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November 30, 2005

U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Document Control Desk

Subject: Oconee Nuclear Station
Docket Numbers 50-269, 270, and 287
Response to Request for Additional Information
Pertaining to the License Amendment Request (LAR)
for RPS/ESPS Digital Upgrade
Technical Specification Change (TSC) Number
2004-09, Supplement 4

In a submittal dated February 14, 2005, Duke Energy Corporation (Duke) proposed to amend Appendix A, Technical Specifications, for Renewed Facility Operating Licenses DPR-38, DPR-47 and DPR-55 for Oconee Nuclear Station, Units 1, 2, and 3. The LAR requests NRC to approve the Reactor Protective System (RPS)/Engineered Safeguards Protective System (ESPS) modification and associated Technical Specification change.

By letter dated October 6, 2005, Duke provided responses to many of the questions in a Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) dated September 6, 2005. Since many of the responses are tied to design deliverables in the RPS/ESPS modification schedule, Duke committed to provide the remaining responses on or before November 3, 2005, December 1, 2005, and January 12, 2006.

Attachment 1 provides Duke's responses to RAIs 1.D, 1.H, 1.I, 1.J, 1.O, 1.T, 1.V, 4.b, and 27. Attachment 2 provides an updated list of NRC commitments associated with this LAR.

A001

If there are any questions regarding this submittal, please contact Boyd Shingleton at (864) 885-4716.

Very truly yours,

R. A. Jones, Vice President
Oconee Nuclear Site

cc: Mr. L. N. Olshan, Project Manager
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R. A. Jones, being duly sworn, states that he is Vice President, Oconee Nuclear Site, Duke Energy Corporation, that he is authorized on the part of said Company to sign and file with the U. S. Nuclear Regulatory Commission this revision to the Renewed Facility Operating License Nos. DPR-38, DPR-47, DPR-55; and that all the statements and matters set forth herein are true and correct to the best of his knowledge.

R. A. Jones, Vice President
Oconee Nuclear Site

Subscribed and sworn to before me this 30 day of November 2005

Notary Public

My Commission Expires:

6/12/2013

Attachment 1
Duke Response to Request for Additional Information (RAI)
Oconee Nuclear Station License Amendment Request
for RPS/ESPS Digital Upgrade

RAI 1.D **Please provide the following documentation:**
Oconee Software Quality Assurance Plan and any procedures specific to this system (BTP-14, Section 3.1.c). This may include vendor document, but must specifically show how the licensee will maintain control of the hardware and software quality at the licensee site.

Duke Response to RAI 1.D

Duke provided a copy of the SDQA plan in electronic format to the NRC Staff via electronic mail on November 30, 2005. Duke requests that this document be withheld from public disclosure pursuant to 10 CFR 2.390.

RAI 1.H **Please provide the following documentation:**
Oconee Software Development plan and related life-cycle documentation, if any applications software is being developed by the licensee (BTP-14, Section 3.1b). If applications software is being developed by Framatome, please provide the following software life-cycle documents in accordance with Section 5.1.2 of Topical Report EMF-2110, "Teleperm XS: A digital Reactor Protection System".
i. Requirements Definition
ii. Technical Design Specification.
iii. Detailed Design Specification.
iv. Implementation Specification.
v. Integration Plan (BTP-14, Section 3.1.d).
vi. Test Plan

Duke Response to RAI 1.H

Duke provided a copy of the Integration Plan and Test Plan in electronic format to the NRC Staff via electronic mail on November 30, 2005. Duke requests that this document be withheld from public disclosure pursuant to 10 CFR 2.390.

The remaining documentation (Implementation Specification) required by EMF-2110 is being prepared in accordance with the Implementation Phase Life-cycle of the FANP V&V Plan (FANP Document 51-5058661-00). This document is in preparation, review, and approval and is expected to be issued by January 28, 2006. Duke will provide this document when it is issued.

RAI 1.I **Please provide the following documentation:**
The documentation and plans which the licensee will determine that the RPS/ESPS system software meets the requirements. This would normally include:
i. Software Design Review.
ii. Source Code Review
iii. Software Verification and Validation Plan (BTP-14, Section 3.1.j)
iv. Verification and Validation Report

Duke Response to RAI 1.I

In the October 6, 2005, submittal, Duke stated that software development is currently at the stage of completing V&V activities described in the Requirements Phase Life-cycle of the V&V Plan. Duke indicated that Software Design Reviews and Source Code Reviews are performed in later Software Life-cycle phases and were expected to be issued by October 31, 2005, and December 16, 2005, respectively.

After further review, Duke determined that the Software Design Review is captured by the design phase V&V Report. Duke provided a copy of this document in electronic format to the NRC Staff via electronic mail on November 30, 2005. Duke requests that this document be withheld from public disclosure pursuant to 10 CFR 2.390. Also, after further review, Duke determined the Source Code Review is captured by the implementation phase V&V Report. This document is expected to be issued by January 30, 2006. Duke will provide this document when issued.

RAI 1.J **Please provide the following documentation:**
Factory Acceptance Test (Specification item 9.2 – 9.6) and the Oconee Nuclear Station (ONS) Site Acceptance Test (Specification item 9.8), and any other test documentation which will be used.

