

# WOLF CREEK

NUCLEAR OPERATING CORPORATION

Jaime H. McCoy  
Vice President Engineering

November 1, 2016  
ET 16-0026

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

- Reference:
- 1) Letter dated March 12, 2012, from E. J. Leeds and M. R. Johnson, USNRC, to M. W. Sunseri, WCNO, "Request for Information Pursuant to Title 10 of the Code of Federal Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force (NTTF) Review of Insights from the Fukushima Dai-ichi Accident"
  - 2) EPRI Report 1025287, "Seismic Evaluation Guidance, Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic"
  - 3) Letter WO 14-0042 dated March 31, 2014, from R. A. Smith, WCNO, to USNRC.
  - 4) Letter dated August 12, 2015, from F. G. Vega, USNRC, to A. C. Heflin, WCNO, "Wolf Creek Generating Station - Staff Assessment of Information provided Pursuant to Title 10 of the Code of Federal Regulations Part 50, Section 50.54(f), Seismic Hazard Reevaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident"
  - 5) Letter dated October 27, 2015, from W. M. Dean, USNRC, to A. C. Heflin, WCNO, "Final Determination of Licensee Seismic Probabilistic Risk Assessments Under the Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendation 2.1 "Seismic" of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident"
  - 6) EPRI Report 3002007148, Seismic Evaluation Guidance Spent Fuel Pool Integrity Evaluation, February 2016
  - 7) Letter dated February 23, 2016, from A. N. Mauer, NEI, to J. R. Davis, USNRC, "Request for Endorsement of Seismic Evaluation Guidance: Spent Fuel Pool Integrity Evaluation (EPRI 3002007148)

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- 8) Letter dated March 18, 2016, from J. R. Davis, USNRC, to A. N. Mauer, NEI, "Endorsement of EPRI 3002007148, "Seismic Evaluation Guidance: Spent Fuel Pool Integrity Evaluation"

Subject: Docket No. 50-482: Spent Fuel Pool Evaluation Supplemental Report, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident

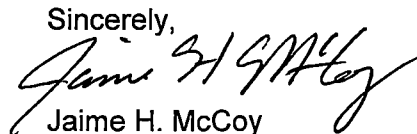
Gentlemen:

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued Reference 1 to Wolf Creek Nuclear Operating Corporation (WCNOC). Enclosure 1, Item (9) of the 50.54(f) letter requested addressees to provide limited scope spent fuel pool (SFP) evaluations. By letter dated October 27, 2015 (Reference 5), the NRC transmitted final seismic information request tables which identified that WCNOC is to conduct a limited scope SFP Evaluation. By Reference 7, Nuclear Energy Institute (NEI) submitted an Electric Power Research Institute (EPRI) report entitled, Seismic Evaluation Guidance Spent Fuel Pool Integrity Evaluation (EPRI 3002007148) (Reference 6) for NRC review and endorsement. NRC endorsement was provided by Reference 8.

EPRI 3002007148 provides criteria for evaluating the seismic adequacy of a SFP to the reevaluated ground motion response spectrum (GMRS) hazard levels. This report supplements the guidance in the Seismic Evaluation Guidance, Screening, Prioritization and Implementation Details (SPID) (Reference 2), for plants where the GMRS peak spectral acceleration is less than or equal to 0.8g. Section 3.3 of EPRI 3002007148 lists the parameters to be verified to confirm that the results of the report are applicable to WCNOC, and that the Wolf Creek Generating Station (WCGS) SFP is seismically adequate in accordance with NTTF 2.1 Seismic evaluation criteria.

The attachment to this letter provides the data for WCGS that confirms applicability of the EPRI 3002007148 criteria, confirms that the SFP is seismically adequate, and provides the requested information in response to Item (9) of the 50.54 (f) letter associated with NTTF Recommendation 2.1 Seismic evaluation criteria.

This letter contains no commitments. If you have any questions concerning this matter, please contact me at (620) 364-4156, or Cynthia R. Hafenstine (620) 364-4204.

Sincerely,  
  
Jaime H. McCoy

JHM/rtt

Attachment

cc: K. M. Kennedy (NRC), w/a,  
B. K. Singal (NRC), w/a,  
N. H. Taylor (NRC), w/a,  
Senior Resident Inspector (NRC), w/a,

STATE OF KANSAS    )  
                                  ) SS  
COUNTY OF COFFEY )

Jaime H. McCoy, of lawful age, being first duly sworn upon oath says that he is Vice President Engineering of Wolf Creek Nuclear Operating Corporation; that he has read the foregoing document and knows the contents thereof; that he has executed the same for and on behalf of said Corporation with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By Jaime McCoy  
Jaime H. McCoy  
Vice President Engineering

SUBSCRIBED and sworn to before me this 1<sup>st</sup> day of November, 2016.



