

# WOLF CREEK NUCLEAR OPERATING CORPORATION

Terry J. Garrett  
Vice President, Engineering

August 31, 2007

ET 07-0039

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

- Reference:
- 1) Letter ET 07-0004, dated March 14, 2007, from T. J. Garrett, WCNOG, to USNRC
  - 2) Letter ET 07-0008, dated April 18, 2007, from T. J. Garrett, WCNOG, to USNRC
  - 3) Letter ET 07-0013, dated May 9, 2007, from T. J. Garrett, WCNOG, to USNRC
  - 4) Letter dated May 29, 2007, from J. W. Lubinski, USNRC, to R. A. Muench, WCNOG
  - 5) Letter ET 07-0022, dated June 15, 2007, from T. J. Garrett, WCNOG, to USNRC
  - 6) Letter dated August 8, 2007, from J. W. Lubinski, USNRC, to R. A. Muench, WCNOG

Subject: Docket No. 50-482: Response to NRC Letter dated August 8, 2007, Regarding the Main Steam and Feedwater Isolation System Controls Modification

Gentlemen:

Reference 1 provided a license amendment request that proposed revisions to Technical Specification (TS) 3.3.2, "Engineered Safety Feature Actuation System (ESFAS) Instrumentation," TS 3.7.2, "Main Steam Isolation Valves (MSIVs)," and TS 3.7.3, "Main Feedwater Isolation Valves (MFIVs)." Reference 1 proposed changes to these specifications based on a planned modification to replace the MSIVs and associated actuators, MFIVs and associated actuators, and replacement of the Main Steam and Feedwater Isolation System (MSFIS) controls. References 2 and 3 provided supplemental information requested by the NRC.

On May 17, 2007, WCNOC personnel met with the NRC staff to discuss the information needed for the staff review of the MSFIS controls modification. Subsequently, Reference 4 provided the results of the May 17, 2007 meeting and the supplemental information needed for the staff to begin its review of the MSFIS controls portion of Reference 1. Reference 5 provided responses to the request for supplemental information in Reference 4 and available supporting documentation. On August 2, 2007, WCNOC personnel met with the NRC to discuss five issues identified by the NRC staff associated with the review of the MSFIS controls modification. Subsequently, Reference 6 provided the results of the meeting and requested WCNOC to respond to the five issues. Attachment I provides WCNOC's response to these items.

During the August 2, 2007, meeting, the NRC staff stated that the review of the MSFIS controls portion of the license amendment request would be completed in Fall 2008 at the earliest. WCNOC continues to pursue this change for implementation during the Spring 2008 refueling outage and will continue to be responsive to requests for information to support this refueling outage.

Enclosure III provides the proprietary CS Innovations LLC Report 6000-00010, "ALS Design Tools," Revision 0.95. As Enclosure III contains information proprietary to CS Innovations LLC, it is supported by an affidavit signed by CS Innovations LLC, the owner of the information. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR 2.390 of the Commission's regulations. Accordingly, it is respectfully requested that the information, which is proprietary to CS Innovations, be withheld from public disclosure in accordance with 10 CFR 2.390 of the Commission's regulations. This affidavit, along with a CS Innovations LLC authorization letter, 9100-00012, "Application for Withholding Proprietary Information from Public Disclosure," is contained in Enclosure IV.

WCNOC is only providing a proprietary version of Enclosure III as a non-proprietary version would be of no value to the public due to the extent of the proprietary information.

The supplemental information provided in Attachment I and the Enclosures do not impact the conclusions of the No Significant Hazards Consideration provided in the Reference. In accordance with 10 CFR 50.91, a copy of the submittal (without Enclosures) is being provided to the designated Kansas State official.

Attachment II provides a list of commitments made in this letter. If you have any questions concerning this matter, please contact me at (620) 364-4084, or Mr. Kevin Moles at (620) 364-4126.