Duke Response to RAI 1.J

The Factory Acceptance Test (FAT) plan was provided in electronic format to the NRC via electronic mail on November 30, 2005. Duke requests that this document be withheld from public disclosure pursuant to 10 CFR 2.390.

RAI 1.O **Please provide the following documentation:**
The Failure Modes and Effects Analysis (FMEA), including not only significant failure modes but all failure modes (specification item 2.1.cc, 2.3.u, 6.12, and 11.11).

Duke Response to RAI 1.O

In the October 6, 2005, submittal, Duke stated that the FMEA was expected to be issued by November 30, 2005. Duke now expects the FMEA to be issued by December 15, 2005. Duke will provide a copy of the FMEA when issued.

RAI 1.T **Please provide the following documentation:**
The Software Installation Plan (BTP-14, Section 3.1.e).

Duke Response to RAI 1.T

In the October 6, 2005, submittal, Duke stated that the Software Installation Plan was expected to be issued by November 30, 2005. Duke now expects this document to be issued by December 31, 2005. Duke will provide a copy of this document when issued.

RAI 1.V **Please provide the following documentation:**
The Software Operations Plan (BTP-14, Section 3.1.h).

Duke Response to RAI 1.V

In the November 3, 2005, submittal (Supplement 2), Duke indicated that the Software Operations Plan is captured by the Oconee SDQA plan.

Duke provided a copy of the SDQA plan in electronic format to the NRC Staff via electronic mail on November 30, 2005. Duke requests that this document be withheld from public disclosure pursuant to 10 CFR 2.390.

RAI 4

The submittal identified several differences between the TXS system approved by the NRC and the system proposed for installation at ONS, principally the SVE CPU module and the communications modules. Please provide the following information:

B. The environmental test data which verified the new equipment qualifications, including temperature, humidity, radiation, seismic, and electromagnetic qualifications.

Duke Response to RAI 4.B

Duke provided a copy of Test Report # 968/K 110.00/02 in electronic format to the NRC Staff via electronic mail on November 30, 2005. Duke requests that this document be withheld from public disclosure pursuant to 10 CFR 2.390. This document covers the qualification testing of the SCP2 communication processor. Duke requests that these documents be withheld from public disclosure pursuant to 10 CFR 2.390.

In the October 6, 2005, submittal, Duke stated that a qualification summary report addressing Oconee specific equipment such as relays, breakers, transmitters, etc., was expected to be issued by November 17, 2005. Duke now expects this document to be issued by December 22, 2005. Duke will provide a copy of this document when issued.

RAI 27

Please show how the Teleperm XS RPS/ESPS system as installed at ONC (*sic*) will comply with the following sections of IEEE Std. 603-1991 (as required by 10 CFR 50.55a). If this information is already contained in sufficient detail in the February 14, 2005 submittal, please reference the section of the submittal where the information is discussed.

Section 4.1	**Identification of the design basis events**
Section 4.4	**Identification of variables monitored**
Section 4.5	**Minimum criteria for manual initiation and control of protective actions**
Section 4.6	**Identification of the minimum number and location of sensors**
Section 4.4	**Identification of the analytical limit associated with each variable.**
Section 4.7	**Range of transient and steady-state conditions**
Section 4.8	**Identification of conditions having the potential for causing functional degradation of safety system performance**
Section 4.9	**Identification of the methods used to determine reliability of the safety system design**
Section 5.1	**Single-Failure Criterion**
Section 5.2	**Completion of Protective Action**
Section 5.3	**Quality**
Section 5.4	**Equipment Qualification**
Section 5.5	**System Integrity**
Section 5.6	**Independence** • **Physical independence.** • **Electrical independence.** • **Communications independence.**
Section 5.7	**Capability for Test and Calibration**
Section 5.8	**Information Displays**
Section 5.9	**Control of Access**
Section 5.10	**Repair**
Section 5.11	**Identification**
Section 5.12	**Auxiliary Features**
Section 5.13	**Multi-Unit Stations**
Section 5.14	**Human Factors Considerations**

Section 5.15	**Reliability**
Sections 6.1 and 7.1	**Automatic Control**
Sections 6.2 and 7.2	**Manual Control**
Section 6.3	**Interaction Between the Sense and Command Features and Other Systems**
Section 7.3	**Completion of Protective Action**
Section 6.4	**Derivation of System Inputs**
Section 6.5	**Capability for Testing and Calibration**
Sections 6.6 and 7.4	**Operating Bypasses**
Sections 6.7 and 7.5	**Maintenance Bypass**
Section 6.8	**Setpoints**
Section 8	**Power Source Requirements**

