has been closed in this inspection report. The licensee's analysis indicated that the existing explosion hazards analysis, which considered the probability of a projectile impacting the HI-STORM cask during transportation or storage, was not altered by the inclusion of the hydrogen water chemistry project. (Section 3)

## REPORT DETAILS

### Summary of Facility Status

Columbia Generating Station is a General Electric boiling water reactor owned by Energy Northwest. The facility is located approximately 12 miles northwest of Richland, Washington, on the Department of Energy's Hanford Reservation. Energy Northwest selected the Holtec HI-STORM 100S cask system for storage of their spent fuel. The licensee was loading spent fuel under the general license requirements of Certificate of Compliance (CoC) 1014, Amendment 2. The initial Independent Spent Fuel Installation (ISFSI) loading campaign was completed in December 2002 and consisted of five casks. The second loading campaign was completed in April of 2004 and consisted of ten casks. The third spent fuel loading campaign was in progress at the time of the inspection and consisted of 12 additional casks. The inspectors witnessed portions of the loading operations associated with Multi-Purpose Canister (MPC) serial numbers 168 and 169 during the third loading campaign.

### **1 Operation of an ISFSI (60855.1)**

#### 1.1 Inspection Scope

An inspection of the Columbia Generating Station ISFSI was conducted to verify the licensee was operating the ISFSI in conformance with the requirements of the CoC, the Final Safety Analysis Report (FSAR) and 10 CFR Part 72. Portions of licensee activities associated with fuel selection, radiological surveillances, heat removal surveillances, corrective actions and Quality Assurance audits were reviewed during the inspection. The inspection of the hydrogen burn events and corrective actions taken by the licensee were also reviewed.

#### 1.2 Observations and Findings

##### a. Hydrogen Burn Events

The potential for a hydrogen burn to occur during canister closure welding operations was first communicated by the NRC to licensees in 1996, using NRC Bulletin 96-04 and Information Notice 96-34. Hydrogen can be produced during loading operations by radiolysis of the water surrounding the loaded fuel assemblies and the passivation of the aluminum neutron absorbers exposed to water in the canister. Once the canister cavity is drained, dried, and backfilled with helium, the source of the hydrogen gas is eliminated.

A hydrogen burn event occurred at approximately 2:45 pm on April 8, 2008, during loading operations for MPC serial number 168. The hydrogen burn event occurred during the welding operations on the seventh canister that had been loaded with spent fuel during the current CGS canister loading campaign. The root pass of the lid-to-shell weld had been completed. The welders were working on the next weld layer using a hot wire pass and had completed approximately one-half of the lid circumferential weld using two weld heads when the first hydrogen burn event occurred. The hydrogen burn caused the vent and drain port covers to be blown off the MPC lid and relocated several inches away. Approximately a quart of water from the MPC drain port was ejected and deposited on the MPC lid.

The licensee stopped the welding operations and placed the canister in a safe condition. The licensee was using Procedure 6.6.7, "MPC Processing," Revision 17 to control the installation activities. The revision of Procedure 6.6.7 in use allowed the cask loading supervisor to stop the venting and combustible gas monitoring after the root pass of the lid-to-shell weld had been completed. Consistent with this procedure, the licensee had stopped venting and monitoring of the combustible gas concentration after the root pass weld had been completed. The licensee determined that a hydrogen burn event had occurred during the lid-to-shell welding operations. After reestablishing the combustible gas monitoring for explosive gas concentrations in the MPC, the licensee completed the lid-to-shell weld for canister serial number 168 without further incident.

Section 3.8 of CoC 1014, Appendix B, "Approved Contents and Design Features," required in part that during the MPC lid-to-shell welding operations, combustible gas monitoring of the space under the MPC lid be performed to ensure that no combustible gas mixture is present in the welding area. Contrary to this requirement, on April 8, 2008, the licensee process did not monitor combustible gas concentrations under the MPC lid during the full duration of the MPC lid-to-shell welding operations of MPC serial number 168. This was identified as a violation of Section 3.8 of CoC 1014, Appendix B.

