

WOLF CREEK NUCLEAR OPERATING CORPORATION

Terry J. Garrett
Vice President, Engineering

June 15, 2007

ET 07-0022

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
- Subject: Docket No. 50-482: Supplemental Information on 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)." The Reference 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, WCNOG 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. As discussed at the May 17, 2007 meeting, some of the information requested has not been developed based on the life cycle of the modification. For those areas where the information has not been developed, a schedule for submission of this information has been provided. However, these dates are subject to change based on the level of progress through the modification process.

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MRR

Some of the documents requested are information prepared by and/or for federal and state agencies. These documents are beyond the control of WCNOG and cannot be verified and validated by WCNOG. In providing information responsive to the request, WCNOG makes no representation as to its accuracy or completeness.

WCNOG requests a meeting with the NRC staff within a short period of time after receipt of this supplemental information. The purpose of the meeting would be to interact with the Staff on the details of the modification to the MSFIS controls and the processes to ensure the quality of the replacement MSFIS controls.

Enclosures 27 through 39 provide proprietary CS Innovations LLC documents. As Enclosures 27 through 39 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, 91000-00010, "Application for Withholding Proprietary Information from Public Disclosure," is contained in Enclosure 40.

Enclosure 41 provides the proprietary WCNOG Report "Diversity and Defense-in Depth Assessment for the Replacement MSFIS Controls," Rev. 0. As Enclosure 41 contains information proprietary to WCNOG, it is supported by an affidavit signed by WCNOG, 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 WCNOG, be withheld from public disclosure in accordance with 10 CFR 2.390 of the Commission's regulations. This affidavit is contained in Enclosure 42.

WCNOG is providing only proprietary versions of Enclosures 27 through 39 and Enclosure 41 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 the Enclosures does not impact the conclusions of the No Significant Hazards Consideration provided in Reference 1. 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 response. 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/rt

Attachment

- Enclosures:
- 1 MSFIS Controls Replacement Project Plan, Revision 1
 - 2 Department of Defense Documentation Certifying Actel
 - 3 Actel ISO 9001:2000 Registration Issued by Non-government Entity
 - 4 Actel's Quality and Reliability Guide
 - 5 Actel Reliability Report
 - 6 Nutherm International Quality Assurance Plan (WCN-9175QAP), Revision 0
 - 7 Nutherm International Dedication Plan WCN-9715DP, Revision 1
 - 8 WCNOC Procedure AP 05-005, "Design, Implementation & Configuration Control of Modifications"
 - 9 WCNOC Procedure AP 05F-001, "Design Verification"
 - 10 WCNOC Procedure STARS-ENG-5000, "Engineering Configuration Management Program"
 - 11 Chapter 17 of the WCNOC USAR
 - 12 WCNOC Procedure AP 24-004, "Procurement of Items and Services"
 - 13 WCNOC Procedure AP 29B-003, "Surveillance Testing"
 - 14 WCNOC Procedure AP 28A-100, "Condition Report"
 - 15 WCNOC Procedure AP 28-007, "Nonconformance Control"
 - 16 Nutherm International Quality Assurance Manual (QA-N-10179-5), Revision 5
 - 17 RTCA DO-254/EUROCAE ED-80, "Design Assurance Guidance for Airborne Electronic Hardware"
 - 18 Installation Plan for the Replacement MSFIS Controls, Revision 1
 - 19 Requirements Traceability Matrix, Revision 0
 - 20 Maintenance Plan for the Replacement MSFIS Controls, Revision 0
 - 21 System Verification and Validation Report, Revision 0
 - 22 IEEE Standard 603-1998 Analysis
 - 23 Applicability of RTCA DO-254, Revision 0
 - 24 WCNOC Procedure AP 22C-002, "Work Controls"
 - 25 WCNOC Procedure AP 16C-006, "MPAC Work Request/Work Order Process Controls"
 - 26 WCNOC Procedure AI 16C-007, "Work Order Planning"

- 27 CS Innovations Document 6101-00008, "MSFIS V & V Plan," Rev. 1.2
- 28 CS Innovations Document 6000-00008, "ALS Board Test Plan," Rev. 0.8
- 29 CSI Innovations Procedures 9002-00024, 9002-00025, and 9002-00026
- 30 CS Innovations Documents ATU-101, "Design Specification," ATE-101, "Design Specification," and ATS-101, "Software Specification"
- 31 CS Innovations Document 6101-00005, "MSFIS Configuration Management Plan," Rev. 0.8
- 32 CS Innovations Document 6101-00009, "MSFIS Quality Assurance Plan," Rev. 0.5
- 33 CS Innovations Quality Assurance Manual and Implementing Quality Control Procedures
- 34 CS Innovations Document 6101-00000, "MSFIS Management Plan"
- 35 CS Innovations Document 6101-00004, "MSFIS System Test Plan," Rev. 0.8
- 36 CS Innovations Document 6101-00006, "MSFIS Safety Assessment," Rev. 0.7
- 37 CS Innovation Document 6000-00000, "ALS Level-1 System Specification," Rev. 1.2
- 38 CS Innovation Document 6101-00002, "MSFIS System Specification, Wolf Creek Generating Station," Rev. 0.98
- 39 CS Innovation Procedures 9002-00033, 9002-00034, 9002-00035, 9002-00036"
- 40 CS Innovations letter 9100-00010, "Application for Withholding Proprietary Information from Public Disclosure"
- 41 Diversity and Defense-in-Depth Assessment for the Replacement MSFIS Controls
- 42 WCNOC Affidavit for Withholding Proprietary Information from Public Disclosure

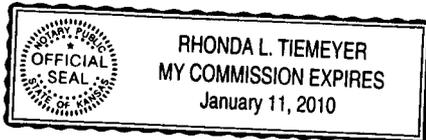
cc: T. A. Conley, (KDHE), w/a, w/e
J. N. Donohew (NRC), w/a, w/e
V. G. Gaddy (NRC), w/a, w/e
B. S. Mallett (NRC), w/a, w/e
Senior Resident Inspector (NRC), w/a, w/e

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 15th day of June, 2007.




Notary Public

Expiration Date January 11, 2010

REQUEST FOR SUPPLEMENTAL INFORMATION

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, the NRC letter dated May 29, 2007, 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 the license amendment request submitted by letter ET 07-0004, dated March 14, 2007. As discussed at the May 17, 2007 meeting, some of the information requested has not been developed based on the life cycle of the modification. For those areas where the information has not been developed, a schedule for submission of this information has been provided. However, these dates are subject to change based on the level of progress through the modification process. The NRC request for supplemental information is italicized.

1. *Commercial-grade Dedication Process*

The NRC staff needs to understand how the commercial-grade dedication process is being accomplished.

- A. *The documentation on the selection of Nutherm International as the Appendix B commercial-grade dedication contractor. This should include the determination that Nutherm International has the personnel and experience necessary to perform this type of commercial-grade dedication.*
- B. *The documentation on the selection of Baseline Engineering as the independent Verification & Validation (V&V) contractor, including the determination that Baseline Engineering has the personnel and experience necessary to perform verification and validation of a process resulting in a product intended for safety-related use in a nuclear power plant, and that this product would be the equivalent of a product designed and manufactured under an Appendix B process.*
- C. *The documentation on the selection of CS Innovations as the commercial-grade design and manufacturing contractor, showing that CS Innovations has the personnel and experience necessary to perform this type of design, and why the licensee believed this design would be capable of commercial-grade dedication to be the equivalent of a product designed and manufactured under an Appendix B process.*
- D. *The documentation of the selection of the Advance Logic System (ALS) product line as suitable for commercial-grade dedication.*
- E. *The documentation of the selection of the basic components contained in the ALS product, such as the basic field programmable gate array (FPGA), the Actel ProASICplus APA600, as suitable for commercial-grade dedication.*
- F. *The documentation of the selection of the software used during the development process as suitable for design and manufacture of product intended for safety-related use in a nuclear power plant, and that this product would be the*

equivalent of a product designed and manufactured under an Appendix B process.

- G. *The plans and procedures used by Nutherm International to verify that the quality of design and manufacturing process was sufficient to determine that the FPGA-based MSFIS actuation system was the equivalent of a product designed and manufactured under an Appendix B process. The Nutherm International Dedication Plan, WCN-9715DP mentions this as a critical characteristic for the replacement MSFIS actuation system, but does not discuss how this determination will be made, or what the requirements are.*

Response:

A. The selection of the 10 CFR 50 Appendix B commercial grade qualification and dedication vendor for the project is discussed in Section 2.2.2 of the MSFIS Controls Replacement Project Plan provided in Enclosure 1.