Duke Response to RAI 27

The Bases for compliance to each Section of IEEE 603-1991 is provided in the table below.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27A	Show how the Teleperm XS Reactor Protective System (RPS/ESPS system as installed at Oconee will comply with Section 4.1, Identification of the design basis events.	The design basis shall document the design basis events applicable to each mode, along with the initial conditions and allowable limits of plant conditions for each event.	The Reactor Protective System (RPS) and Engineered Safeguards Protective System (ESPS) are required by Oconee Nuclear Station (ONS) Technical Specifications (TSs) to be operable in MODES 1-4. The design basis events applicable to these MODES and the analyses of the limiting cases are described in Chapter 15 of the ONS Updated Final Safety Analysis Report (UFSAR), including the analysis methods and assumptions. The allowable limits for design basis parameters are summarized in Reference 11. The specific RPS or ESPS functions credited in each analysis are documented in the Design Basis Document (DBD) for each system (References 5 and 6). The DBDs are referenced source documents for the RPS/ESPS functional requirements specification (Reference 9), which serves as the source document for the RPS/ESPS project design.
27B	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 4.4, Identification of variables monitored.	IEEE Std. 603-1991 Section 4.4 requires: "The design basis shall document the variables, or combination of variables, that are to be monitored to manually or automatically control each protective action."	Reference 9 includes all the input variables, or combination of variables, that shall be monitored by the RPS/ESPS system in order to execute and control each protective function. The variables monitored for RPS are provided in Duke's response to RAI 2 Table 1 (Duke letter dated October 6, 2005). The variables monitored for ESPS are provided in RAI 2 Table 2.
27C	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 4.5, Minimum criteria for manual initiation and control of protective actions.	The design basis shall document the protective actions that may be controlled manually initially or subsequent to initiation. See IEEE Std 494-1974.	No changes were made that require different manual actions. The controls currently being used for RPS trips and ESF actuations will continue to be used. Credited manual actuations are not processed through the TXS system.
27C		1. The design basis shall document the points in time and the plant condition during which manual control is allowed.	No changes were made that require different manual actions. The controls currently being used for RPS trips and ESF actuations will continue to be used. Credited manual actuations are not processed through the TXS system.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27C		2: The design basis shall document the justification for permitting control by manual means.	No changes were made that require different manual actions. The controls currently being used for RPS trips and ESF actuations will continue to be used. Credited manual actuations are not processed through the TXS system.
27C		3: The design basis shall document the range of environmental conditions imposed upon the operator during conditions throughout which manual operations shall be performed.	No changes were made that require different manual actions. The controls currently being used for RPS trips and ESF actuations will continue to be used. Credited manual actuations are not processed through the TXS system.
27C		4: The design basis shall document the variable that shall be displayed for the operator to use in taking manual action.	No changes were made that require different manual actions. The controls currently being used for RPS trips and ESF actuations will continue to be used. Credited manual actuations are not processed through the TXS system.
27D	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 4.6, identification of the minimum number and location of sensors.	For variables that have spatial dependence, i.e. vary as a function of position, the design basis shall document the minimum number and locations of sensors required for protective purposes.	This modification does not change the minimum number and location of sensors.
27E	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 4.4, identification of the analytical limit associated with each variable.	See 27B, above	See 27B, above
27E		1: The design basis shall document the analytical limit associated with each variable [for each event analyzed].	This modification does not change analytical limits. Duke currently does not anticipate any setpoint changes as a result of this modification.
27E		2: The design basis shall document the ranges (normal, abnormal, and accident conditions) for each variable.	Reference 9 includes the ranges, in both electrical and physical units, for each analog input variable among the sense and command features. These ranges are not being changed in connection with this modification.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27E		3: The design basis shall document the rates of change of each variable to be accommodated until proper completion of the protective action is ensured.	The rates of change of each variable during design basis events requiring protective action by the RPS/ESPS are documented in the references to Reference 9, and the limiting time delays assumed in the associated accident analyses are summarized in Table 15-35 of Reference 4. The time responses allocated for the TXS RPS/ESPS are specified in Reference 9 for each RPS and ESPS function. These time response requirements exclude sensor response times and ESF actuation times, and therefore differ from the overall delay times assumed in the accident analyses.
27F	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 4.7, range of transient and steady-state conditions.	The design basis shall document the range of environmental conditions during normal, abnormal, and accident conditions throughout which the safety system shall perform.	The TXS RPS/ESPS system will be installed at ONS inside the control room envelope, which is maintained in a mild Environmental Qualification (EQ) environment, in order to assure its habitability for human operators.
27F		1: The design basis shall document the range of radiation conditions during normal and accident conditions.	The TXS RPS/ESPS design basis as documented in References 7 and 8 specifies the total integrated dose (TID), including both normal and accident conditions is < 1.0E-03 Rad.
27F		2: The design basis shall document the range of ambient temperature conditions during normal and accident conditions.	The TXS RPS/ESPS design basis as documented in References 7 and 8 specifies the range of ambient temperature conditions during normal and accident conditions is 60 – 100°F.
27F		3: The design basis shall document the range of atmospheric pressure conditions during normal and accident conditions.	The TXS RPS/ESPS system will be installed inside the control room, which is designed to be maintained at a positive pressure with respect to adjacent areas during normal and accident conditions.
27F		4: The design basis shall document the range of humidity conditions during normal and accident conditions.	The TXS RPS/ESPS design basis as documented in References 7 and 8 specifies the range of humidity conditions during normal and accident conditions is 30 – 80% RH (non-condensing)