Following the hydrogen event on April 8, 2008, the licensee determined that the area beneath the MPC lid needed to be continuously vented and monitored for explosive gases during the welding of the lid-to-shell weld. The licensee implemented corrective actions in Revision 19 to Procedure 6.6.7 to require continuous venting and combustible gas monitoring during the lid-to-shell weld. A clear tygon hose was firmly attached to the canister vent port and routed to a receiving tank. Another hose was routed from the receiving tank to the inlet of the explosive gas monitor during the welding operations.

Following implementation of corrective actions from the first hydrogen burn event, a second hydrogen burn event occurred on April 16, 2008, at approximately 11:58 pm, during welding operations of the hot wire layer on MPC serial number 169. Similar to the first hydrogen burn event, the root pass weld had been completed and the hot wire weld layer pass was in process at the time of the event. The second hydrogen burn event caused the tygon hose on the vent port and the drain port cover plate to be blown off and water from the MPC drain line was deposited on the MPC lid.

The NRC inspector was informed of the second hydrogen burn event and arrived onsite at approximately 2:00 am on April 17, 2008. The inspector observed that the explosive gas monitor was in place and that the monitor indicated that no explosive gas was present. The inspector questioned the CGS supervisor as to whether the existing configuration of the explosive gas monitor would detect explosive gases and the supervisor took a spare calibrated monitor to the MPC vent port to check for the presence of an explosive atmosphere. The monitor read off scale high on explosive gases when exposed to the MPC vent port. The supervisor then removed the explosive gas monitor that was configured to detect the presence of explosive gases from the MPC vent port, which also registered off scale high on explosive gases when exposed directly to the MPC vent port. The licensee secured the MPC in a safe condition and proceeded to determine the next course of action to be taken.

As previously stated, Section 3.8 of CoC 1014, Appendix B, required that during the MPC lid-to-shell welding operations, combustible gas monitoring of the space under the MPC lid was required to ensure that there was no combustible gas mixture present in the welding area. Contrary, to the above requirement, on April 16, 2008, the licensee system configuration did not effectively monitor combustible gas concentrations under the MPC lid which contributed to a second hydrogen burn event. This is a violation of Section 3.8 of CoC 1014, Appendix B. This violation is being treated as a cited violation, consistent with Section VI.A.1 of the NRC Enforcement Policy.

Following the second occurrence of a hydrogen burn, the licensee suspended loading operations and commenced recirculation of water from the spent fuel pool through the MPC. Individuals with outside industry experience arrived on site to assist in the determination of the cause of the hydrogen burn events and determine the best method to prevent recurrence. The team performed a root cause analysis utilizing change analysis and barrier analysis methods. The Summary Report Hydrogen Burn Event was still in draft form at the time this inspection report was prepared, however the licensee had decided to introduce an inert gas (argon) beneath the MPC lid during the lid-to-shell welding process to prevent recurrence. The licensee also relocated the explosive gas monitor sampling point to the vicinity of the MPC vent port. As part of the licensee's corrective actions, Procedure 6.6.7 was revised to include directions on how to introduce the inert gas into the MPC void area and how to monitor for explosive gases in Attachment 9.14, "Combustible Gas Monitoring and Purging," Revision 20.

An evaluation of the potential impact of the bounding hydrogen burn event on the spent fuel assemblies and the spent fuel canister was performed by the dry fuel cask vendor. The calculated pressure increase that occurred during the hydrogen burn event was determined to be less than 1.0 psi, which is a small fraction of the normal design pressure of the MPC (100 psi) or the spent fuel rods (in excess of 1,000 psi). Therefore, the integrity of the MPC and the spent fuel assemblies was unaffected by the hydrogen burn events.