Gayle Shephard  
Notary Public

Expiration Date 7/24/2019

### Site-Specific Spent Fuel Pool Criteria for Wolf Creek Generating Station

The 10 CFR 50.54(f) letter (Reference 1) requested that, in conjunction with the response to Near-Term Task Force (NTTF) Recommendation 2.1, a seismic evaluation be made of the Spent Fuel Pool (SFP). More specifically, plants were asked to consider "all seismically induced failures that can lead to draining of the SFP." Such an evaluation would be needed for any plant in which the ground motion response spectrum (GMRS) exceeds the safe shutdown earthquake (SSE) in the 1 to 10 Hz frequency range. The staff confirmed through Reference 2 that the GMRS exceeds the SSE and concluded that a SFP evaluation is merited for Wolf Creek Generating Station (WCGS). By letter dated March 17, 2016 (Reference 3), the staff determined that EPRI 3002007148 (Reference 4) was an acceptable approach for performing SFP evaluations for plants where the peak spectral acceleration is less than or equal to 0.8g.

The table below lists the criteria from Section 3.3 of EPRI 3002007148 along with data for WCGS that confirms applicability of the EPRI 3002007148 criteria and confirms that the SFP is seismically adequate and can retain adequate water inventory for 72 hours in accordance with NTTF 2.1 Seismic evaluation criteria.

SFP Criteria from EPRI 3002007148	Site-Specific Data
<b>Site Parameters</b>	
1) The site-specific GMRS peak spectral acceleration at any frequency should be less than or equal to 0.8g.	The GMRS peak spectral acceleration in the Seismic Hazard Evaluation and Screening Report (Reference 5, Table 2.4-1), as accepted by the NRC in Reference 6, is 0.727g, which is less than 0.8g; therefore, this criterion is met.
<b>Structural Parameters</b>	
2) The structure housing the SFP should be designed using an SSE with a peak ground acceleration (PGA) of at least 0.1g.	The SFP is housed in the Fuel Building (Reference 7 Chapter 3, Section 3.8.4.1.2). Per USAR Chapter 9, Section 9.1A.4.4 (Reference 7) the SFP has been designed in accordance with the criteria for Seismic Category 1 structures, and the Fuel Building is seismically designed to the site SSE with a PGA of 0.20g per Seismic Hazard Evaluation and Screening Report (Reference 5). The WCGS PGA is greater than 0.1g; therefore, this criterion is met.

<b>SFP Criteria from EPRI 3002007148</b>	<b>Site-Specific Data</b>
3) The structural load path to the SFP should consist of some combination of reinforced concrete shear wall elements, reinforced concrete frame elements, post-tensioned concrete elements and/or structural steel frame elements.	<p>The fuel building is supported on a two way reinforced concrete base mat per Chapter 3, Section 3.8.4.1.2 of Reference 7, and the floors and roof are reinforced concrete slabs supported by structural steel beams and girders. The SFP walls have been designed to resist SSE-induced stresses per Reference 8, and the structural load path from the Fuel Building foundation to the SFP has been designed to resist SSE-induced stresses per Reference 9.</p> <p>Based on the above discussion the load path criterion is met for WCGS.</p>
4) The SFP structure should be included in the Civil Inspection Program performed in accordance with Maintenance Rule.	<p>The Fuel Building, which houses the SFP, is included in the WCGS Structural Monitoring Program, per Attachment B of Reference 10. This program includes regular inspections in accordance with 10 CFR 50.65, which monitors the performance or condition of structures, systems, or components (SSCs) in a manner sufficient to provide reasonable assurance that these SSCs are capable of fulfilling their intended functions; therefore, this criterion is met for Wolf Creek Generating Station.</p>