RAI No	RAI	IEEE 603-1991 Requirements	Response
27F		5: The design basis shall document the range of vibration conditions during normal and accident conditions.	The TXS RPS/ESPS design basis as documented in Attachment F of Reference 7 and Attachment G of Reference 8 specifies the seismic response spectra for a design basis earthquake. This specification envelopes the range of seismic based vibration conditions that could occur during normal and accident conditions.
27F		6: The design basis shall document the range of electrical power conditions, e.g. voltage and frequency, during normal and accident conditions.	The TXS RPS/ESPS design basis as documented in References 7 and 8 specifies the range of electrical power supply conditions during normal and accident conditions in the 120 V 60 Hz AC vital power system as ±10% voltage and ±3% frequency.
27G	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 4.8, identification of conditions having the potential for causing functional degradation of safety system performance.	The design basis shall document the conditions having potential to functionally degrade safety system performance, and for which [design] provisions have been incorporated to retain capability, including missiles, pipe breaks, and fires.	The design basis for protecting the RPS/ESPS safety system against the effects of missiles, pipe breaks, and fires is described in References 5 and 6. This portion of the design is not being changed in connection with this modification.
27G		The design basis shall document the provisions for protection from failures in non-safety-related systems, where applicable.	All non safety related systems are isolated from the TXS systems by qualified isolation devices. Electrical isolation will be performed by class 1E isolation means such that the maximum credible voltage or current transient applied to the non-1E side will not degrade the operation of the circuit on the other side. Data communications with non-safety-related systems is isolated using one-way communication paths where applicable. Also non-safety SSCs are not located in proximity to the RPS/ESPS safety channels in a manner that their failure could jeopardize the capability of the safety system to perform its safety function.
27H	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 4.9, identification of the methods used to determine reliability of the safety system design.	The design basis shall document the methods used to determine system reliability, and any qualitative or quantitative reliability goals imposed on the system design.	Quantitative reliability goals have been established in References 7 and 8 for the TXS RPS and ESPS systems, in terms of operational unavailability, at <1.0E-05. The methodology used to determine system reliability is consistent with IEEE Std 352-1987 and IEEE Std 577-1976. See also the response to RAI 27W.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27I	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.1 Single-Failure Criterion.	The safety system shall perform all safety functions, both automatic and manual, required for a design basis event in the presence of (1) any single detectable failure within the system, concurrent with all identifiable but non-detectable failures, plus (2) all [consequential] failures caused by the single failure, plus (3) all failures (or spurious actions) that caused or are caused by the DBE under consideration.	This is addressed in the TXS Topical Report, Section 7.1 (Reference 1). Achievement of the single-failure criterion is demonstrated with the use of a failure modes and effects analysis (FMEA), performed in accordance with IEEE Std 352-87. A FMEA has been performed on the system architecture proposed for the ONS RPS/ESPS. It demonstrates that the TXS RPS/ESPS will comply with the single failure criterion as defined in IEEE 603-1991 and IEEE Std 379-2000.
27J	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.2, Completion of Protective Action.	The system shall be designed so that, once initiated automatically or manually, the intended sequence of protective actions of the execute features shall continue until completion.	This is addressed in the TXS Topical Report, Section 7.2.
27J		This requirement shall not preclude provision for deliberate operator interventions.	Each of the eight ESPS logic channels will have an individual AUTO/MANUAL pushbutton selector switch. Selecting MANUAL causes the relay output (RO) contacts for each actuated component in the associated digital logic channels (Channels 1 through 8) to go OPEN, thus allowing operator manual control of the individual components from the normal component control switch.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27K	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.3, Quality.	Safety systems shall be designed, manufactured, installed, and tested in accordance with a prescribed QA program. (ANSI/ASME NQA-1-1989)	This is addressed in TXS Topical Report, Sections 2.1 and 7.3. Project design, manufacturing, and testing activities are being performed by Framatome-ANP (FANP) under a QA program approved by Duke Power Co. The FANP QA program meets 10 CFR 50, Appendix B and ASME NQA-1-1989, through the NQA-1b-1991 Addenda. Platform software development is being performed by Framatome-GmbH following Siemens procedures that have been reviewed and approved by the NRC (Reference 2). Application software development is being performed by FANP-ICE in Alpharetta, GA, following a Software Quality Assurance Plan (SQAP) that complies with the requirements of ANSI/ASME NQA-1a Subpart 2.7-1995 and IEEE Std 730-2002. Site installation and post-installation testing will be performed under the ONS QA program as described in the UFSAR.
27L	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.4, Equipment Qualification.	Safety system equipment shall be qualified (by type test, previous operating experience, analysis, or any combination of these) to substantiate that it will be capable of meeting the performance requirements specified in the design basis.	This is addressed in TXS Topical Report Sections 2.2 and 7.4. The results of this testing are documented in Reference 10 and summarized in Attachment 3 to Reference 3.
27L		5.4.1: Qualification of Class 1E equipment shall be in accordance with IEEE Std 323-1983.	A complete listing of the related EQ reports is provided in Reference 10 and Section 8 of Reference 1.
27L		5.4.2: Qualification of Class 1E equipment shall be in accordance with IEEE Std 627-1980.	IEEE Std 627-1980, Standard for Design Qualification of Safety Systems Equipment Used in Nuclear Power Generating Stations, has not been used. This standard has been withdrawn, and is no longer endorsed by the IEEE. It was deleted from IEEE Std 603 in 1998.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27M	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.5 System Integrity.	The safety systems shall be designed to accomplish their safety functions under the full range of applicable conditions enumerated in the design basis.	The TXS safety system has been designed and tested to confirm the equipment demonstrates system performance adequate to ensure completion of protective actions over the range of transient and steady-state conditions of both the power supply and the environment. See the response to RAI 27F for additional details.