B. The selection of the verification and validation (V&V) Engineer is discussed in Section 2.2.3 of the MSFIS Controls Replacement Project Plan provided in Enclosure 1. Baseline Engineering was contracted as providing WCNOG supplemental staff. As such, Baseline Engineering is utilizing WCNOG's processes and procedures for verification and validation activities.

C. The selection of CS Innovations as the design and manufacturing contractor for the project is discussed in Section 2.2.1 of the MSFIS Controls Replacement Project Plan provided in Enclosure 1.

D. Section 1.2 of the MSFIS Controls Replacement Project Plan provided in Enclosure 1 discusses the selection of the Advanced Logic System (ALS) as the system architecture. This discussion identifies several of the benefits the ALS provides for a Class 1E safety-related control system.

E. As part of the commercial grade dedication process, Nutherm International performed a review of the field programmable gate array (FPGA) producer prior to the selection of a manufacturer. Actel Corporation (Actel) was selected as the manufacturer of the FPGA based on review of the following information:

- Actel is a mature microcircuit manufacturing company
- Actel complies with MIL-PRF-38535
- Actel maintains ISO 9001:2000 certificate of registration (issued March 2007)
- Actel maintains certification to the requirements of STACK International
- Actel's Quality and Reliability Guide
- Actel reliability data for commercial products

Actel's first product was shipped in 1988. The ProASICplus FPGA has been used in avionic, military, and civilian applications. Since 2004, Actel has maintained compliance with MIL-PRF-38535, the performance specification used by the Department of Defense for monolithic integrated circuits. Enclosure 2 provides the Department of Defense documentation certifying Actel.

Actel has been reviewed and accepted by other users. In addition to the ISO 9001:2000 registration issued by the Defense Logistics Agency in conjunction with MIL-PRF-38535, Actel also maintains an ISO 9001:2000 registration issued by a non-government entity (see Enclosure 3. An audit by STACK International was conducted prior to issuance of that certificate that approved Actel to the requirements of the STACK International Supplier Certification Program. STACK International is a group of multinational independent electronic equipment manufacturers.

Section 3 of Actel's Quality and Reliability Guide outlines the Actel Quality System. The Quality and Reliability Guide was reviewed by Nutherm International and found to be acceptable for the scope of work for the MSFIS controls modification. The Actel Quality System meets the requirements of ISO 9001:2000. Actel's Quality and Reliability Guide is provided in Enclosure 4.

Actel maintains reliability data for the products it manufactures. This data was reviewed by Nutherm International and the FPGA found to be acceptable for use in the ALS application. Enclosure 5 provides the latest Actel Reliability Report which has been reviewed by Nutherm International.

The Nutherm Final Dedication Report shall contain information concerning the selection of the Actel ProASICplus APA600 basic FPGA as suitable for commercial grade dedication.

F. The software used by CS Innovations during the development and manufacture processes was reviewed by Nutherm International as part of the dedication process. Software was used during both the design of the ALS application and the programming of the FPGA.

CS Innovations selected two software suites for design and verification of the FPGA. Each software suite consisted of multiple software tools. The software suites consisted of the Actel Libero suite and the Altium Designer suite. Both suites have been used in various industries.

The Libero Integrated Design Environment is Actel's comprehensive toolset for designing with all Actel FPGAs. Because these are the recommended software design tools for the ProASICplus product line, selection of this toolset was made at the time the Actel FPGA was selected for this project. Libero has been used extensively with the ProASICplus product line. This toolset is used from schematic and/or hardware description language (HDL) design, synthesis and simulation, through floor planning, place and route, timing constraints and analysis, and program file generation.

The Libero suite is a collection of software and hardware tools used at different steps in the design process from initial VHDL code simulation to flashing a completed design into a FPGA device. The software in the Libero suite is created by multiple software providers.

Actel maintains a Quality System meeting the requirements of ISO 9001:2000. Additionally, Actel maintains compliance with specification MIL-PRF-38535 for integrated circuits (microcircuits) manufacturing. This specification includes requirements on controls on the modification of programming algorithms.

Altium Designer suite customer base includes Europe's space program, defense contracts, oceanographic equipment, and radar technology. The Altium Schematic Capture and printed

circuit board (PCB) Layout tool was used though out the CS Innovation's development phase. The Schematic Capture tool is used for board and backplane design, but also for generating wiring drawing for cables and chassis wiring. The Altium Designer software suite includes a series of integrated tools, which are used in the CS Innovations PCB design flow.

Tools used by CS Innovations for the MSFIS Controls Replacement Project are described in Table 1.

The use of two independent software suites and extensive testing of the completed system provide reasonable assurance that the software used for this process is suitable for a product designed and manufactured under a 10 CFR 50 Appendix B program. The Nutherm Final Dedication Report shall contain information concerning the selection of the software used to design and program the Actel ProASICplus APA600 basic FPGA and its suitability for commercial grade dedication.

Table 1

Tool Suite	Tool	Tool creator	Use in MSFIS controls	Tool output independently assessed
Libero (Actel)	ModelSim 6.1b	Actel Edition produced by Mentor Graphics	Design & Verification	No <u>The VHDL simulator does not provide an output.</u> It is a verification tool used to verify the VHDL description.
	Synplify 8.5F	Actel Edition produced by Synplicity	Design	Yes (Board Verification)
	Actel Designer Version 7.2.3.2	Actel	Design	Yes (Board Verification)
	Actel FlashPro Version 7.1.0.13	Actel	Production	Yes (Board Verification)
Altium Designer	Schematic Capture Version 6.6.7903	Altium	Design	Yes (Board Verification & manual review)
	PCB Layout Version 6.6.7903	Altium	Design	Yes (Board Verification & manual review)
	Gerber Extraction Version 6.6.7903	Altium	Design	Yes (Board Verification & manual review)

G. Nutherm International developed a Quality Assurance Plan (WCN-9715QAP) specific to the MSFIS controls replacement project. This Quality Assurance Plan is based on Nutherm International's Quality Assurance Manual which satisfies the requirements of 10 CFR 50 Appendix B, 10 CFR 21, ANSI/ASME N45.2, and ANSI/ASME NQA-1. This Quality Assurance Plan identifies that the quality of manufacture is established by confirming the adequacy of the sub-components, assembly of the sub-components, and programming the FPGA. Sub-components used to produce the assembly consist of commercial-off-the-shelf items. Adequacy of these items shall be confirmed by successful completion of a factory acceptance test. Sub-component assembly consists of populating the board in accordance with the design documents and the soldering of components to the board. Adequacy of these items shall be determined by receipt inspection activity and confirmed by successful completion of a factory acceptance test. The FPGA shall be programmed in accordance with the approved design. Adequacy of the FPGA programming shall be determined by successful completion of a factory acceptance test. The Nutherm International Quality Assurance Plan (WCN-9175QAP) is provided in Enclosure 6.

The quality of design and manufacture of the FPGA based MSFIS controls will be confirmed by successful completion of the Nutherm International Dedication Plan WCN-9715DP. Successful completion of validation activities identified in the Critical Characteristic Matrix in the dedication plan (page 8) shall provide reasonable assurance of the adequacy of the quality of design and manufacture process of the system. The Nutherm International Dedication Plan WCN-9715DP, Revision 1, is provided in Enclosure 7.