Sincerely,



Terry J. Garrett

TJG/rlt


Attachments: I Response to NRC Letter Regarding the Main Steam and Feedwater Isolation System (MSFIS) Controls Modification  
II List of Commitments

Enclosures: I Nutherm International Dedication Plan WCN-9715DP, Revision 2  
II MSFIS Controls Replacement Project Plan, Revision 2  
III CS Innovations LLC Report 6000-00010, "ALS Design Tools," Revision 0.95  
IV CS Innovations LLC Letter 9100-00012, "Application for Withholding Proprietary Information from Public Disclosure"

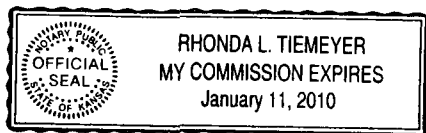
cc: T. A. Conley (KDHE), w/a, w/e  
J. N. Donohew (NRC), w/a, w/e  
V. G. Gaddy (NRC), w/a, w/e  
B. S. Mallett (NRC), w/a, w/e  
Senior Resident Inspector (NRC), w/a, w/e

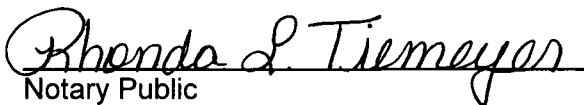
STATE OF KANSAS    )  
                                  ) SS  
COUNTY OF COFFEY )

Terry J. Garrett, 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   
Terry J. Garrett  
Vice President Engineering

SUBSCRIBED and sworn to before me this 31<sup>st</sup> day of August, 2007.



  
Notary Public

Expiration Date January 11, 2010

## **Response to NRC Letter Regarding the Main Steam and Feedwater Isolation System (MSFIS) Controls Modification**

On August 2, 2007, Wolf Creek Nuclear Operating Corporation (WCNOC) personnel met with the Nuclear Regulatory Commission (NRC) staff to discuss five issues identified by the NRC associated with the review of the MSFIS controls modification. Subsequently, the NRC issued a letter dated August 8, 2007, in which the NRC staff accepted the MSFIS controls modification license amendment request for review. The NRC staff indicated that the acceptance of review and the schedule to complete the review is conditional on WCNOC providing timely and acceptable responses to the first two items below. The five NRC issues are italicized.

*1. The standard which the licensee chose to use to develop this system, RTCA DO-254/EUROCAE ED-80, "Design Assurance Guidance for Airborne Electronic Hardware," has not been reviewed or approved for nuclear safety-related use at nuclear power plants by the NRC staff. At this point, the licensee should provide a detailed mapping of this standard to an NRC-approved standard such as the Institute of Electrical and Electronic Engineers (IEEE) Standard 7-4.3.2, and show on a paragraph-by-paragraph basis what portion of standard RTCA DO-254/EUROCAE ED-80 has similar requirements, and why meeting that portion of RTCA DO-254/EUROCAE ED-80 will satisfy the corresponding section of the approved IEEE standard. There may be sections of the approved standard which are not applicable to an FPGA design, and these should be pointed out and justified. The NRC staff should receive the results of this task by September 20, 2007, as the licensee agreed to in the August 2, 2007, meeting. If this date is not met or the quality of the information is not sufficient, our acceptance of the review of the proposed replacement MSFIS will be retracted.*

**Response:** A more detailed comparison of RTCA DO-254/EUROCAE ED-80, "Design Assurance Guidance for Airborne Electronic Hardware," to IEEE 7-4.3.2-2003, "IEEE Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations," is being performed. As discussed at the August 2, 2007 meeting, WCNOC will provide this comparison by September 20, 2007.

*2. The licensee appears not to understand what the NRC staff requires in its review of the proposed application of FPGAs in a safety-related system. In its application, in "Nutherm Dedication Plan for Replacement MSFIS System," Nutherm document number WCN-9715DP, the statement is made that "the MSFIS system is not a digital system in the strictest definition as it is not software based,....". Advanced Logic System (ALS) Level-1 System Specification," CS Innovation document 6000-00000, states "The ALS does not utilize a microprocessor and therefore has no software component for the operation of the system. The concern for software common mode failures is eliminated by incorporating a full hardware system which only uses proven design practices and methodologies for implementation of the hardware."*

*The NRC staff has reviewed the licensee's discussion in its May 9, 2007, letter, which presents the licensee's position stated above that the replacement MSFIS with FPGAs is not a digital software-based system. As is stated in IEEE Standard 100-2000, "The Authoritative Dictionary of IEEE Standards Terms," the term "digital" is defined as "pertaining to quantities in the form of discrete, integral values," and a "digital device" is defined as "A device that operates on the basis of discrete numerical techniques in which the variables are represented by coded pulses or states." Because the proposed FPGA system uses digital values, the NRC staff concludes that it is, therefore, a digital system.*