27N	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.6 Independence (Physical, Electrical & Communications independence).	1. Redundant portions of a safety system shall be independent of and physically separated from each other to the degree necessary to retain the capability to accomplish the safety function during and following any DBE requiring that function.	*NOTE: Duke addressed this part of RAI 27 in response to RAI 6 in letter dated November 3, 2005. This response compliments what has already been provided.* This is addressed in TXS Topical Report Section 7.6. The TXS RPS/ESPS safety system at ONS is implemented using four separate and independent process channels of Reactor trip and three independent channels for ESF actuation. Physical separation of the field sensors and actuated devices, including instrumentation and power cables is consistent with IEEE Std 279-1971 and UFSAR Sections 7.2 and 7.3. Field sensors and actuated devices are not being changed by this modification. Redundant channels that provide signals for the same protective functions are located in different panels, ensuring they are physically separated with metal barriers, and electrically isolated. Where redundant equipment communicates via data links, the TXS architecture has been designed to preserve independence between channels. Communications independence is provided in accordance with the guidance of IEEE Std. 7-4.3.2-1993, Annex G.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27N		2. Safety system equipment required to mitigate a specific DBE shall be independent of, and physically separated from, the effects of the DBE to the degree necessary to [perform its safety function]. EQ per 5.4 is one way to meet this requirement.	The TXS RPS/ESPS will be installed at ONS in the control room, where it is protected from the dynamic and environmental effects of the Design Basis Events (DBEs) for which it is credited to function. The control room is classified as a mild EQ zone. The TXS RPS/ESPS has been environmentally qualified by testing to the criteria of IEEE Std 323-1983 and EPRI TR-107330.
27N		3. The safety system design shall be such that credible failures in and consequential actions by other systems shall not prevent the safety system from [performing its safety functions].	All non safety related systems are isolated from the TXS systems by qualified isolation devices. Furthermore, system interactions have been reviewed and the conclusion reached that there is no credible failure scenario for one safety system that would prevent any other safety system from performing its safety function. The Class 1E MSI computers are required to isolate the Class 1E safety actuation channels from the Non 1E service unit and operator aid computer (OAC). By means of the MSI computer it can be ensured that any failure in the service unit or OAC cannot prevent the capability of the TXS RPS/ESPS to perform its safety functions. MSI computers are physically separated from the equipment in the safety actuation channels. Due to space limitations, they will be installed in the RPS-E cabinet. This location affords equivalent seismic qualification and protection from environmental and dynamic effects of any DBE. The power supplied to the RPS-E cabinet is designated Non 1E. However, the power source for RPS-E is isolated and derived from the same DC sources as the Vital AC panel boards for RPS channels A through D. This power source exception is considered acceptable because the MSI will perform its isolation function satisfactorily, even if it is de-energized due to a loss of power.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27N		Equipment that is used for both safety and non-safety functions shall be classified as part of the safety systems.	As documented in Reference 9, the TXS RPS/ESPS develops certain signals for use in both safety and non-safety functions performed by external systems. All components in the safety signal path up to and including the qualified isolator are Class 1E and part of the safety system.
27N		Isolation devices used to effect a safety system boundary shall be classified as part of the safety system.	Class 1E electrical and optical isolation devices are employed to preserve independence of the TXS from non-safety systems. These isolation devices are classified as part of the safety system, are located in Class 1E panels, and are designed and qualified to meet the requirements of IEEE Std 603-1991. This subject is discussed in more detail in Section M.15 of Attachment 3 to Reference 3.
27N		No credible failure on the non-safety side of an isolation device shall prevent any portion of a safety system from meeting its minimum performance requirements during and following any DBE requiring its safety function.	Electrical isolation will be performed by class 1E isolation means such that the maximum credible voltage or current transient applied to the non-1E side will not degrade the operation of the circuit on the other side. See related response to RAI 27G
27N		A failure in an isolation device shall be evaluated in the same manner as a failure of any other equipment in a safety system.	Electrical isolation devices are included in the Failure Modes and Effects Analysis (FMEA) which evaluates the potential impacts of their failure modes in the same manner as is done for other RPS/ESPS equipment. The FMEA is discussed in more detail in the response to RAI 27I, above.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27N		[Non-safety] equipment in other systems that is in physical proximity to safety system equipment, but neither an associated circuit nor another Class 1E circuit, shall be physically separated from the safety system equipment to the degree necessary to retain the safety system function in the event of the failure of the non-safety equipment. Separation may be achieved by physical barriers or acceptable distance, but shall be in accordance with the requirements of IEEE Std 384-1981.	There are no unanalyzed non-safety SSCs located in physical proximity to the TXS RPS/ESPS equipment such that their failure could jeopardize the safety system function The new configured digital safety I&C system is located in the same place as the existing cabinet and utilizes the existing field cables for input and output signals. The existing channel separation for these instances will be maintained. Portions of the RPS/ESPS external to the TXS that are existing plant equipment and will remain so are separated by physical barriers and/or distance from non-safety equipment, following the recommendations in IEEE Std 279-1971 as endorsed by 10CFR50.55a(h). Existing equipment that is not being modified will not be requalified to IEEE Std 603-1991.