On April 26, 2008 the inspectors witnessed the resumption of welding operations by Energy Northwest personnel on MPC serial number 169. The inspectors reviewed the revised hydrogen purge and monitoring process as part of the Procedure 6.6.7, Revision 20. The inspectors observed the hydrogen purge gas setup and implementation and the process used by the licensee to monitor for explosive gases during the welding process. The inspectors concluded that the procedures had been adequately revised and that the installation activities were completed without any recurrence of the of the previous hydrogen burn events. Additionally, the inspectors made similar observations of the welding operations on MPC serial number 170 on May 1, 2008 with the same conclusions.

b. Fuel Selection

The MPC-68 canister fuel parameters are specified in the Holtec CoC 1014, Appendix B, Section 2.0, "Approved Contents." The fuel assemblies that had been loaded into canister serial numbers 162 (cask 16), 164 (cask 18) and 166 (cask 20) were selected for review by the inspector and compared against the requirements located in the CoC.

The licensee utilized several procedures to document the fuel selection process, fuel loading process and to provide verification that the fuel assemblies had been placed in the correct canister cell location. Procedure 9.6.1, "Spent Fuel Selection for Cask Storage," Revision 2 had been used to select the fuel assemblies for loading during the current cask campaign. Procedure 9.6.1 had been revised to include the fuel selection requirements contained in CoC 1014, Amendment 2.

Procedure 9.6.1, Attachment 9.3, "Cask Loading Plan," included locations for the preparer and reviewer to document that the fuel assemblies selected for loading met the CoC Appendix B requirements. The attachment also specified the MPC canister storage cell where the fuel assembly was to be placed. The attachments for canister serial numbers 162, 164 and 166 were reviewed by the inspector and were found to have been signed by the preparer and reviewer as meeting the CoC Appendix B requirements.

Procedure 6.3.40, "Determination of Fuel Assembly Condition for ISFSI," Revision 4, provided the procedural guidance to ensure that selected fuel assemblies met the CoC definition of intact fuel, consisting of no known or suspected cladding defects greater than pinhole leaks or hairline cracks. The inspector reviewed the criteria contained in the procedure as well as supplemental fuel sipping data contained in Calculation NE-02-00-08, Revision 1, which documented which discharged spent fuel assemblies were suspect and flagged as lacking documentation to meet the CoC definition of intact fuel. All of the fuel assemblies from cycle 3 and 4 were suspect as well as four fuel assemblies from cycle 5 and one fuel assembly from cycle 15. There were also 45 fuel assemblies that were discharged from cycle 5 that were suspect. The inspector reviewed a sampling of fuel assemblies to be loaded in canister serial numbers 162, 164 and 166 and determined that the licensee had not selected any of the suspect fuel assemblies that lacked sufficient documentation as meeting the definition of intact fuel for loading into the selected canisters.

Procedure 6.6.15, "Fuel Handling and Refuel Activities Procedures," Revision 5 was used to verify that the fuel assembly that had been selected for placement by Procedure 9.6.1 had been placed in the correct MPC canister cell. Page 11 of Procedure 6.6.15 required the signature of the preparer and reviewer that performed the verification of each fuel assembly serial number by MPC cell location. The inspector reviewed the documentation for canister serial numbers 162, 164 and 166 and determined that all assemblies had been documented as being installed in the correct canister cell.

c. Radiological Surveillances

The Holtec Technical Specifications included bounding requirements for levels of contamination and radiological dose levels on the canisters and casks. The inspector reviewed the licensee documentation of the dose rate surveys performed on selected HI-STORM and of selected contamination level surveys performed on the HI-TRAC transfer cask and the canisters.

Technical Specification 3.2.2 required the removable contamination on the exterior surfaces of the transfer cask and the accessible portions of the canister not to exceed 1,000 disintegrations per minute (dpm) per 100 square centimeters from beta and gamma sources and 20 dpm/100 square centimeters from alpha sources.

Procedure HSP-SFS-C102, "Transfer Cask Surface Contamination," Revision 2 provided directions for obtaining contamination surveys of the HI-TRAC transfer cask and the accessible portions of the MPC. The contamination smears were counted for alpha and beta-gamma contamination. The results for each MPC were recorded in Attachment 9.1. The inspector reviewed the results of the contamination smears for canister serial numbers 162, 164 and 166. All the documentation indicated that the smears were below the required Technical Specification limits of 1,000 dpm/100 square centimeters from beta and gamma sources and 20 dpm/100 square centimeters from alpha sources.