*Furthermore, the replacement MSFIS is a software-based system. One of the definitions of "software" in the same IEEE standard is "The programs, procedures, rules, and any associated documentation pertaining to the operation of an information processing system." The nature of an FPGA is also that the device is programmed to perform its intended functions, and that programming is done using a variety of software tools. While it is true that the output of these tools is used to flash the FPGA into its intended configuration rather than being used as a program to tell a microprocessor what to do, in either case the device is subject to programming and uses software tools to achieve its design objectives. Based on this, the NRC staff concludes that the proposed FPGA system is a software-based digital system and must be reviewed on that basis.*

*Based on the definitions in the IEEE standards and the NRC staff's understanding of FPGA devices discussed above, the NRC staff concludes that the FPGA system proposed by the licensee is a software-based digital system, which must rely on high-quality software to meet its design objectives. Acknowledgment by the licensee that the proposed FPGA system is a software-based digital system, which must meet the requirements discussed during meetings with the NRC, should be received by September 4, 2007, as agreed to in the August 2, 2007, meeting. If this date is not met or the quality of the information is not sufficient, our acceptance of the review of the proposed replacement MSFIS will be retracted.*

**Response:** WCNOC letter ET 07-0013 concluded that the Advanced Logic System (ALS) that is utilized for the MSFIS controls is a digital system as described in IEEE 100-2000, "Authoritative Dictionary of IEEE Standards Terms." Letter ET 07-0013 further stated that the ALS is not considered to be a digital computer-based instrumentation and control system. Further clarification of this statement is that there are no microprocessors utilized in the ALS or MSFIS controls and there is no software installed in or on the equipment and therefore, the system is not software-driven. WCNOC agrees that there is high quality software utilized in the FPGA logic development process, as well as in the circuit design, board design, and build process. As such, WCNOC acknowledges that this FPGA-based system is a software-based digital system only from the standpoint that there is high quality software utilized in the FPGA logic development process. The MSFIS equipment to be installed at WCGS is a hardware-driven system. The hardware-driven system is hardwired logic that consists of a group of logic circuits permanently interconnected to perform a specified function. WCNOC is interpreting the statement "which must meet the requirements discussed during meeting with the NRC" to mean that agreement was reached that the system is software-based digital system and that the FPGA-based system would be required to meet the appropriate criteria of IEEE 7-4.3.2-2003. As discussed in the response to Question #1 above, WCNOC is developing a detailed comparison of IEEE 7-4.3.2-2003 to RCTA DO-254 to identify the appropriate criteria of IEEE 7-4.3.2-2003 that is applicable to an FPGA-based safety related system.

Additionally, as discussed in letter ET 07-0013, WCNOC does not intend to maintain the capability onsite to modify the logic design in the FPGA and any change to the logic design would be contracted to a qualified vendor following the established design change process. However, as discussed with the NRC staff in a teleconference on August 23, 2007, WCNOC does intend to maintain the capability to utilize spare boards that could be built onsite using the approved logic design.

3. *Nutherm International, the commercial grade dedication contractor, chose to use Electric Power Research Institute (EPRI) topical report NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications," as its guideline for commercial grade dedication for the FPGA system, rather than EPRI TR-106439, "Guideline on Evaluation and Acceptance of Commercial Grade Digital Equipment for Nuclear Safety Applications" or EPRI TR-107330, "Generic Requirements Specification for Qualifying a Commercially Available PLC for Safety-Related Applications in Nuclear Power Plants." As a result, the dedication was by test and inspection only, and no evaluation of the quality of the design effort was made. The commercial dedication process will need to be redone, with an emphases on high-quality design and lifecycle process is required in addition to the V&V and testing already done. The following documentation needs to be revised:*

- a. MSFIS Controls Replacement Project Plan, Revision 1*
- b. Nutherm International Dedication Plan WCN-9715DP, Revision 1*
- c. Nutherm International Quality Assurance Plan (WCN-9175QAP), Revision 0*
- d. Nutherm International dedication procedures and reports.*

**Response:** Nutherm International developed the Dedication Plan WCN-9715DP, Revision 0 and Revision 1, based on the guidelines in EPRI TR-106439, "Guideline on Evaluation and Acceptance of Commercial Grade Digital Equipment for Nuclear Safety Applications," which supplements EPRI NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications." The Critical Characteristic Matrix (starting on page 8 of WCN-9715DP, Revision 1) was based, in part, on Table 4.1, "Critical Characteristics Matrix for Digital Equipment," and Table 6-4, "ESFAS Programmable Logic Controller Characteristics" in EPRI TR-106439. However, the Critical Characteristic Matrix in WCN-9715DP, Revision 1, does not comprehensively explain some of the processes being undertaken by Nutherm International to complete the dedication process.