SFP Criteria from EPRI 3002007148	Site-Specific Data																																				
<b>Non-Structural Parameters</b>																																					
<p>5) To confirm applicability of the piping evaluation in Section 3.2 of EPRI 3002007148, piping attached to the SFP up to the first valve should have been evaluated for the SSE.</p>	<p>Piping &amp; Instrumentation Diagram M-12EC01 (Reference 11) shows 11 piping lines attached to the SFP, which are:</p> <table border="1" data-bbox="756 447 1417 1381"> <thead> <tr> <th data-bbox="756 447 954 583">Line</th> <th data-bbox="954 447 1260 583">Function</th> <th data-bbox="1260 447 1417 583">Isometric Drawing (Reference 11)</th> </tr> </thead> <tbody> <tr> <td data-bbox="756 583 954 653">012-HCC-2</td> <td data-bbox="954 583 1260 653">Essential Service Water</td> <td data-bbox="1260 583 1417 653">M-13EF12</td> </tr> <tr> <td data-bbox="756 653 954 722">013-HCC-2</td> <td data-bbox="954 653 1260 722">Essential Service Water</td> <td data-bbox="1260 653 1417 722">M-13EF12</td> </tr> <tr> <td data-bbox="756 722 954 827">001-HCC-12</td> <td data-bbox="954 722 1260 827">Suction of Fuel Pool Cooling (FPC) Pump "A"</td> <td data-bbox="1260 722 1417 827">M-13EC04</td> </tr> <tr> <td data-bbox="756 827 954 896">009-HCC-12</td> <td data-bbox="954 827 1260 896">Suction of FPC Pump "B"</td> <td data-bbox="1260 827 1417 896">M-13EC04</td> </tr> <tr> <td data-bbox="756 896 954 966">011-HCC-10</td> <td data-bbox="954 896 1260 966">SFP HX (Heat Exchanger) Return</td> <td data-bbox="1260 896 1417 966">M-13EC04</td> </tr> <tr> <td data-bbox="756 966 954 1001">003-HCC-10</td> <td data-bbox="954 966 1260 1001">SFP HX Return</td> <td data-bbox="1260 966 1417 1001">M-13EC04</td> </tr> <tr> <td data-bbox="756 1001 954 1071">094-HCC-6</td> <td data-bbox="954 1001 1260 1071">Fuel Pool Clean-Up Demineralizers</td> <td data-bbox="1260 1001 1417 1071">M-13EC04</td> </tr> <tr> <td data-bbox="756 1071 954 1140">083-HCD- 2 1/2</td> <td data-bbox="954 1071 1260 1140">Pool Skimmer</td> <td data-bbox="1260 1071 1417 1140">M-13EC06</td> </tr> <tr> <td data-bbox="756 1140 954 1209">086-HCD-2 1/2</td> <td data-bbox="954 1140 1260 1209">Pool Skimmer</td> <td data-bbox="1260 1140 1417 1209">M-13EC06</td> </tr> <tr> <td data-bbox="756 1209 954 1278">084-HCD-2 1/2</td> <td data-bbox="954 1209 1260 1278">Pool Skimmer</td> <td data-bbox="1260 1209 1417 1278">M-13EC06</td> </tr> <tr> <td data-bbox="756 1278 954 1381">079-HCD-3</td> <td data-bbox="954 1278 1260 1381">Recycle Evaporator Feed Pumps to Fuel Transfer Canal</td> <td data-bbox="1260 1278 1417 1381">M-13EC06</td> </tr> </tbody> </table> <p data-bbox="756 1434 1372 1602">Per Wolf Creek's Piping Class Summary (Reference 12), lines 012-HCC-2, 013-HCC-2, 001-HCC-12, 009-HCC-12, 011-HCC-10, 003-HCC-10, and 094-HCC-6 are all Class 1 piping and as such have been designed for the SSE.</p>	Line	Function	Isometric Drawing (Reference 11)	012-HCC-2	Essential Service Water	M-13EF12	013-HCC-2	Essential Service Water	M-13EF12	001-HCC-12	Suction of Fuel Pool Cooling (FPC) Pump "A"	M-13EC04	009-HCC-12	Suction of FPC Pump "B"	M-13EC04	011-HCC-10	SFP HX (Heat Exchanger) Return	M-13EC04	003-HCC-10	SFP HX Return	M-13EC04	094-HCC-6	Fuel Pool Clean-Up Demineralizers	M-13EC04	083-HCD- 2 1/2	Pool Skimmer	M-13EC06	086-HCD-2 1/2	Pool Skimmer	M-13EC06	084-HCD-2 1/2	Pool Skimmer	M-13EC06	079-HCD-3	Recycle Evaporator Feed Pumps to Fuel Transfer Canal	M-13EC06
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083-HCD- 2 1/2	Pool Skimmer	M-13EC06																																			
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SFP Criteria from EPRI 3002007148	Site-Specific Data
	<p>Upon review of the discussion provided on page 3-13 of Reference 4, the intent of the seismic evaluation criterion is to prevent rapid drain-down of the SFP inventory via a break in piping attached to the SFP below the surface of the water. Per Note 8 of M-12EC01 (Reference 11), lines 083-HCD- 2 ½, 086-HCD-2 ½, and 084-HCD-2 ½ penetrate the pool boundary 6 inches below normal pool water level. Per M-13EC06 (Reference 11), these lines do not route any further below this elevation inside the pool boundary. Additionally, each line has a ¾" diameter vent hole located on top of the pipe. This shallow depth and vent holes preclude these lines as being a source of rapid drain-down and the intent of this criterion has been met for these lines.</p> <p>Per Note 11 of M-12EC01 (Reference 11), line 079-HCD-3 penetrates the fuel transfer canal wall 12 inches above normal water level. Per M-13EC06 (Reference 11), this line does not route any further below this elevation inside the pool boundary. This line is not a possible source of drain-down and the intent of this criterion has been met for this line.</p> <p>As discussed previously, piping attached to the SFP and capable of draining the SFP is evaluated to the SSE; therefore, this criterion is met for WCGS.</p>
<p>6) Anti-siphoning devices should be installed on any piping that could lead to siphoning water from the SFP. In addition, for any cases where active anti-siphoning devices are attached to 2-inch or smaller piping and have extremely large extended operators, the valves should be walked down to confirm adequate lateral support.</p>	<p>Per M-12EC01 (Reference 11) the termination for the Fuel Pool Cooling (FPC) pump suction lines 009-HCC-12 and 001-HCC-12 is at Elevation 2040'-0" (6'-0" below the normal water). Per Section 9.1.3.2.1.1 of Reference 7, the top of the fuel racks is at approximately Elevation 2021'. No anti-siphoning devices are present on the SFP HX suction lines. However, these lines are acceptable because of the shallow elevation of the line termination. Additionally, these lines have been evaluated for the SSE, as discussed previously.</p>