Technical Specification 5.7.8 required dose rates to be measured at the HI-STORM cask inlet and outlet vent screens, on the cask top and on the sides of the cask. The measured surface dose rates (gamma + neutron) were required to be below the licensee's site-specific surface dose rate limit. In the case of the cask top and sides, additional upper limits were imposed of 20 mrem/hour for the cask top and 110 mrem/hour for the cask sides.

The inspector reviewed the licensee documentation for the HI-STORM dose rate measurements taken on the concrete casks containing canister serial numbers 162, 164, and 166. The HI-STORM surface dose rate measurements were documented in Procedure HSP-SFS-C103, "Overpack Average Surface Dose Rate," Revision 3. The calculated site-specific HI-STORM dose rates for the sides, top and vent ducts were included in Attachment 9.2, "HI-STORM Surface Dose Rates Data Sheet." The measured HI-STORM dose rates for canister serial numbers 162, 164 and 166 were all well below the site-specific surface dose rate limits. Additionally, the site-specific dose rate limits for the HI-STORM top and sides were well below the upper limits imposed by the Technical Specifications of 20 mrem/hour and 110 mrem/hour, respectively.

d. Heat Removal Surveillances

Holtec Technical Specification 3.1.2.1 required the licensee to either verify that all the storage cask inlet and outlet air ducts were free from blockage every 24 hours or for storage casks with installed temperature monitoring equipment, verify that the difference between the average storage cask air outlet temperature and the ISFSI ambient temperature was less than or equal to 126 degrees Fahrenheit every 24 hours. The licensee had elected to monitor the cask temperatures in lieu of inspecting the inlet and outlet ducts.

The inspector selected the licensee cask temperature records for the months of July 2006 and December 2007 for review. Procedure OSP-SFS-D101, "Spent Fuel Storage Cask Heat Removal System Daily Checks," Revisions 6 through 9 had been used to document the daily temperatures. The licensee had specified a more conservative cask outlet temperature difference of 114 degrees Fahrenheit in Procedure OSP-SFS-D101. All of the daily temperature readings from the selected months were reviewed and found to be less than the licensee specified 114 degree Fahrenheit temperature difference between the cask outlet vent temperatures and the ambient air temperatures.

e. Corrective Actions

The licensee prepared a list of the ISFSI related condition reports that had been generated since the last NRC inspection in April 2004. The inspector selected nine of the condition reports for review. The condition reports reviewed by the inspector were:

Condition Report No.	Condition Report Description
21608	Smears should be taken before decontamination of casks
21673	MPC Lid would not fully seat into MPC
22279	Casks 8-15 do not have temperature monitoring
22377	In-process documents storage not meeting QA program
35087	OE-Hatch crawler found to have damaged lift towers
40558	Daily screen checks are performed outside of ISFSI fence
41190	Maintenance procedures require 10 CFR 72.48 screens
176686	Lack of procedural guidance for snow blocking ISFSI vents
179373	Lead snakes identified on MPC to be downloaded

The inspector determined that the corrective actions associated with the listed condition reports and associated deficiencies appeared to have been appropriately addressed by the licensee. No additional findings were identified.

f. Quality Assurance Audits

Two Quality Assurance Audits of the ISFSI program had been performed by the licensee since the last NRC inspection completed on March 31, 2004. Audit Report AU-DC-04, documented the audit that had been conducted during the second cask loading campaign from April 19 to May 13, 2004. Audit Report AU-DC-06 included observations that had been conducted from April 6 to May 11, 2006. The audit teams had identified several ISFSI program weaknesses and had initiated Condition Reports (CRs) and Problem Evaluation Requests (PERs).