The Nutherm International Dedication Plan WCN-9715DP, Revision 1, page 6, states:

The critical characteristics are divided into three general categories: Product Information, Physical Attributes, and Performance. EPRI TR-106439 incorporated Product Information in the Physical Attributes categories and added Dependability. Though the MSFIS system is not software based, many of the critical characteristics and dedication activities described in EPRI TR-106439 are applicable and have been incorporated into the Dedication Plan.

EPRI TR-106439, Section 1.2, states:

The guidance in this document is intended for use by utilities or by other organizations who perform dedication of commercial grade equipment which ultimately is supplied to utilities.

The approach taken in developing this guidance is based on the conclusions reached by the working group that: (1) the existing process for commercial grade dedication can, with appropriate supplemental guidance, be applied to digital equipment, and (2) supplemental guidance provided for digital-specific issues should be consistent with the existing framework established for design and

licensing of digital upgrades. Accordingly, this document supplements and is consistent with existing industry guidance contained in:

- EPRI NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications,"
- EPRI TR-102348, "Guideline on Licensing Digital Upgrades," and
- IEEE 7-4.3.2-1993, "Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations."

The Dedication Plan specifies that all four acceptance methods will be used during the dedication process. Special Tests and Inspections (Method 1) include a detailed Final Acceptance Test and component and parts verification inspections. Commercial Grade Surveys of Supplier (Method 2) are ongoing as Nutherm works with CS Innovations and Wolf Creek through the fabrication process. Source Verification (Method 3) will occur during witnessed system acceptance testing of the finished product at CS Innovations. Acceptable Supplier/Item Performance Record (Method 4) was utilized during the review of the field programmable gate array (FPGA) device and associated software tools chosen for the modification to the MSFIS controls. It is recognized that the Dedication Plan contains a large number of tests and inspections. The test regime was developed through a line-by-line review of the WCNOG Specification J-105(Q) for Replacement MSFIS System, Rev. 2, with requirements translated into tests or inspections. The quantity of tests could lead one to misunderstand the emphasis being placed on other activities. Nutherm International has revised the Dedication Plan to "unpack" some of the Critical Characteristics listed in the matrix and more comprehensively explain some of the processes being undertaken. Nutherm International Dedication Plan WCN-9715DP, Revision 2, is provided in Enclosure I to this letter.

EPRI TR-106439 recognizes that built-in quality is best assured through close interaction between the manufacturer and the utility/dedicating entity. During the design and fabrication process, there has been frequent interaction between CS Innovations, WCNOG, Nutherm International, and Baseline Engineering through periodic teleconference calls (typically weekly) and site visits. WCNOG letter ET 07-0013 indicated that Nutherm International has reviewed design documentation and activities of CS Innovations' level of design and build quality in the initial design. Nutherm at the CS Innovations offices has conducted various activities, including commercial grade surveys and surveillances, during the following time periods:

5/1/06 – 5/2/06  
7/6/06 – 7/7/06  
5/14/07 – 5/16/07  
7/23/07 – 7/27/07  
8/13/07 – 8/15/07

Nutherm International has performed thread audits during the system acceptance testing conducted at CS Innovations during August 2007. Documentation of the commercial grade dedication activities will be provided in the final dedication report that is scheduled for completion in early November 2007. WCNOG will submit the Nutherm International Final Dedication Report by November 30, 2007.



A review of the Nutherm International Quality Assurance Plan (WCN-9175QAP), Revision 0, determined that this plan adequately describes the dedication activities being accomplished through a combination of inspection, testing, survey, and source inspections using the guidance of EPRI NP-5652 and EPRI TR-106439.

WCNOC has revised the MSFIS Controls Replacement Project Plan to indicate that the Qualification and Dedication Contractor is responsible for providing a dedication plan based on the guidelines in EPRI TR-106439, "Guideline on Evaluation and Acceptance of Commercial Grade Digital Equipment for Nuclear Safety Applications," which supplements EPRI NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications." The MSFIS Controls Replacement Project Plan, Revision 2, is provided in Enclosure II to this letter.

WCNOC will be performing a Part 50 Appendix B audit of CS Innovations in September 2007. The performance based supplier audit focuses on the supplier's in-process activities that are needed to reach a conclusion about whether items produced by the supplier's process will perform their intended function.