27N		Physical barriers used to effect a safety system boundary shall meet the requirements of 5.3, 5.4, and 5.5 for the applicable conditions specified in 4.7 and 4.8 of the design basis.	The TXS RPS/ESPS system equipment will be installed at ONS in Class-1E, seismically-qualified cabinets. The cabinets provide physical barriers to effect a boundary between channels. The cabinets meet all the system integrity requirements specified, including seismic qualification to the required response spectra defined in References 5 and 6. A brief description is included in Attachment 3 to Reference 3.
27N		Where a single random failure in a non-safety system can both result in a DBE and also prevent proper action of a portion of the safety system designed to mitigate that event, the remaining portions of the safety system shall be capable of providing the safety function even when degraded by any separate single failure. See IEEE Std. 379-1988.	The implementation of the TXS platform does not introduce any new events or cause any change in the current ONS analysis of single failures, causing an event while concurrently preventing the safety action with the same single failure. There are no new single failures within a non-safety system that can result in a DBE and also prevent proper operation of the TXS safety system designed to mitigate that event. The ONS Chapter 15 Safety Analysis will remain the same with the TXS platform modification.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27O	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.7, Capability for Test and Calibration.	Capability for testing and calibration shall be provided while retaining the capability of the safety systems to accomplish their functions. This capability shall be provided during power operation, and shall duplicate, as closely as practicable, performance of the safety function.	This is addressed in TXS Topical Report Sections 2.5 and 7.7.
27O		Testing of Class 1E systems shall be in accordance with the requirements of IEEE Std. 338-1987.	This is addressed in TXS Topical Report Section 7.7.
27O		Exceptions to testing and calibration at power are allowed, where this capability cannot be provided without adversely affecting the safety or operability of the generating station. In this case: (1) appropriate justification shall be provided. (2) acceptable reliability shall be otherwise demonstrated, and (3) the capability shall be provided while the station is shut down.	The capability to perform testing of the TXS platform while at-power is provided. This is addressed in TXS Topical Report Section 7.7.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27P	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.8, Information Displays.	Display information provided for manually controlled actions for which no automatic control is provided, and that are required for the safety systems to accomplish their safety function, shall be part of the safety systems and shall meet the requirements of IEEE Std. 497-1981.	The information displays provided to support manual operator actions during a DBE are not being changed in connection with the TXS RPS/ESPS project. These have been previously defined as part of the post-accident monitoring requirements in accordance with RG 1.97, Rev. 2, which are described in Section 7.5 of Reference 4. The adequacy of the control room information displays was demonstrated by NUREG-0737 Control Room Design reviews, and will be reviewed again as part of Human Factors Engineering (HFE) reviews being performed in support of the new design. IEEE Std 497-1981 was not used, and was never endorsed by the NRC in RG 1.97. The current version of IEEE Std 497 (2002) incorporates applicable requirements from IEEE Std. 497-1981, ANS Std. 4.5-1980, RG 1.97, to present digital design techniques for post-accident monitoring displays. This version will be used as part of the HFE reviews being performed for the ONS RPS/ESPS project.
27P		The design shall minimize the possibility of ambiguous indications that could be confusing to the operator.	The possibility of ambiguous or confusing indications is minimized by the application of HFE principles, as discussed in the response to RAI 27V, below.
27P		Display instrumentation shall provide accurate, complete, and timely safety system status. This information shall include indication and identification of protective actions of the sense and command features and the execute features. Status indication need not be part of the safety systems.	This is addressed in TXS Topical Report Section 7.8. RPS/ESPS channel status information is provided in the control room for channel trip, trouble, and test for each RPS and ESPS channel. In addition, bypass information is provided for each RPS channel and ESPS voter. This status information is displayed on the Statalarm Panels, described in Section 22 of Reference 9. The Statalarm Panels are classified as Non 1E, and are electrically isolated from the TXS by Class 1E relays.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27P		If the protective actions of some part of a safety system have been bypassed or deliberately rendered inoperative for any purpose other than an operating bypass, continued indication of this fact for each affected safety group shall be provided in the control room. Bypass indication need not be part of the safety systems.	This is addressed in TXS Topical Report Section 7.8. If a channel is bypassed for any reason, a signal is provided to facilitate continuous indication of this condition. Limiting conditions for maintenance and test bypass conditions are provided in plant specific Technical Specifications, and are not being changed by the license amendment request.
27P		Bypass indication shall be automatically actuated if the bypass is expected to occur more frequently than once a year and is expected to occur when the affected system is required to be operable.	The bypasses are annunciated in the control room. Bypasses are alarmed on the OAC via the TXS Gateway.
27P		The capability shall exist in the control room to manually activate bypass display indication.	Lamp test push buttons will be provided in the control room on 1VB2 to manually test the odd and even ESPS status lamps. Lamp push buttons are provided in the control room to manually test statalarm lamps. The capability for manual activation exists in the RPS/ESPS cabinets, by operating the bypass keyswitch. The cabinets are located in the instrument room adjoining the control room.
27P		Information displays shall be located accessible to the operator.	Most information displays will remain as they are. The information displays receiving inputs from the RPS/ESPS consist of the Statalarm Panels SA1, 2, 5, and 7, the OAC, and the event recorder, all of which are located in the control room and accessible to the control room operator. An ESF status panel is provided to display ESF component status.
27P		Information displays provided to support manually controlled protective actions shall be visible from the location of the controls used to effect the actions.	The location of information displays provided to support manual operator actions during a DBE are not being changed in connection with the TXS RPS/ESPS project. These have been previously reviewed as part of the ONS RG 1.97 review and NUREG-0737 Control Room Design Reviews.