2. *V&V Plans and Procedures*

The Wolf Creek V&V plan was received. However, the following additional plans and procedures are requested:

- A. *The V&V plan or whatever plan was used by CS Innovations to assure the correctness of their design.*
- B. *The V&V procedures or whatever procedures were used by CS Innovations to assure the correctness of their design.*
- C. *The V&V plan used by Baseline Engineering to provide independent V&V for the CS Innovations planning, design, and test activities.*
- D. *The V&V procedures used by Baseline Engineering during the independent V&V activities.*
- E. *The Nutherm International V&V plan or whatever plan was used to assure the correctness of the commercial-grade dedication process.*
- F. *The Nutherm International V&V procedures or whatever procedure was used to assure the correctness of the commercial-grade dedication process.*

Response:

A./B. The CS Innovations document 6101-00008, "MSFIS V & V Plan," is provided in Enclosure 27. This plan establishes the method of providing verification and validation of the replacement MSFIS controls during the project life cycle. The ALS Board Test Plan (document 6000-00008) and the MSFIS System Test Plan (document 6101-00004) provide the procedural direction and control for verification and validation activities and testing associated with the ALS boards and the replacement MSFIS controls. The CS Innovations document 6000-00008 is provided in Enclosure 28 and 6101-00004 is provided in Enclosure 35. Procedures 9002-00024, "Electrical Wiring Design Review," 9002-00025, "Board Design Review Procedure," and 9002-00026, "FPGA Design Review Procedure," specify the methods for reviewing and documenting the various design aspects during specification, detailed design, and manufacturing preparations. Procedures 9002-00024, 9002-00025, and 9002-00026 are provided in Enclosure 29. Additionally, ATU-101, "Design Specification," ATE-101, "Design Specification," and ATS-101, "Software Specification," provide detailed descriptions of the hardware, equipment, and software that is utilized for validation of the ALS based systems. The CS Innovations documents ATU-101, ATE-101, and ATS-101 are provided in Enclosure 30.

C. Baseline Engineering was contracted as providing WCNOC supplemental staff. As such, Baseline Engineering is utilizing WCNOC's processes and procedures for verification and validation activities. Enclosure IV to WCNOC letter ET 07-0004, dated March 14, 2007 provided the System Verification and Validation Plan, Revision 0. This plan is being used by Baseline Engineering for the independent verification and validation activities.

D. The procedures utilized by Baseline Engineering are WCNOC procedures AP 05-005, "Design, Implementation & Configuration Control of Modifications," and AP 05F-001, "Design Verification." These procedures provide the program for the design and implementation of modifications and the requirements for performing design verification to ensure the design of the system, structure, or component is adequate and provide assurance that the design intent has been correctly translated into the design documents. Specifically, Section 6.2.7 of procedure AP 05-005 provides guidance on independent verification and references procedure AP 05F-001. Procedure AP 05-005 is provided in Enclosure 8. Procedure AP 05F-001 is provided in Enclosure 9.

E. As described in Nutherm International Dedication Plan WCN-9715DP, EPRI NP-5652 is used as a guideline for the dedication process of commercial grade items. As stated in section 1.3.4 of EPRI NP-5652, "...the methods in the guideline are in conformance with existing regulatory requirements." The methods for accepting commercial grade items are consistent with the provisions of Criterion VII of Appendix B to 10 CFR 50 which states:

Measures shall be established to assure that purchased material, equipment, and services, whether purchased directly or through contractors and subcontractors, conform to the procurement documents. These measures shall include provisions, as appropriate, for source evaluation and selection, objective evidence of quality furnished by the contractor or subcontractor, inspection at the contractor or subcontractor, inspection at the contractor or subcontractor source, and examination of products upon delivery.

Nutherm International has incorporated the guideline into its QA program and in-place procedures for the dedication of commercial grade items. Nutherm International's Quality Assurance Manual satisfies the requirements of 10 CFR 50 Appendix B, 10 CFR 21, ANSI/ASME N45.2, and ANSI/ASME NQA-1. Based on the Quality Assurance Manual, Nutherm developed a Quality Assurance Plan (WCN-9175QAP, provided in Enclosure 6). The Quality Assurance Plan establishes and defines the quality assurance controls Nutherm applies to the goods and services used to qualify and dedicate the replacement MSFIS controls.

The quality of design and manufacture of the FPGA based MSFIS controls will be confirmed by successful completion of the Nutherm International Dedication Plan WCN-9715DP. The Nutherm International verification and validation plan is incorporated in the dedication plan. Successful completion of validation activities identified in the Critical Characteristic Matrix in the dedication plan (page 8) shall provide reasonable assurance of the adequacy of the quality of design and manufacture process of the system. The Nutherm International Dedication Plan WCN-9715DP, Revision 1, is provided in Enclosure 7.

F. The documentation provided in the Nutherm Quality Assurance Plan, Nutherm Dedication Plan, and Nutherm Qualification Report for CS Innovations Replacement MSFIS System (provided in Enclosure VI to WCNO letter ET 07-0008, dated April 18, 2007) outline the processes used for the dedication process. The plans contain specific details on the dedication process and procedures used for this project. The plans focus on those activities that affect the performance of the items being dedicated. The factory acceptance test procedure(s) referenced in the Nutherm Dedication Plan will be available July 30, 2007.

3. *Configuration Management (CM) Plans*

Four CM plans are requested:

- A. *The plan used by CS Innovations to perform configuration management during the development process. This should show the following items:*
 - *Method for change control of development and V&V documentation.*
 - *Version control of pre-released burn or flash lists; version control.*
 - *Historical recording and archiving of released verified source code modules; historical recording and archiving of verified and validated burn or flash lists.*
 - *Control of hardware manufacturing.*
 - *How and where the software tools under configuration management are stored.*
- B. *The plan used by Baseline Engineering during the independent V&V process.*
- C. *The plan used by Nutherm International during the commercial-grade dedication process.*

- D. *The plan which the licensee will use to maintain configuration management after delivery of the MSFIS actuation system.*

Response:

A. CS Innovations document 6101-00005, "MSFIS Configuration Management Plan," provides the methods and tools to establish the baselines, control changes to the baseline, record and track status, and audit the hardware developed for the replacement MSFIS controls. The Configuration Management Plan is based on the requirements set forth in the RTCA DO-254/EUROCAE ED-80, "Design Assurance Guidance for Airborne Electronic Hardware," as well as applicable part of the IEEE Std 828-1998, "IEEE Standard for Software Configuration Management Plans." Enclosure 31 provides CS Innovations document 6101-00005.

B./D. Baseline Engineering was contracted as providing WCNOG supplemental staff. As such, Baseline Engineering is utilizing WCNOG's processes and procedures for verification and validation activities. Enclosure III to WCNOG letter ET 07-0008 dated April 18, 2007, provided Revision 0 of the MSFIS Configuration Management Plan. This document provides the methods and tools for the baseline MSFIS controls and the control of changes to the baseline controls prior to delivery of the system to WCNOG. WCNOG procedure STARS-ENG-5000, "Engineering Configuration Management Program," provides guidance for and establishes the requirements and responsibilities for the development of changes to the facility or documentation to satisfy the requirements of ANSI N45.2.11 based upon INPO AP-929, "Configuration Control Process Description," and EPRI TR-103586, "Guidelines for Optimizing the Engineering Change Process for Nuclear Power Plants." Procedure STARS-ENG-5000 is provided in Enclosure 10.

C. The Nutherm International Configuration Management Plan is incorporated in the Dedication Plan, WCN-9715DP. The Nutherm International Dedication Plan WCN-9715DP, Revision 1, is provided in Enclosure 7.

4. *Quality Assurance Plans and Procedures*

Four Quality Assurance plans are requested:

- A. *The plans and procedures used by CS Innovations to perform quality assurance activities during the development process.*
- B. *The plans and procedures used by Baseline Engineering to perform quality assurance activities during the independent V&V process.*
- C. *The plans and procedures used by Nutherm International to perform quality assurance activities during the commercial-grade dedication process.*
- D. *The plans and procedures which the licensee used for quality assurance activities during the specification process and will use after delivery of the MSFIS actuation system.*

Response:

A. The CS Innovation's MSFIS Quality Assurance Plan (document 6101-00009) is provided in Enclosure 32. The MSFIS Quality Assurance Plan establishes the goals, processes, and responsibilities required to implement effective quality assurance functions for the Wolf Creek MSFIS Project. The plan provides the framework necessary to ensure a consistent approach to quality assurance throughout the project life cycle. The MSFIS Quality Assurance Plan is based on the CS Innovations Quality Assurance Manual and associated implementing quality control procedures. The Quality Assurance Manual and implementing quality control procedures are provided in Enclosure 33. QCP-3, "Design Control," establishes the requirements for CS Innovation design activities. CS Innovation procedures 9002-00033, "Hardware Design Development Procedure," 9002-00034, "Electrical Wiring Design Development Procedure," 9002-00035, "Board Design Development Procedure," and 9002-00036, "FPGA Design Development Procedure," provide detailed guidance on the design development process. Procedures 9002-0033, 9002-0034, 9002-0035, and 9002-0036 are provided in Enclosure 39.