SFP Criteria from EPRI 3002007148	Site-Specific Data
	<p>Per Section 9.1.3.2.1.1 of Reference 7, M-13EC04 (Reference 11), and Note 7 of M-12EC01 (Reference 11), a 3" siphon break is present on the SFP HX return lines 011-HCC-10 and 003-HCC-10 at Elevation 2043'-2". This siphon break precludes these lines as being a source of rapid drain-down.</p> <p>As stated above, Lines 083-HCD- 2½, 086-HCD- 2½, and 084-HCD-2½ are SFP skimmers and located near the top of the pool, with the bottom of the skimmer weir located six inches below the water surface. Per M-12EC01 (Reference 11), each line contains a ¾" siphon hole; therefore, no rapid drain-down is possible.</p> <p>Line 094-HCC-6 flows into line 003-HCC-10 and does not penetrate the pool; therefore, it cannot directly siphon water from the SFP per M-12EC01 (Reference 11).</p> <p>Line 079-HCD-3, as stated above, is located 12 inches above the water line and therefore cannot siphon water from the SFP.</p> <p>Per M-12EC01 (Reference 11) and M-13EF12 (Reference 11), the termination for the Essential Service Water lines 012-HCC-2 and 013-HCC-2 is at Elevation 2044'-6" (1'-6" below the normal water). Per Section 9.1.3.2.1.1 of Reference 7, the top of the fuel racks is at approximately Elevation 2021'. No anti-siphoning devices are present on these Essential Service Water lines; however, these lines are acceptable because the shallow elevation of the line termination precludes the possibility of drain-down. Additionally, these lines have been evaluated for the SSE, as discussed previously.</p> <p>As described, all SFP piping that could lead to siphoning either has anti-siphoning devices installed or has been documented to be seismically adequate. There are no anti-siphoning devices attached to 2-inch or smaller piping with extremely large extended operators. This anti-siphoning criterion is therefore met for WCGS.</p>