RAI No.	RAI	IEEE 603-1991 Requirements	Response
27Q	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.9, Control of Access.	The design shall permit the administrative control of access to safety system equipment. These controls shall be supported by provisions within the system, or in the generating station design, or by a combination thereof.	This is addressed in TXS Topical Report Sections 2.6 and 7.9. Access to the TXS RPS/ESPS hardware is controlled using a combination of station administrative procedures and system design features. The system is located inside the Protected Area, to which access is controlled by station security features and site security forces. The system is located inside the control room, to which access is restricted to authorized persons. Access to the processors is via front and rear mounted cabinet doors. During normal operation, the cabinet doors will be closed and locked, monitored and alarmed, allowing operators to be aware of and investigate the reason for any open doors. Only one key type for all cabinet doors will exist for ONS-1 (different from Unit 2 or 3 door key types), so that the protection system service unit access is restricted. The service unit is protected against unauthorized interventions, using keylock switches and passwords. Authorized operator actions are monitored and logged by the central server of the service unit. Independent of the control of the rights to use the service unit, commands sent from the service unit to the function processors are only executed if the function processors are in an appropriate operating mode. This operating mode is controlled administratively by procedure and by an individual key switch located in the specific channel.
27R	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.10, Repair.	The safety systems shall be designed to facilitate timely recognition, location, replacement, repair, and adjustment of malfunctioning equipment.	This is addressed in TXS Topical Report Section 7.10.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27S	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.11, Identification.	Safety system equipment shall be distinctly identified for each redundant portion in accordance with the requirements of IEEE Std 384-1981 and IEEE Std 420-1982.	Marking and identification requirements are detailed in Section 13 of References 7 and 8. When installed, equipment will be labeled in the field using distinctive color-coded tags to identify channel assignments (gray, yellow, blue, and orange for Channels A, B, C, and D, respectively), in accordance with existing ONS site procedures. Channel independence and separation within the TELPERM equipment is in accordance with IEEE Std 384.
27S		Identification shall be distinguishable from any identifying markings for other purposes (e.g. fire protection or phase identification on power cables).	Tags and labels used to identify train assignment are easily distinguishable from other markings due to their specific color coding.
27S		Associated documentation shall be distinctly identified in accordance with the requirements of IEEE Std 494-1974.	IEEE Std 494-1974 (ANSI N41.28-1976) is not used to identify safety-related documentation for the TXS RPS/ESPS. This standard was withdrawn in 1997, and is no longer endorsed by IEEE. The applicable documentation requirements are detailed in Section 11 of References 7 and 8. Safety-related documents are entered into FANP and ONS records following procedures that implement requirements meeting the intent of IEEE Std 494-1974. Additionally, a project software configuration management plan (SCMP) complying with IEEE Std. 828-1998 as endorsed by RG 1.169 is issued to implement the control requirements for software media and documentation.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27T	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.12, Auxiliary Features.	Auxiliary supporting features (e.g. power, HVAC) shall meet all the requirements of this standard. (i.e. 1E)	This is addressed in TXS Topical Report Section 7.12. Auxiliary supporting systems (e.g. HVAC, 120 VAC, etc) interfacing with the TXS RPS/ESPS panels are not being modified in connection with this design change. These and other legacy systems at ONS-1 were designed and installed following guidance in IEEE Std 279-1971, and this standard remains the design and licensing basis for these supporting features following the modification. Affects on these systems by the TXS RPS/ESPS changes are being evaluated and addressed and will be tested as part of implementation as indicated in Attachment 3 of Reference 3 in response to the TXS SER Section 6 plant specific action item 14 (Reference 2).
27U	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.13, Multi-Unit Stations.	Sharing of SSCs between units at multi-unit generating stations is permissible, provided that the ability to simultaneously perform required safety functions in all units is not impaired.	There is no sharing on RPS. There is limited sharing on a system basis for ESPS for Keowee starts and LPSW initiation and is in accordance with applicable GDC's associated with sharing of components between units. ONS Units 1 and 2 share a common control room, and the RPS/ESPS cabinets for both units will be located in this shared structure. The ability of each RPS/ESPS to perform their required safety functions is unimpaired by sharing a common structure. Sharing of a common control room is the current design and licensing basis for ONS Units 1 and 2, and is not being changed in connection with this modification.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27V	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.14, Human Factors Considerations.	Human factors shall be considered at the initial stages and throughout the design process to assure that the functions allocated in whole or in part to the human operator(s) and maintainer(s) can be successfully accomplished to meet the safety system design goals, in accordance with IEEE Std 1023-1988.	HFE has been a design consideration on the RPS/ESPS since the conceptual design stage, and work continues through the requirements definition and detailed design phases. HFE principals are being applied to all HSI features within the scope of the project, at a level commensurate with their relative importance to safety. HSI features include the control board modifications, the maintenance screen layouts displayed on the Graphic Service Monitor (GSM), and the new displays to be used on the OAC. An ESF status panel is provided to display ESF component status. The HFE work is being performed following Reference 12 and using the guidance of IEEE Std 1023-1988, NUREG-0700 Rev. 2, NUREG-0711 Rev. 2, and SRP Chapter 18. HFE reviews of the control room modifications will include a review of commitments made in response to NUREG-0737.