B./D. Baseline Engineering was contracted as providing WCNOG supplemental staff. As such, Baseline Engineering is utilizing WCNOG's processes and procedures for verification and validation activities. Enclosure II to WCNOG letter ET 07-0008 dated April 18, 2007, provided Revision 0 of the MSFIS Quality Assurance Plan. Chapter 17 of the Updated Safety Analysis Report (USAR) specifies the requirements for establishing and maintaining an Operating Quality Program for WCGS during the operations phase. The program provides control over activities affecting quality as required by 10 CFR 50, Appendix B, and is structured to comply with NRC Regulatory Guide 1.33, Revision 2, "Quality Assurance Program Requirements (Operation)." Chapter 17 of the USAR is provided in Enclosure 11. Provided below are primary areas of the WCNOG Quality Program that are applicable to the MSFIS controls modification.

USAR Section 17.2.3, "Design Control," discusses the design control quality assurance requirements. Procedures AP 05-005, "Design, Implementation & Configuration Control of Modifications," and AP 05F-001, "Design Verification," provide the program for the design and implementation of modifications and the requirements for performing design verification. Procedure AP 05-005 is provided in Enclosure 8. Procedure AP 05F-001 is provided in Enclosure 9.

USAR Section 17.2.7, "Control of Purchased Material, Equipment, and Services," discusses the quality activities associated with the procurement of material, equipment, and services. Procedure AP 24-004, "Procurement of Items and Services," establishes requirements and assigns responsibilities for establishing Engineering Procurement Requirements for the purchase of engineered items and services, and services for the repair or refurbishment of engineered items. Procedure AP 24-004 is provided in Enclosure 12.

USAR Section 17.2.11, "Test Control," indicates that testing is performed at WCGS to demonstrate that safety related, selected special scope, American Society of Mechanical Engineers code equipment, structures, systems, and components perform satisfactorily in service. Procedure AP 29B-003, "Surveillance Testing," prescribes the administrative controls to control required surveillance (testing) activities. Procedure AP 29B-003 is provided in Enclosure 13.

USAR Section 17.2.16, "Corrective Action," specifies that corrective action control measures have been established to assure that conditions adverse to quality are promptly identified, reported, and corrected. Procedure AP 28A-100, "Condition Report," prescribes the process for evaluating procedural or programmatic issues and human performance errors. Procedure AP 28-007, "Nonconformance Control," establishes the program requirements for the control of nonconformances including the identification, documentation, control, disposition, and correction of nonconforming items. Procedure AP 28A-100 is provided in Enclosure 14. Procedure AP 28-007 is provided in Enclosure 15.

C. In response to this request for supplemental information, Nutherm International developed a Quality Assurance Plan (WCN-9715QAP) specific to the MSFIS controls replacement project. This Quality Assurance Plan is based on Nutherm International's Quality Assurance Manual which satisfies the requirements of 10 CFR 50 Appendix B, 10 CFR 21, ANSI/ASME N45.2, and ANSI/ASME NQA-1. This Quality Assurance Plan establishes and defines the controls Nutherm International shall apply to the goods and services used to qualify and dedicate the replacement MSFIS controls. The Nutherm International Quality Assurance Plan (WCN-9175QAP) is provided in Enclosure 6. The Nutherm International Quality Assurance Manual (QA-N-10179-5) is provided in Enclosure 16.

The documentation provided in the Nutherm Quality Assurance Plan, Nutherm Dedication Plan, and Nutherm Qualification Report for CS Innovations Replacement MSFIS System (provided in Enclosure VI to WCNO letter ET 07-0008, dated April 18, 2007) outline the processes used for the dedication process. The plans contain specific details on the dedication process and procedures used for this project. The plans focus on those activities that affect the performance of the items being dedicated.

5. *Management Plans*

Four Management Plans are requested:

- A. *The management plan used by CS Innovations which shows the management characteristics which display the purpose, organization, oversight, responsibilities, and security for this project.*
- B. *The management plan used by Baseline Engineering which shows the management characteristics which display the purpose, organization, oversight, responsibilities, and security for this project.*
- C. *The management plan used by Nutherm International which shows the management characteristics which display the purpose, organization, oversight, responsibilities, and security for this project.*
- D. *The management plan used by the licensee which shows the management characteristics which display the purpose, organization, oversight, responsibilities, and security for this project.*

Response:

A. The CS Innovations MSFIS Management Plan (document 6101-00000) is provided in Enclosure 34. The MSFIS Management Plan, in addition to the Quality Assurance Manual, Section 1, "Organization," and procedure QCP-1, "Organization," provides information regarding the functional organization and responsibilities to assure effective execution for the replacement MSFIS controls.

B./D. The MSFIS Controls Replacement Project Plan discusses the project purpose, scope and objectives. The project plan also identifies the project organization and assigns the roles and responsibilities for the project team. Baseline Engineering was contracted as providing WCNOG supplemental staff. As such, Baseline Engineering is utilizing WCNOG's processes and procedures for fulfilling the V&V engineer role on the MSFIS Controls Replacement Project. The management aspects of the V&V Engineer role are identified in the project plan. The MSFIS Controls Replacement Project Plan is provided in Enclosure 1 as well as the System Verification and Validation Plan, Revision 0, was provided as Enclosure IV to WCNOG letter ET 07-0004, dated March 14, 2007.

C. Nutherm International Quality Assurance Plan (WCN-9715QAP) indicates that the management plan for Nutherm International is contained within the Quality Assurance Manual (QA-N-10179-5). The Statement of Policy on page i, Section I, "Organization," and Section 10, "Inspection," describes the purpose, organization, oversight and responsibilities associated with the replacement of the MSFIS controls for WCGS. The Nutherm International Quality Assurance Plan (WCN-9175QAP) is provided in Enclosure 6. The Nutherm International Quality Assurance Manual (QA-N-10179-5) is provided in Enclosure 16.

6. *Development Plan*

Four Development Plans are requested:

- A. *The Development Plan used by CS Innovations which shows the development life-cycle model that will be used in this project, the objectives of each life-cycle activity group and its context within the overall project, and the strategy for managing the technical development effort.*
- B. *The Development Plan used by Baseline Engineering which shows the V&V activities for the development life cycle that will be used in this project, the objectives of each of the phase of the V&V activities for each life-cycle activity group and its context within the overall project, and the strategy for managing the V&V effort.*
- C. *The Development Plan used by Nutherm International which shows the commercial-grade dedication activities to assure high quality of the development life cycle that will be used in this project, the context of each of these activities within the overall project, and the strategy for managing the overall commercial-grade dedication effort.*

- D. *The Development Plan used by the licensee which shows how the licensee will monitor the activities of CS Innovations, Baseline Engineering, and Nutherm International during the life cycle that will be used in this project, and the method to be used by the licensee to determine that the design and commercial-grade dedication process are sufficient to assure that the final product is suitable for safety-related use in a nuclear power plant, and that this product would be the equivalent of a product designed and manufactured under an Appendix B process.*

Response:

A. The Development Plan for CS Innovations is encompassed with the MSFIS Management Plan (document 6101-00000) provided in Enclosure 34. Additionally, the MSFIS V & V Plan (document 6101-00008) Section 2.3 and 3 identifies the various life cycle states and objectives of each phase of the verification and validation activities. The MSFIS V & V Plan is provided in Enclosure 27.

B./D. Baseline Engineering was contracted as providing WCNOC supplemental staff. As such, Baseline Engineering is utilizing WCNOC's processes and procedures for verification and validation activities. Enclosure IV to WCNOC letter ET 07-0004, dated March 14, 2007 provided the System Verification and Validation Plan, Revision 0, which is being utilized by Baseline Engineering for the independent verification and validation activities. The System Verification and Validation Plan is considered the Development Plan as Section 1.7 through 1.12 identifies the various life cycle stages and the objectives of each phase of the verification and validation activities. The strategy for managing the verification and validation activities is described in Section 1.5.