The inspector reviewed Procedure SWP-ASU-01, "Evaluations of Programs, Processes, and Suppliers," Revision 17 which provided instructions for conducting internal and external audits to determine the effectiveness of the Columbia Generating Station Quality Assurance Program. Attachment 7.1 listed the audit frequency of the ISFSI program as "discretionary." The inspector noted that 10 CFR 72.176 required in part that the licensee shall carry out a comprehensive system of planned and periodic audits to verify compliance with all aspects of the quality assurance program. The licensee had been conducting audits on a biennial frequency which met the requirement of 10 CFR 72.176, however Procedure SWP-ASU-01 did not specify the appropriate regulatory requirement for conducting a periodic audit of the ISFSI programs. The licensee initiated CR 00180254 to evaluate the discrepancy.

1.3 Conclusions

Two hydrogen burn events occurred during welding of the MPC lid-to-shell welds on canister serial numbers 168 and 169. During the welding operations for canister serial number 168 the licensee had elected to suspend combustible gas monitoring after the completion of the root pass weld. Although the licensee subsequently implemented



procedure changes to require combustible gas monitoring during the entire MPC lid-to-shell weld process, the combustible gas monitoring configuration was ineffective in determining the presence of combustible gases and a second hydrogen burn event occurred during welding operations on MPC canister serial number 169. Following the second hydrogen burn event, the licensee placed the MPC in a safe configuration and brought in individuals with outside industry experience to determine the causes of the hydrogen burn events and determine corrective actions to prevent recurrence. The licensee implemented changes to introduce an inert gas (argon) beneath the MPC lid during the lid-to-shell welding process and to relocate the explosive gas monitor sampling point to the vicinity of the MPC vent port. The completion of the MPC lid-to-shell weld on canister serial number 169 and the welding of the MPC lid-to-shell weld on canister serial number 170 occurred without further incident. A Notice of Violation is being issued, consistent with Section VI.A.1 of the NRC Enforcement Policy for failure to monitor combustible gas concentrations during the MPC lid-to-shell weld.

The licensee procedures contained sufficient information to select and load spent fuel assemblies into storage in compliance with CoC, Appendix B requirements. Selected fuel assemblies were verified by the inspector to meet the CoC, Appendix B requirements.

The licensee was performing radiological surveys of canister contamination and cask dose rates in accordance with the Technical Specification requirements. Results of surveys performed for selected canisters and casks were well below the Technical Specification limits.

The licensee was meeting the temperature monitoring requirements of Technical Specification 3.1.2.1 by performing daily temperature readings of the cask outlet vents and ambient air. All of the selected daily temperature readings reviewed were found to be below the Technical Specification and licensee specified maximum temperature limits. The ISFSI related condition reports sampled from the licensee's corrective action system adequately address the identified deficiencies and provide appropriate corrective actions.

The licensee was meeting the requirements of 10 CFR 72.176 for conducting periodic audits of the ISFSI program. Deficiencies discovered during the audits were entered into the licensee corrective action program for evaluation, as appropriate.

## **2 10 CFR 72.48 Evaluations (60857)**

### **2.1 Inspection Scope**

The licensee's 10 CFR 72.48 program and selected 10 CFR 72.48 evaluations/screenings were reviewed to determine compliance with regulatory requirements.

### **2.2 Observations and Findings**

Procedure SWP-LIC-02, "Licensing Basis Impact Determinations," Revision 7, provided the overall guidance for the licensee process for meeting the requirements of 10 CFR 72.48. Section 4.3.2 instructed the preparer of the change document to perform an applicability determination to decide which change processes apply to the proposed

activity, including a 10 CFR 72.48 screen or evaluation. Section 4.4.1 of Procedure SWP-LIC-02 instructed the preparer to perform a 10 CFR 72.48 screen when directed by the licensee's applicability determination or the guidance contained in NEI 96-07, Appendix B. Thus, Procedure SWP-LIC-02 instructed the preparer to use guidance from Procedure SWP-LIC-02 and NEI 96-07, Appendix B when performing 10 CFR 72.48 reviews.

The licensee provided a list of the 10 CFR 72.48 screenings and single evaluation that had been performed since the last NRC inspection conducted in March 2004. The inspector selected 10 CFR 72.48 screen numbers 7248-04-0012, 7248-06-002 and 7248-07-0001 along with 10 CFR 72.48 evaluation number 7248-07-002 for review. No issues or concerns were identified with the selected 10 CFR 72.48 regulatory reviews.