WCNOC also intends to perform a supplier quality surveillance of the Nutherm International commercial grade dedication of the MSFIS controls. This surveillance is not required to qualify Nutherm International to perform commercial grade dedication activities for WCNOC. Nutherm is a supplier with a Quality Assurance Program meeting the requirements of 10CFR50, Appendix B; the Nuclear Utilities Procurement Committee (NUPIC) has audited the Nutherm Quality Assurance Program. WCNOC has reviewed and accepted the NUPIC audit and has found Nutherm to be acceptable to perform commercial grade dedication activities for WCNOC.

The commercial dedication process is not required to be redone as suggested in the question, as there has been specific emphasis on ensuring a high quality design and life cycle process.

*4. The licensee's diversity and defense-in-depth analysis submitted in the June 15, 2007, letter is insufficient. This is the document The conclusion of this document is that no diversity or defense-in-depth is needed since "employment of the [RTCA] DO-254 design guidelines by CS Innovations has resulted in a high quality design," and "the replacement MSFIS system performs at an equivalent level and in several cases provides improved performance resulting in the replacement MSFIS providing increased reliability over the existing MSFIS controls." A new diversity and defense-in-depth analysis will be required, where for each anticipated operational occurrence or postulated accident in the design basis occurring in conjunction with each single postulated common-cause failure, the plant response calculated using best-estimate (realistic assumptions) analyses should not result in unacceptable consequences. The licensee will need to demonstrate that sufficient diversity exists to achieve these goals, or to identify the vulnerabilities discovered and show that the corrective actions were taken, including adding a diverse system if necessary.*

**Response:** WCNOC will develop a new Diversity and Defense-in-Depth Analysis where for each anticipated operational occurrence or postulated accident in the design basis occurring in conjunction with each single postulated common-cause failure, the plant response calculated using best-estimate (realistic assumptions) analyses should not result in unacceptable consequences. WCNOC intends to demonstrate in the analysis that sufficient diversity exists to

achieve these goals. The Diversity and Defense-in Depth Analysis will be submitted to the NRC by December 12, 2007.

*5. The licensee's LAR does not appear to conform with the requirement that software tools be qualified. Approved Standard IEEE 7-4.3.2 defines software tools in section 3.1.42: "A computer program used in the development, testing, analysis, or maintenance of a program or its documentation. Examples include comparator, cross-reference generator, decompiler, driver, editor, flowcharter, monitor, test case generator, and timing analyzer." Section 5.3.2, "Software tools," requires that "Software tools used to support software development processes and verification and validation (V&V) processes shall be controlled under configuration management," and "A test tool validation program shall be developed to provide confidence that the necessary features of the software tool function as required." There are similar requirements in RTCA DO-254/EUROCAE ED-80, "Design Assurance Guidance for Airborne Electronic Hardware." Section 11.4, "Tool Assessment and Qualification," requires that "Prior to use of a tool, a tool assessment should be performed. The results of this assessment and, if necessary, tool qualification should be recorded and maintained." The licensee will need to demonstrate that the software tools were qualified for the development of safety-related systems.*

**Response:** Letter ET 07-0008, Enclosure XII, provided the CS Innovations report entitled "ALS Design Tools." This report provided an overview of the tools used in the CS Innovations design, development and production process. In letter ET 07-0022, the response to Question #1F, discussed the tools used by CS Innovations and some basis behind the selection of the tools.

Based on discussions during the NRC site visit to CS Innovations during the week of July 23, 2007, the "ALS Design Tools" report was revised to include additional details as to why the tools are suitable for this application and why these specific tools were selected, and CS Innovations experience with these tools. Enclosure III to this letter provides the revised document.

### LIST OF COMMITMENTS

The following table identifies those actions committed to by Wolf Creek Nuclear Operating Corporation in this document. Any other statements in this letter are provided for information purposes and are not considered regulatory commitments. Please direct questions regarding these commitments to Mr. Kevin Moles, Manager Regulatory Affairs at Wolf Creek Generating Station, (620) 364-4126.

<b>REGULATORY COMMITMENT</b>	<b>DUE DATE</b>
As discussed at the August 2, 2007 meeting, WCNOC will provide a detailed comparison of RTCA DO-254 to IEEE 7-4.3.2-2003 by September 20, 2007.	9/20/2007
WCNOC will submit the Nutherm International Final Dedication Report by November 30, 2007.	11/30/2007
The Diversity and Defense-in Depth Analysis will be submitted to the NRC by December 12, 2007.	12/12/2007