C. The Development Plan for Nutherm International is encompassed within the Section entitled "Dependability" of the Quality Assurance Plan (WCN-9715QAP). The hardware design developed by CS Innovations is based on the guidance in RTCA DO-254/EUROCAE ED-80, "Design Assurance Guidance for Airborne Electronic Hardware." This document describes the hardware design life cycle and the data to be developed to meet the guidance. Nutherm International is performing commercial grade surveys to confirm CS Innovations adherence to the guidance in RCTA DO-254. This was previously discussed in the response to Item 2 in WCNOC letter ET 07-0013, dated May 9, 2007. The Nutherm International Quality Assurance Plan (WCN-9175QAP) is provided in Enclosure 6. RTCA DO-254/EUROCAE ED-80, "Design Assurance Guidance for Airborne Electronic Hardware," is provided in Enclosure 17. This document is considered as copyrighted material and therefore should be protected as such.

7. *Test Plan*

Development of a test plan is a V&V activity; therefore, the following information is requested:

- A. *The Baseline Engineering test plans for the factory and site acceptance tests and for installation tests.*
- B. *The CS Innovations test plans for design tests.*
- C. *The documentation of the Nutherm International review of the test plan.*

Response:

A./C. Factory acceptance test procedure(s) have been developed by Nutherm International and will be performed by Nutherm. The Nutherm International Dedication Plan, WCN-9715DP, Rev. 1, provided as Enclosure 7 includes a factory acceptance test plan (page 20 of 24). Upon completion of a factory acceptance test and acceptance of the testing by WCNOG, the MSFIS controls equipment is then accepted by WCNOG.

Section 1.11, "Installation and Checkout Phase," of the System Verification and Validation Plan (contained in Enclosure IV to WCNOG letter ET 07-0004, dated March 14, 2007) describes the site acceptance testing the MSFIS controls when the equipment is at the WCGS site. Section 2.5 of the Installation Plan (Enclosure 18), provided in the response to RAI No. 8, describes the installation and post maintenance testing activities to ensure the replacement MSFIS controls functions as designed.

B. The CS Innovations documents 6000-00008, "ALS Board Test Plan," and 6101-00004, "MSFIS System Test Plan," provide the test plans and test procedures for the acceptance of the equipment following the board manufacturing phase. The ALS Board Test Plan is provided in Enclosure 28. The MSFIS System Test Plan is provided in Enclosure 35.

8. *Installation Plan*

The installation plan is requested. This plan would be specific to the Wolf Creek site, and would be produced by the licensee. There may be input to this plan from the system designer, CS Innovations.

Response: The Installation Plan for the replacement MSFIS controls is provided in Enclosure 18.

9. *Maintenance Plan*

The maintenance plan is requested. This plan would be specific to the Wolf Creek site, and would be produced by the licensee. The plan should discuss the methods and responsibilities involved with the possible future modifications of the MSFIS actuation system, requirements for documentation and reporting of failures, and requirements for regression testing of any future modifications. The plan may consist of two parts. The first part concerns the those actions by the licensee to maintain the system design, and a second part may be required if the licensee relies on the system vendor to perform certain maintenance functions. The second part would consist of the vendor's plans and procedures. For this reason, there may be input to this plan from CS Innovations and Nutherm International.

Response: The Maintenance Plan for the replacement MSFIS controls is provided in Enclosure 20. The Maintenance Plan describes responsibilities and methods associated with on-going maintenance and repair of the system, which would be performed under WCNOC procedures as described in RAI No. 22. Modifications to the system are not described in the Maintenance Plan. Modifications to the system would be initiated and implemented in accordance with WCNOC procedure AP 05-005, "Design, Implementation & Configuration Control of Modifications." Procedure AP 05-005 is provided in Enclosure 8.

10. *Safety Plan*

While an FPGA-based system does not have software, it does have a burn or flash list, the correctness of which will determine the proper operation of the FPGA-based system. This burn or flash list is generated using a variety of software tools, in a manner somewhat analogous to the tools used to generate the operational software of a microprocessor-based system. For this reason, a safety plan which will have some of the characteristics of a software safety plan is requested. There should be three safety plans:

- A. *The CS Innovations safety plan which describes the safety effort, how the safety activities are coordinated with the development activities, and the interactions between the safety organization and the V&V organization. This plan also needs to discuss the methods to be used to reduce safety risks caused by failures of the various software tools to an acceptable level. The safety plan should include a requirement that a safety analysis be performed and documented on each of the principal design documents: requirements, design descriptions, and burn or flash list. Hazards, including abnormal events and conditions and malicious modifications, should be analyzed and documented. Hazard reduction efforts should be documented.*
- B. *The Nutherm International safety plan, which shows that commercial-grade dedication of a product designed and built to commercial standards and using commercial processes does not increase the safety risks.*
- C. *The licensee's evaluation and acceptance of the CS Innovations and Nutherm International safety plans.*

Response:

A. The CS Innovations document 6101-00006, "MSFIS Safety Assessment," is provided in Enclosure 36. The MSFIS Safety Assessment was performed to identify and assess the impact of a failure in the replacement MSFIS controls. The safety assessment analyzed consequences of abnormal behavior on both the system board and component level. Weak spots and imbalances in the design are identified and assessed as to the relative importance of identified failures. The safety assessment provides both a qualitative and quantitative analysis of the replacement MSFIS controls reliability and availability.

B. For Nutherm International, the aspects of a safety plan are encompassed within Dedication Plan WCN-9715DP. The dedication plan requires documenting the review of CS Innovations safety analysis and source inspection activities that the FPGA-based system will not cause or contribute to the MSFIS reaching a hazardous state. The dedication plan utilizes a combination of the methods in EPRI NP-5652, "Guideline for Utilization of Commercial Grade Items in Nuclear Safety Related Applications," as follows:

- Method 1 – Special Tests and Inspections,
- Method 2 – Commercial Grade Survey of Supplier, and
- Method 3 – Source Inspection.

Commercial grade surveys of the CS Innovations safety analysis are performed to verify:

1. FPGA-based functions that have the potential to cause or are required to control a hazard have been identified in the CS Innovations safety analysis;
2. That CS Innovations has clearly transferred from the safety analysis to the MSFIS design requirements those FPGA-based functions required to control hazards;
3. That appropriate CS Innovations verification and validation requirements are established to ensure proper implementation of FPGA-based safety functions;
4. That the CS Innovations test plan and procedures will satisfy the intent of the verification and validation requirements; and
5. That the results of CS Innovations hazard reduction efforts are satisfactory and documented.

Nutherm International source inspections in conjunction with special tests and inspections are performed to verify:

1. CS Innovations programs exist to provide closed-loop tracking of FPGA-based safety function discrepancies. Changes or modifications to the FPGA-based safety function shall be evaluated to determine the effect on MSFIS safety functions;
2. CS Innovations programs ensure that affected documentation is updated to correctly reflect changes in the FPGA-based safety functions;

3. CS Innovations verification and validation testing is performed to verify correct implementation of FPGA-based safety functions in conjunction with system hardware/operators and shall verify successful operation during the presence of system faults and;
4. CS Innovations verification and validation results are analyzed to verify that FPGA-based safety requirements, as defined in WCNOG Diversity and Defense-in-Depth analysis, have been satisfied.

Through the above methods, an acceptance process is implemented to provide reasonable assurance that the replacement MSFIS controls will perform its intended safety function and, in this respect, is deemed equivalent to controls designed and manufactured under a 10 CFR 50 Appendix B quality program. The Nutherm International Dedication Plan WCN-9715DP, Revision 1, is provided in Enclosure 7.

C. WCNOG's evaluation and acceptance of the CS Innovations safety assessment and Nutherm International Dedication Plan will be available by August 31, 2007.

11. *Requirements Specifications*

The NRC staff has received the Wolf Creek Specification J-105A(Q) for Replacement MSFIS System. At this time, the NRC staff does not need any additional requirements specifications.

Response: Enclosure I to WCNOG letter ET 07-0008, dated April 18, 2007, provided "Specification J105A(Q) for Replacement MSFIS System."

12. *Requirement Traceability Matrix*

The Requirement Traceability Matrix for those portions of the design already done, and a schedule for the remainder of the Requirement Traceability Matrix is requested.

Response: The Requirements Traceability Matrix ensures that each requirement of Specification J-105A(Q) for Replacement MSFIS System has been addressed in the MSFIS design documents and test procedures. The Requirements Traceability Matrix, Revision 0, is provided in Enclosure 19. Revisions to the Requirements Traceability Matrix are performed in conjunction with revisions to the System Verification and Validation Report which is discussed in the response to RAI No. 19.