During the 10 CFR 72.48 regulatory review, the inspector noted that there were no 10 CFR 72.48 screenings or evaluations that had been performed by the licensee specifically associated with revision four or five to the "Energy Northwest Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation."

Regulation 10 CFR 72.212(b)(2)(ii) required in part that the licensee shall evaluate any changes to the written evaluations required by 10 CFR 72.212 using the requirements of 10 CFR 72.48(c). The 10 CFR 72.212(b) report incorporated several written evaluations that provide documentation of how the general licensee is meeting the regulatory requirements. The written evaluations required by 10 CFR 72.212(b)(2)(i)(A) include showing that the conditions set forth in the CoC have been met. Holtec CoC Condition 2 required that written operating procedures for cask handling, loading, movement, surveillance, and maintenance are consistent with the technical basis described in Chapter 8 of the Final Safety Analysis Report (FSAR). In accordance with the requirements of 10 CFR 72.212(b)(2)(i)(A), Energy Northwest provided a written evaluation of how Columbia Generating Station operating procedures were meeting the requirements of CoC Condition 2 in Section 1.1.2 of the "Energy Northwest Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation."

As previously noted, Procedure SWP-LIC-02 directed the user to use NEI 96-07 Appendix B for guidance in determining when to perform a 10 CFR 72.48 screen. Section B4.1.7 of NEI 96-07, Appendix B states that when a CoC holder has screened/evaluated a cask design change under 10 CFR 72.48 and determined that prior NRC approval is not required, a general licensee wanting to adopt the change would not be required to do a separate screening/evaluation for the change if the site-specific 10 CFR 72.212 evaluations are not changed. However, the general licensee should review their site-specific 10 CFR 72.212 evaluations to determine if any information would be changed by the cask design change and, if so, perform a 10 CFR 72.48 screening/evaluation as required by 10 CFR 72.212(b)(2)(ii). The answers and/or justification used in the 10 CFR 72.48 screening/evaluation may be taken from the CoC holder's 10 CFR 72.48 screening/evaluation if they could also apply to the general licensee screening/evaluation.

Revision 5 of the "Energy Northwest Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation," incorporated a Holtec Supplier Manufacturing Deficiency Report (SMDR) that reduced the number of HI-TRAC top lid bolts that were required to be installed. This change was added to the written evaluation contained in Section 1.1.2,

“Operating Procedures,” of the “Energy Northwest Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation.” The cask vendor provided the 10 CFR 72.48 Evaluation Number 876 to Energy Northwest, which determined that prior NRC approval was not required to implement the change. Energy Northwest utilized the Holtec SMDR and associated 10 CFR 72.48 Evaluation as the justification for the change to Revision 5 of the “Energy Northwest Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation.” A separate 10 CFR 72.48 screen or evaluation was not performed by the licensee when incorporating the changes to the written evaluations in the “Energy Northwest Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation.” The cask vendor 10 CFR 72.48 Evaluation Number 876 was reviewed by the inspector and determined to adequately address the proposed change per the requirements of 10 CFR 72.48(c).

As previously stated, Regulation 10 CFR 72.212(b)(2)(ii) required in part that the licensee shall evaluate any changes to the written evaluations required by 10 CFR 72.212 using the requirements of 10 CFR 72.48(c). Contrary to this requirement, Energy Northwest revised the written evaluation contained in Section 1.1.2 of the “Energy Northwest Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation,” Revision 5 without performing a 10 CFR 72.48 screen/evaluation. This is a violation of 10 CFR 72.212(b)(2)(ii). This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Section VI.A.1 of the NRC Enforcement Policy. This violation is in the licensee’s corrective action program as CR 181046.