SFP Criteria from EPRI 3002007148	Site-Specific Data
<p>7) To confirm applicability of the sloshing evaluation in Section 3.2 of EPRI 3002007148, the maximum SFP horizontal dimension (length or width) should be less than 125 ft, the SFP depth should be greater than 36 ft, and the GMRS peak <math>S_a</math> should be <math>&lt;0.1g</math> at frequencies equal to or less than 0.3 Hz.</p>	<p>The WCGS SFP has a length of 50'-0" and a width of 28'-6" based on drawing C-1C6211 (Reference 11). The bottom of the SFP liner is Elevation 2006'-6" (Reference 11). Per Note 1 of M-12EC01 (Reference 11), lines 009-HCC-12" and 001-HCC-12 penetrate the pool boundary 3'-0" below the normal water level of the pool. Per M-13EC04 (Reference 11), these lines penetrate the pool boundary at Elevation 2043'-0". Consequently, the normal water level is 2046'-0" and the total SFP depth is 39'-6".</p> <p>Considering a nominal water depth to be 1'-6" from top of the pool, per Table 9.1-4 of Reference 7, the minimum water depth is 38'. All SFP dimensions are within the allowable dimensions; therefore, this criterion is met.</p> <p>The Wolf Creek Generating Station GMRS maximum spectral acceleration in the frequency range less than 0.3 Hz is 0.0386 g from the Seismic Hazard Evaluation and Screening Report (Reference 5) which is less than 0.1g; therefore, this criterion is met.</p>
<p>8) To confirm applicability of the evaporation loss evaluation in Section 3.2 of EPRI 3002007148, the SFP surface area should be greater than 500 ft<sup>2</sup> and the licensed reactor core thermal power should be less than 4,000 MWt per unit.</p>	<p>The surface area of the WCGS SFP is 1,425 ft<sup>2</sup> based on drawing C-1C6211 (Reference 11), which is greater than 500 ft<sup>2</sup>; and licensed reactor thermal power for WCGS is 3565 MWt per unit (Reference 7, Chapter 1, Section 1.1.5) which is less than 4,000 MWt per unit; therefore, these criteria are met.</p>

#### References:

1. Letter from E. J. Leeds and M. R. Johnson, USNRC, to M. W. Sunseri, WCNO, "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 2.1, 2.3, and 9.3, of the Near-Term Task Force (NTTF) Review of Insights from the Fukushima Dai-ichi Accident," March 12, 2012. ADAMS Accession No. ML12053A340 (Letter), ML12056A046 (Pkg).
2. Letter from W. M. Dean, USNRC, to A. C. Heflin, "Final Determination of Licensee Seismic Probabilistic Risk Assessments Under the Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendation 2.1 "Seismic" of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," October 27, 2015. ADAMS Accession No. ML15194A015.

3. Letter from J. R. Davis, USNRC, to A. N. Mauer, NEI, "Endorsement of Electric Power Research Institute Report 3002007148, *"Seismic Evaluation Guidance: Spent Fuel Pool Integrity Evaluation,"* March 17, 2016. ADAMS Accession No. ML15350A158.
4. EPRI 3002007148, "Seismic Evaluation Guidance: Spent Fuel Pool Integrity Evaluation", February 2016.
5. WCNOC Letter WO 14-0042, "Wolf Creek Nuclear Operating Corporation's Seismic Hazard and Screening Report (CEUS Sites), Response NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," March 31, 2014. ADAMS Accession No. ML14097A020.
6. Letter from F. G. Vega, USNRC, to A. C. Heflin, WCNOC, "Wolf Creek Generating Station - Staff Assessment of Information Provided Pursuant to Title 10 of the Code of Federal Regulations Part 50, Section 50.54(f), Seismic Hazard Reevaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident (TAC No. MF3755)", August 12, 2015. ADAMS Accession No. ML15216A320.
7. Wolf Creek Updated Safety Analysis Report (USAR), Rev 29
8. Wolf Creek Calculation 05-80-F, Rev. 1, "Fuel Building Spent Fuel Pool Walls Design"
9. Wolf Creek Calculation 05-82-F, Rev. 0, "Fuel Building Exterior Walls & Pilasters"
10. Wolf Creek Procedure, AI 23M-007, Rev. 5, "Structures Monitoring Program"
11. Wolf Creek Generating Station drawings:
  - i. C-1C6211, Rev. 1, "Fuel Building Conc. Neat Line and Reinforcing Plan Floor EL 2026'-0"
  - ii. M-13EC04, Rev. 6, "Piping Isometric of Fuel Pool Cooling & Clean-Up System Fuel Building"
  - iii. M-13EF12, Rev. 8, "Essential Service Water Fuel Building"
  - iv. M-13EC06, Rev. 2, "Piping Isometric of Fuel Pool Cooling & Clean-Up System Fuel Building"
  - v. M-12EC01, Rev. 21, "Piping & Instrumentation Diagram Fuel Pool Cooling and Clean-Up System"
12. Wolf Creek MS-01, Rev. 76, "Piping Class Summary"