13. *Design Specifications*

The NRC staff has received the CS Innovations ALS Level-1 System Specification, revision 1.0. At this time, the NRC staff does not need any additional design specifications.

Response: Enclosure IV to WCNOC letter ET 07-0008, dated April 18, 2007, provided CS Innovations document 6000-00000, "ALS Level-1 System Specification." Minor revisions to these documents have been made since the April 18, 2007 submittal and are therefore being included in this submittal. Document 6000-00000 is provided in Enclosure 37.

14. *Detailed Architecture Description*

The following information is requested on the description and the reviews that determined the design is suitable.

- A. *The CS Innovations detailed architecture description needs to include the system description, processor subsystem, input/output (I/O) subsystem, test subsystem, and any other subsystems as needed. These descriptions should not only be of the electronic part of the system, but also a physical description discussing cabinets used, I/O cabling, interconnect wiring, and general layout.*
- B. *The Nutherm International evaluation of the detailed architecture description, and the reasoning behind the decision that the CS Innovations final product is suitable for safety-related use in a nuclear power plant, and that this product would be the equivalent of a product designed and manufactured under an Appendix B process.*
- C. *The licensee's evaluation and acceptance of the CS Innovations architecture and of the Nutherm International review of that architecture.*

Response:

A. The detailed architecture description is provided in CS Innovation documents 6000-00000, "ALS Level-1 System Specification," and 6101-00002, "MSFIS System Specification, Wolf Creek Generating Station." Enclosure IV to WCNOC letter ET 07-0008, dated April 18, 2007, provided CS Innovations document 6000-00000 and Enclosure IX provided document 6101-00002. Minor revisions to these documents have been made since the April 18, 2007 submittal and are therefore being included in this submittal. Document 6000-00000 is provided in Enclosure 37. Document 6101-00002 is provided in Enclosure 38.

B. Nutherm International's evaluation and acceptance of the CS Innovations architecture will be available on August 17, 2007.

C. WCNOC's evaluation and acceptance of the CS Innovations architecture and of the Nutherm International review of that architecture will be available on September 7, 2007.

15. *Flash or Burn List*

The Flash or Burn List is requested.

Response:

During the NRC and WCNOG meeting on May 17, 2007, WCNOG identified the flash or burn list is a binary file and is difficult to read and understand. WCNOG suggested that it would be more appropriate to review the VHSIC Hardware Description Language or VHDL at the vendor site. Reviewing the VHDL at the vendor site would encompass the aspects of a thread audit. VHDL or VHSIC Hardware Description Language is commonly used as a design entry language for FPGAs and application-specific integrated circuits in electronic design automation of digital circuits. The key advantage of VHDL when used for systems design is that it allows the behavior of the required system to be described (modeled) and verified (simulated) before synthesis tools translate the design into real hardware (gates and wires). When a VHDL model is translated into the "gates and wires" that are mapped onto a programmable logic device such as a FPGA, then it is the actual hardware being configured, rather than the VHDL code being "executed" as if on some form of a processor chip. WCNOG and CS Innovations are prepared to review the VHDL source with the NRC at the vendor site.

16. *System Build Documentation*

A detailed description of the system as it will be installed at Wolf Creek is requested.

Response: The system build documentation will be available by July 16, 2007.

17. *Test Plans and Documentation*

These are the test procedures based upon the test plans mentioned in section 7 of this list.

A. *Environmental test plans, procedures, and results. The following undocketed reports, which have been received by the NRC staff, should be docketed:*

*Nutherm Qualification Report WCN-9715R, Rev. 0
Nutherm Qualification Report WCN-9715R, Rev. 0 App. I
Nutherm Qualification Report WCN-9715R, Rev. 0 App. II
Nutherm Qualification Report WCN-9715R, Rev. 0 App. III
Nutherm Qualification Report WCN-9715R, Rev. 0 App. IV
Nutherm Qualification Report WCN-9715R, Rev. 0 App. V
Nutherm Qualification Report WCN-9715R, Rev. 0 App. VI Part 1
Nutherm Qualification Report WCN-9715R, Rev. 0 App. VI Part 2
Nutherm Qualification Report WCN-9715R, Rev. 0 App. VI Part 3
Nutherm Qualification Report WCN-9715R, Rev. 0 App. VI Part 4*

Nutherm Qualification Report WCN-9715R, Rev. 0 App. VI Part 5
Nutherm Qualification Report WCN-9715R, Rev. 0 App. VI Part 6
Nutherm Qualification Report WCN-9715R, Rev. 0 App. VI Part 7
Nutherm Qualification Report WCN-9715R, Rev. 0 App. VI Part 8

B. Factory acceptance test procedures, and results. The NRC staff requests the following four documents for the test procedures and test results:

- The CS Innovations test procedure and the test results.*
- The Baseline Engineering analysis of the test procedures verifying that the procedures will test the items required by the test plan, and that the results show that the tests demonstrated that the system meets the requirements.*
- The Nutherm International analysis of the CS Innovations and Baseline Engineering analysis reports showing that the tests demonstrated that the final product is suitable for safety-related use in a nuclear power plant, and that this product is the equivalent of a product designed and manufactured under an Appendix B process.*
- The licensee review and acceptance reports of the previous procedures, results, and analysis.*

C. Site acceptance test procedures, and results. The NRC staff requests the following four documents for the test procedures and test results:

- The CS Innovations test procedure and the test results.*
- The Baseline Engineering analysis of the test procedures verifying that the procedures will test the items required by the test plan, and that the results show that the tests demonstrated that the system meets the requirements.*
- The Nutherm International analysis of the CS Innovations and Baseline Engineering analysis reports showing that the tests demonstrated that the final product is suitable for safety-related use in a nuclear power plant, and that this product is the equivalent of a product designed and manufactured under an Appendix B process.*
- The licensee review and acceptance reports of the previous procedures, results, and analysis.*

D. Installation test procedures, and results. The NRC staff requests the licensee procedure and the test results, with the licensee review and determination that the FPGA-based MSFIS system meets all licensee requirements and expectations.

Response:

A. WCNOC letter ET 07-0004 (Enclosure V), dated March 14, 2004, provided Nutherm Qualification Report WCN-9175R, "Nutherm Qualification Report for CS Innovations Replacement MSFIS System" but did not include the Appendices which contained the test procedures and test data. Enclosure VI to WCNOC letter ET 07-0008, dated April 18, 2007, provided Nutherm Qualification Report WCN-9175R and all Appendices. Letter ET 07-0008 provided the qualification report on the WCGS docket.

B. The CS Innovations system acceptance test procedure(s) is encompassed within the MSFIS System Test Plan (document 6101-00004) and is provided in Enclosure 35, and the corresponding test report will be available by August 31, 2007. This testing will be performed on-site at CS Innovations prior to equipment shipment to Nutherm International. Nutherm International is independently developing a factory acceptance test procedure(s), which will be performed as part of their equipment dedication activities. This procedure(s) will be available by July 30, 2007 and the test results will be available by October 5, 2007. The analysis of factory acceptance testing activities verifying that the procedure(s) will test the items required by the test plan, and that the results show that the tests demonstrated that the system meets the requirements, will be performed by Baseline Engineering and captured in Revision 2 of the System Verification and Validation Report, to be available by November 16, 2007.

C. Site acceptance test procedure(s) are being developed by WCNOC and will be available by September 7, 2007. The results of this testing will be documented and available by October 26, 2007.

D. Installation test procedure(s) are being developed by WCNOC and will be available by October 16, 2007. The results of this testing will be documented and available by May 30, 2008. The final revision of the System Verification and Validation Report will include a verification and validation analysis of the installation testing and will be available by June 13, 2008.

18. *Diversity and Defense-in-Depth Analysis*

The diversity and defense-in-depth analysis is requested. This analysis must demonstrate that there is sufficient diversity and defense-in-depth to meet the requirements of Part 50, Appendix A, of Title 10 of the Code of Federal Regulations (10 CFR), General Design Criterion 22 on protection system independence, as described in the Standard Review Plan, Appendix 7.1-A, section 2.h.

Response: Enclosure 41 provides the WCNOC Diversity and Defense-in Depth Assessment. This assessment concluded that the replacement MSFIS controls are designed to ensure that the effects of natural phenomena, and of normal operating, maintenance, testing, and postulated accident conditions on redundant channels do not result in a loss of the protection function. Functional diversity has been incorporated into the design and principles of operation to prevent a loss of the protection function.