Revision 4 of the “Energy Northwest Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation,” incorporated over 40 separate changes. The licensee incorporated administrative and editorial changes as well as changes associated with Amendment 2 of Holtec CoC 1014. These changes were incorporated without a licensee 10 CFR 72.48 screening or evaluation associated with the 10 CFR 72.212 revision. There were also several changes which were incorporated into written evaluations contained in the “Energy Northwest Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation,” that used a separate 10 CFR 72.48 screen/evaluation to evaluate each proposed change. Finally, Appendix A and B were added to the “Energy Northwest Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation,” which included a table that referenced the MPC serial numbers and the applicable Supplier Manufacturer Deviation Reports (SMDRs) that had been issued against the MPC from the cask vendor. After a thorough review of all the changes that had been made to Revision 4 of the “Energy Northwest Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation,” the staff determined that there were no negative findings associated with Revision 4.

## 2.3 Conclusions

The licensee 10 CFR 72.48 screenings and the single 10 CFR 72.48 evaluation had been performed in accordance with the requirements of 10 CFR 72.48(c). However, the licensee did not perform a 10 CFR 72.48(c) review of the changes to the written evaluations contained in Section 1.1.2 of the “Energy Northwest Independent Spent Fuel

Storage Installation 10 CFR 72.212 Evaluation,” as required by 10 CFR 72.212(b)(2)(ii). This violation is being treated as a Non-Cited Violation, consistent with Section VI.A.1 of the NRC Enforcement Policy.

### **3 Follow-up (IP 92701)**

(Closed) IFI 72-35/0401-01 Review of the 10 CFR 72.212(b) Changes Needed to Support the Hydrogen Water Chemistry Project. On April 23, 2004, the NRC issued Inspection Report 50-397/04-07; 72-035/04-01 which included Inspection Follow-up Item (IFI) 72-35/0201-01. The licensee had performed a 10 CFR 72.48 screening (Screen 03-010) that had determined the storage of the hydrogen onsite and the location of the underground hydrogen pipeline was bounded by previously analyzed accidents. The inspectors issued IFI to review the changes made to the licensee’s 10 CFR 72.212 report after the hydrogen water chemistry project had been incorporated.

The inspector reviewed the “Energy Northwest Licensing Document Change Notice Form Number LDCN 72212-03-066,” and the “Energy Northwest Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation,” Revision 2, which incorporated relevant changes associated with the hydrogen water chemistry project. The licensee had performed a site-specific fire and explosion hazards analysis in Section 1.3.3.4, Item 5, “Fires and Explosions and  $\leq 50$  Gallons of Combustible Fuel in Transporter Fuel Tank.” The analysis indicated that the existing explosion hazards analysis, which considered the probability of a projectile impacting the HI-STORM cask during transportation or storage, was not altered by the inclusion of the hydrogen water chemistry project. The licensee concluded that results for the conservative calculations for all scenarios, including any explosions associated with the hydrogen water chemistry project, continue to show that all probabilities of a projectile impacting a HI-STORM cask are less than  $10^{-6}$ .

The use of a risk informed approach to determine the acceptability of the site-specific fire and explosion hazards analysis was discussed with inspectors from the Spent Fuel Storage and Transportation (SFST) Office. SFST determined that this was an acceptable technique for the site-specific fire and explosion hazards analysis, as there has been no specific regulatory restrictions placed on the methods that the general licensees could use for this analysis and that the risk associated with an event having a frequency less than one in  $10^{-6}$  has been acknowledged by the agency as being acceptably low.

### **4 Exit Meeting Summary**

A debrief was held with members of the licensee management at the conclusion of the initial onsite inspection on April 17, 2008. At the conclusion of the inspection a telephonic exit was held with members of the licensee management on May 19, 2008. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.

**ATTACHMENT 1**

**SUPPLEMENTAL INFORMATION**

**PARTIAL LIST OF PERSON CONTACTED**

Licensee Personnel

M. Davis, Radiological Support Supervisor  
R. Fuller, ISFSI Project Manager  
R. Garcia, Licensing Engineer  
D. Gregoire, Licensing Engineer  
M. Humphries, Licensing Supervisor  
C. Madden, Scientist  
S. Nappi, Quality Audit  
S. Rejniak, Principal Engineer  
J. Suing, Reactor Maintenance Manager