19. *V&V Reports*

The V&V Reports are requested. For each of these reports, there should be three documents; (1) the report written by the independent V&V contractor, Baseline Engineering, (2) the analysis of the report by Nutherm International showing that the report shows that the covered portion of the life cycle is suitable to produce a final product suitable for safety-related use in a nuclear power plant, and that this product will be the equivalent of a product designed and manufactured under an Appendix B process, and (3) the licensee acceptance of the report and analysis.

- A. *V&V Requirements Analysis Report*
- B. *V&V Design Analysis Report*
- C. *V&V Implementation Analysis & Test Report*
- D. *V&V Validation & Test Report*

Response:

Baseline Engineering was contracted as providing WCNOC supplemental staff. As such, Baseline Engineering is utilizing WCNOC's processes and procedures for verification and validation activities. Enclosure IV to WCNOC letter ET 07-0004, dated March 14, 2007 provided the System Verification and Validation Plan, Revision 0, which is being utilized by Baseline Engineering for the independent verification and validation activities. Since Baseline Engineering is supplemental staff to WCNOC, the System Verification and Validation Report and associated analysis is being performed by WCNOC. A review of the System Verification and Validation Report by Nutherm International is not required.

The System Verification and Validation Report documents the verification and validation processes and procedures that were used by Wolf Creek Nuclear Operating Company to assure that the MSFIS controls being developed meets the requirements for a safety related Class 1E system.

The System Verification and Validation Report will be issued in four (4) phases, as follows:

- Revision 0 -- Requirements Analysis Report
- Revision 1 -- Design Analysis Report
- Revision 2 -- Implementation and Test Analysis Report
- Revision 3 -- Validation Test Report

The System Verification and Validation Report will be a living document that is prepared and updated periodically during the course of the project development. Each phase of the project, e.g., System Conceptual Requirements, System Design Requirements, Design, etc., is covered by a subsection that documents in detail the verification and validation efforts during that phase, and the results thereof, including anomalies discovered and their resolution and consequent rework, reverification and revalidation. The documentation that each phase has been completed in full compliance with the requirements of that phase with respect to the specifications shall be included or specifically referenced from among the other required project

documentation. The final report will consist of these subsections, together with subsections providing an overview and a summary of the entire verification and validation effort. The System Verification and Validation Report, Revision 0, is provided in Enclosure 21.

Revision 1 of the report will be available on August 31, 2007. Revision 2 of the report will be available on November 16, 2007. Revision 3 of the report will be available on June 13, 2008.

20. *An analysis of all Institute of Electrical and Electronics Engineers (IEEE) 603 requirements, with a description of how the FPGA-based MSFIS actuation system meets these requirements, is requested.*

Response: Enclosure 22 provides an analysis of replacement MSFIS controls to the requirements of IEEE Std 603-1998, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations."

21. *The standard used by CS Innovations during the design process is requested. The May 9, 2007, letter (ET 07-0013) from the licensee stated that the licensee considered the Federal Aviation Administration (FAA) guidance document RTCA DO-254/EUROCAE ED-80, "Design Assurance Guidance for Airborne Electronic Hardware," to be more appropriate guidance than IEEE 7-4.3.2. In this respect, the NRC staff requests:*

- A. *A copy of RTCA DO-254/EUROCAE ED-80, "Design Assurance Guidance for Airborne Electronic Hardware."*
- B. *Documentation on how and why this determination was made.*
- C. *A comparison of the requirements of the FAA guidance document RTCA DO-254/EUROCAE ED-80 and IEEE 7-4.3.2.*

Response:

Enclosure 23 documents the applicability of RTCA DO-254, "Design Assurance Guidance for Airborne Electronic Hardware," to the MSFIS Controls Replacement Project, specifically the FPGA design process. Included within Enclosure 23 is a comparison of the requirements of RTCA DO-254 and IEEE Std 7-4.3.2, "IEEE Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations."

A copy of RTCA DO-254/EUROCAE ED-80, "Design Assurance Guidance for Airborne Electronic Hardware," is provided in Enclosure 17. This document is considered as copyrighted material and therefore should be protected as such.

22. *Installation, Operations, and Maintenance Documentation*

It is requested that each of the following manuals be available for review prior to installation, that there is a Nutherm International evaluation of these manuals as suitable for a safety-related system, and a licensee acceptance of these manuals:

- A. *Operations Manuals*
- B. *Maintenance Manuals*
- C. *Training Manuals*
- D. *Repair Planning*

Response:

Nutherm International is developing an Operations and Maintenance Manual. As such, this manual will be suitable for a safety related system. The manual will be developed by September 14, 2007 with WCNOG acceptance of the manual by September 28, 2007.

Training associated with the MSFIS controls is developed by WCNOG based on procedure AP 30A-005, "Training and Qualification." This procedure establishes the requirements and expectations for training and qualification of personnel to perform activities affecting the operation and maintenance of WCGS. The training materials are developed utilizing the guidance in procedure AP 30E-004, "Training Materials Development." Procedure AP 30E-004 establishes the process for development, review, approval, and revision of training materials. The training material associated with the MSFIS controls will be available by September 26, 2007.

Repairs associated to the MSFIS are conducted in accordance with existing plant procedures. Procedure AP 22C-002, "Work Controls," provides a systematic method in identifying, generating scheduling, and tracking work activities to optimize the health of plant systems and components while maintaining plant risk at a minimum. Procedure AP 16C-006, "MPAC Work Request/Work Order Process Controls," provides the administrative process controls for work activities at WCGS using the Maintenance Planning and Controls (MPAC) electronic work controls system. Procedure AI 16C-007, "Work Order Planning," provides the specific guidance for initiation, planning and processing of Work Orders. These and other procedural controls ensure effective controls over maintenance and repair activities. Procedure AP 22C-002 is provided in Enclosure 24. Procedure AP 16C-006 is provided in Enclosure 25. Procedure AI 16C-007 is provided in Enclosure 26.

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.

REGULATORY COMMITMENT	DUE DATE
The factory acceptance test procedure(s) referenced in the Nutherm Dedication Plan will be available July 30, 2007.	July 30, 2007
WCNOC's evaluation and acceptance of the CS Innovations safety plan and Nutherm International Dedication Plan will be available by August 31, 2007.	August 31, 2007
Nutherm International's evaluation and acceptance of the CS Innovations architecture will be available on August 17, 2007.	August 17, 2007
WCNOC's evaluation and acceptance of the CS Innovations architecture and of the Nutherm International review of that architecture will be available on September 7, 2007.	September 7, 2007
The system build documentation will be available by July 16, 2007.	July 16, 2007
The CS Innovations system acceptance test procedure(s) is encompassed within the MSFIS System Test Plan (document 6101-00004) and is provided in Enclosure 35, and the corresponding test report will be available by August 31, 2007.	August 31, 2007
This procedure(s) will be available by July 30, 2007 and the test results will be available by October 5, 2007.	July 30, 2007 October 5, 2007
The analysis of factory acceptance testing activities verifying that the procedure(s) will test the items required by the test plan, and that the results show that the tests demonstrated that the system meets the requirements, will be performed by Baseline Engineering and captured in Revision 2 of the System Verification and Validation Report, to be available by November 16, 2007.	November 16, 2007
Site acceptance test procedure(s) are being developed by WCNOC and will be available by September 7, 2007. The results of this testing will be documented and available by October 26, 2007.	September 7, 2007 October 26, 2007

REGULATORY COMMITMENT	DUE DATE
<p>Installation test procedure(s) are being developed by WCNOG and will be available by October 16, 2007. The results of this testing will be documented and available by May 30, 2008. The final revision of the System Verification and Validation Report will include a verification and validation analysis of the installation testing and will be available by June 13, 2008.</p>	<p>October 16, 2007 May 30, 2008 June 13, 2008</p>
<p>Revision 1 of the System Verification and Validation Report will be available on August 31, 2007. Revision 2 of the System Verification and Validation Report will be available on November 16, 2007. Revision 3 of the System Verification and Validation Report will be available on June 13, 2008.</p>	<p>August 31, 2007 November 16, 2007 June 13, 2007</p>
<p>The Operations and Maintenance Manual will be developed by September 14, 2007 with WCNOG acceptance of the manual by September 28, 2007.</p>	<p>September 14, 2007 September 28, 2007</p>
<p>The training material associated with the MSFIS controls will be available by September 26, 2007.</p>	<p>September 26, 2007</p>

Enclosure 40 to ET 07-0022

**CS Innovations letter 9100-00010, "Application for Withholding Proprietary Information
from Public Disclosure"**

Ref: 9100-00010



CS INNOVATIONS LLC

CS INNOVATIONS
9150 E. DEL CAMINO, SUITE 110
SCOTTSDALE, AZ, 85256

Direct phone: 480-612-2040
Fax: 623-505-1055
Email: steen@cs-innovation.com

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

Our ref: 9100-00010
June 13th, 2007

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

Subject: **CS Innovations LLC Proprietary Documents**
(CS Innovations LLC 2006 Confidential and Proprietary)

The proprietary information for which withholding is being requested in the above documents is further identified in Affidavit 9100-00011 signed by the owner of the proprietary information, CS Innovations LLC. The affidavit, which accompanies this letter, 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 Section 2.390 of the Commission's regulations.