Contract Personnel

C. Deady, Welder Foreman  
D. Larken, ISFSI Project Manager  
K. Saunders, Welder  
M. Wright, Welder

**INSPECTION PROCEDURES USED**

60855.1      Operation of an ISFSI at Operating Plants  
60857        Review of 10 CFR 72.48 Evaluations  
92701        Follow-Up

**ITEMS OPENED, CLOSED, AND DISCUSSED**

Opened

72-35/0801-01NOV    Failure to monitor the combustible gas concentration while performing the MPC lid-to-shell weld  
72-35/0801-02NCV    Failure to perform 10 CFR 72.48(c) review when revising the 10 CFR 72.212(b) written evaluations

Closed

72-35/0401-01IFI    Review of the 10 CFR 72.212(b) Changes Needed to Support the Hydrogen Water Chemistry Project  
72-35/0801-02NCV    Failure to perform 10 CFR 72.48(c) review when revising the 10 CFR 72.212(b) written evaluations

Discussed

None

### **LIST OF ACRONYMS**

CFR	Code of Federal Regulations
CGS	Columbia Generating Station
CoC	Certificate of Compliance
CR	Condition Report
FSAR	Final Safety Analysis Report
IFI	Inspection Follow-up Item
ISFSI	Independent Spent Fuel Storage Installation
MPC	Multi-Purpose Canister
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
PER	Problem Evaluation Request
SFST	Spent Fuel Storage and Transportation
SMDR	Supplier Manufacturing Deficiency Report

**ATTACHMENT 2**

**LOADED HI-STORM 100S CASKS AT THE COLUMBIA GENERATING STATIONS ISFSI**

<b>LOADING ORDER</b>	<b>MPC (canister) SERIAL #</b>	<b>DATE ON PAD</b>	<b>HEAT LOAD (Kw)</b>	<b>BURNUP MWd/MTU</b>	<b>MAXIMUM FUEL ENRICHMENT %</b>	<b>PERSON-REM DOSE</b>
1	MPC-68-028	09/22/02	10.81	32,299	2.72	0.385
2	MPC-68-031	10/07/02	11.10	32,416	2.72	0.341
3	MPC-68-022	10/28/02	11.30	32,541	2.72	0.315
4	MPC-68-039	11/18/02	11.42	33,045	2.72	0.298
5	MPC-68-033	12/09/02	11.20	32,804	2.72	0.245
6	MPC-68-091	02/25/04	12.00	32,318	2.72	0.390
7	MPC-68-092	03/03/04	17.10	38,607	2.92	0.298
8	MPC-68-093	03/11/04	17.10	38,738	2.92	0.320
9	MPC-68-094	03/18/04	17.00	38,732	2.92	0.304
10	MPC-68-095	03/24/04	17.00	38,772	2.92	0.276
11	MPC-68-096	03/31/04	17.10	38,729	2.92	0.253
12	MPC-68-097	04/06/04	17.20	39,121	2.92	0.251
13	MPC-68-098	04/14/04	17.10	39,002	2.92	0.237
14	MPC-68-099	04/20/04	17.00	39,008	2.92	0.208
15	MPC-68-100	04/25/04	16.80	38,982	2.92	0.199
16	MPC-68-162	02/22/08	11.91	39,172	3.22	0.260
17	MPC-68-163	02/29/08	21.00	43,302	3.56	0.458
18	MPC-68-164	03/07/08	21.02	43,181	3.56	0.426
19	MPC-68-165	03/14/08	21.02	43,010	3.56	0.343
20	MPC-68-166	03/21/08	21.00	43,330	3.56	0.379
21	MPC-68-167	04/04/08	21.03	42,827	3.56	0.587
22	MPC-68-168	04/11/08	21.01	43,020	3.56	0.503
23	MPC-68-169	04/29/08	20.88	42,269	3.87	0.362

Notes:

- 1) Heat Load (Kw) is the sum of the heat load values for all spent fuel assemblies in the cask
- 2) Burnup is the value for the spent fuel assembly with the highest individual discharge burnup
- 3) Fuel Enrichment is the spent fuel assembly with the highest individual enrichment percent of U-235