Accordingly, this letter authorizes the utilization of the accompanying affidavit by the Wolf Creek Nuclear Operating Corporation.

Correspondence with respect to the proprietary aspects of the application for withholding or the CSI affidavit should reference this letter, 9100-00010, and should be addressed to Steen D. Sorensen, President & CEO, CS Innovations LLC, 9150 E. Del Camino, Suite 110, Scottsdale, AZ, 85256.

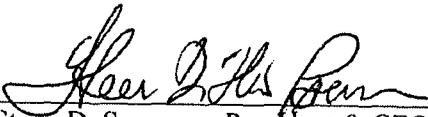
Very truly yours,


Steen D. Sorensen
President & CEO

AFFIDAVIT

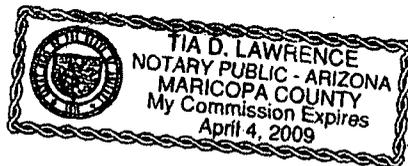
State of Arizona
County of Maricopa

Before me, the undersigned authority, personally appeared Steen D. Sorensen, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of CS Innovations LLC (CSI), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:



Steen D. Sorensen, President & CEO

Sworn to and subscribed
before me this 13 day
of June, 2007





Notary Public

- (1) I am President & CEO, CS Innovations LLC (CSI), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of CSI.
- (2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the CSI "Application for Withholding" accompanying this Affidavit.
- (3) I have personal knowledge of the criteria and procedures utilized by CSI in designating information as a trade secret, privileged or as confidential commercial or financial information.
- (4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining the information sought to be withheld from public disclosure should be withheld.
 - (i) The information sought to be withheld from public disclosure is owned and been held in confidence by CSI.
 - (ii) The information is of a type customarily held in confidence by CSI and not customarily disclosure to the public. CSI has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determining when and whether to hold certain types of information in confidence. The application of that system and substance of that system constitutes CSI policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

- (a) The information reveals the distinguishing aspects of a process (or component structure, tool, method, etc.) where prevention of its use by any of CSI's competitors without license from CSI constitutes a competitive economic advantage over other companies.
- (b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.) the application of which data secures a competitive economic advantage, e.g. by optimization or improved marketability.

- (c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.
- (d) It reveals costs or price information, production capacities, budget levels, or commercial strategies of CSI, its customers or suppliers.
- (e) It reveals aspects of past, present, or future CSI or customer funded development plans and programs of potential commercial value to CSI.
- (f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the CSI system which include the following:

- (a) The use of such information by CSI gives CSI a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the CSI competitive position.
 - (b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the CSI ability to sell products and services involving the use of the information.
 - (c) Use by our competitor would put CSI at a competitive disadvantage by reducing his expenditure of resources at our expense.
 - (d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving CSI of a competitive advantage.
 - (e) The CSI capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.
- (iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.
 - (iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

- (v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in WCNO letter ET 07-0022, Enclosures 27 through 39 and includes the following CS Innovations LLC documents:

Quality Assurance Manual and Implementing Quality Control Procedures
6000-00000, "ALS Level 1 System Specification"
6000-00008, "ALS Board Test Plan"
6101-00000, "MSFIS Management Plan"
6101-00002, "MSFIS System Specification, Wolf Creek Generating Station"
6101-00004, "MSFIS System Test Plan"
6101-00005, "MSFIS Configuration Management Plan"
6101-00006, "MSFIS Safety Assessment"
6101-00008, "MSFIS V&V Plan"
6101-00009, "MSFIS Quality Assurance Plan"
6101-00100, "ATU-101 Design Specification"
6101-00101, "ATE-101 Design Specification"
6101-00102, "ATS-101 Software Specification"
9002-00024, "Electrical Wiring Design Review Procedure"
9002-00025, "Board Design Review Procedure"
9002-00026, "FPGA Design Review Procedure"
9002-00033, "Hardware Design Development Procedure"
9002-00034, "Electrical Wiring Design Development Procedure"
9002-00035, "Board Design Development Procedure"
9002-00036, "FPGA Design Development Procedure"

The information is provided in support of a submittal to the Commission, being transmitted by the Wolf Creek Nuclear Operating Corporation and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk.

This information is part of that which will enable CSI to:

- (a) Provide a replacement MSFIS Controls for Wolf Creek Generating Station.

Further this information has substantial commercial value as follows:

- (a) The information requested to be withheld reveals the distinguishing aspects of a methodology which was developed by CSI.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of CSI.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive CSI effort and the expenditure of a considerable sum of money.

In order for competitors of CSI to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

Enclosure 42 to ET 07-0022

WCNOC Affidavit for Withholding Proprietary Information from Public Disclosure

AFFIDAVIT

STATE OF KANSAS)
) SS
COUNTY OF COFFEY)

Before me, the undersigned authority, personally appeared Terry J. Garrett, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Wolf Creek Nuclear Operating Corporation (WCNOC), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

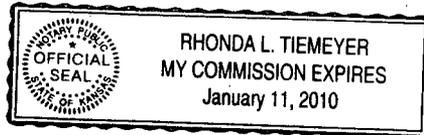


Terry J. Garrett
Vice President Engineering

Sworn to and subscribed
before me this 15 day
of June, 2007

Rhonda L. Tiemeyer

Notary Public



- (1) I am Vice President Engineering, Wolf Creek Nuclear Operating Corporation (WCNOC), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in WCNOC's submittal of the Diversity and Defense-in-Depth Assessment for the Replacement MSFIS Controls, and am authorized to apply for its withholding on behalf of WCNOC.
- (2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with WCNOC letter ET 07-0022 which includes the Diversity and Defense-in-Depth Assessment for the Replacement MSFIS Controls accompanying this Affidavit.
- (3) I have personal knowledge of the criteria and procedures utilized by WCNOC in designating information as a trade secret, privileged or as confidential commercial or financial information.
- (4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.
 - (i) The information sought to be withheld from public disclosure is owned and has been held in confidence by WCNOC.
 - (ii) The information is of a type customarily held in confidence by other organizations and not customarily disclosed to the public. Based on a review of 10 CFR 2.390, the information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:
 - (a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any other company without license from WCNOC constitutes a competitive economic advantage over other companies.
 - (b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.
 - (c) Its use by another company would reduce its expenditure of resources or improve its competitive position in the design, assurance of quality, or licensing a similar product.
 - (d) It is not the property of WCNOC, but must be treated as proprietary by WCNOC according to agreements with the owners of the information.

There are sound reasons behind the WCNOC position which include the following:

- (a) It is information which is marketable in many ways.

- (b) Use by other companies would put WCNOC at a competitive disadvantage by reducing their expenditure of resources at our expense.
 - (c) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If other companies acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving WCNOC of a competitive advantage.
- (iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.
 - (iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.
 - (v) The proprietary information sought to be withheld in this submittal is the Diversity and Defense-in-Depth Assessment for the Replacement MSFIS Controls.

The subject information could only be duplicated by competitors if they were to invest time and effort equivalent to that invested by WCNOC provided they have the requisite talent and experience.

Public disclosure of this information is likely to cause substantial harm to the competitive position of WCNOC because it would simplify design and evaluation tasks without requiring a commensurate investment of time and effort.