27W	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 5.15, Reliability.	For those systems for which either quantitative or qualitative reliability goals have been established, appropriate analysis of the design shall be performed in order to confirm that such goals have been achieved. IEEE Std 352-1987 and IEEE Std 577-1976 provide guidance.	This is addressed in TXS Topical Report Sections 2.4 and 7.14. The RPS reliability or failure to trip on demand probability [PFD], currently assumed in the ONS PRA is 1.0E-6/demand. The ESPS channel PFD assumed in the PRA is 1.12E-03/demand. Both these PFD values have been adopted by FANP as quantitative reliability goals for the RPS/ESPS. To demonstrate achievement of the reliability goals, a hardware reliability analysis has been performed following the methods recommended in IEEE Std 352-1987. The limiting results of this analysis for the RPS are a PFD of 5.44E-10 per demand, considering that for each DBE there is a primary and at least one backup trip function. For the ESPS, the calculated PFD is 2.78E-05 per demand, per logical channel. For the RPS, the calculated operational unavailability is 9.83E-07.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27X	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Sections 6.1 and 7.1, Automatic Control.	6.1 Means shall be provided to automatically initiate and control all protective actions, except as justified in 4.5. The safety system shall be designed such that the operator is not required to take any action prior to the time and plant conditions specified in 4.5 following the onset of each design basis event. 7.1 Means shall be incorporated in the execute features to receive and act upon automatic control signals from the sense and command features consistent with 4.4 of the design basis.	This is addressed in TXS Topical Report Section 7.15. The TXS RPS/ESPS at ONS will automatically initiate all required protective actions to mitigate DBEs that occur in plant modes in which the system is required to be OPERABLE by the ONS Technical Specifications, except those events justified in the response to RAI 27C, above. The TXS RPS/ESPS at ONS is designed such that the operator is not required to take any action prior to the time specified in Reference 6.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27Y	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Sections 6.2 and 7.2, Manual Control.	6.2 Means shall be provided in the control room to implement manual initiation at the division level of the automatic protective actions. This means shall minimize the number of discrete operator manipulations, and shall depend on the operation of a minimum of equipment consistent with the constraints of 5.6.1. 7.2 If manual control of any actuated component in the execute features is provided, the additional design features necessary to accomplish such manual control shall not defeat requirements 5.1 and 6.2. Capability shall be provided to receive and act upon manual control signals from the sense and command features consistent with the design basis.	This is addressed in TXS Topical Report Section 7.16. Means are provided in the control room for manual reactor trip at the system level, and emergency safeguards actuation at the channel level. Requirements to perform operator manual actions remain minimal. The manual actuation of reactor trip is performed by a hard-wired pushbutton on the MCB, bypassing the TXS trip logic and directly connected to the control circuits of the trip breakers. Depressing the manual TRIP/RESET pushbutton will initiate a TRIP signal to the associated ESPS Channel in two ways: (1) via an input to the TXS Channel logic, and (2) directly to the associated Channel output relays bypassing the TXS. The manual or automatic TRIP signal can be reset by depressing the associated Channel RESET button. These ESPS manual actuation paths do not pass through the TXS software and therefore, are not dependent on the correct functioning of the software. Manual control of individual ESF components is provided using AUTO/MANUAL switches that bypass the TXS platform. Each of the eight ESPS logic channels will have an individual AUTO/MANUAL selector switch. Once an ESPS signal is actuated, the AUTO light on this switch is illuminated while automatic ESPS operations proceed to completion. However, if it is desired to take manual control of an individual component, the MANUAL mode may be selected, after which the individual components associated with that channel may be operated from their normal component control switches. ESPS Channels 1 and 2 Load Shed AUTO/MANUAL switches will allow the Load Shed logic to remain enabled even if the operator selects MANUAL on the AUTO/MANUAL switch for Channels 1 and 2.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27Z	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 6.3, Interaction Between the Sense and Command Features and Other Systems.	6.3.1 Where a single credible event, including all direct and consequential results of that event, can cause a non-safety system action that results in a condition requiring protective action, and can concurrently prevent that action, [either alternate channels or equipment shall be provided that is not subject to failure caused by the same event.]	An initiating event in a non-safety system that results in a DBE, and also could prevent proper action of a RPS/ESPS function to mitigate the event, will be mitigated by an associated backup function. Failures of non safety related SSC's have been evaluated on the replacement RPS/ESPS. No adverse affects were identified.
27Z		6.3.2 Provisions shall be included so that the requirements in 6.3.1 can be met in conjunction with the requirements in 6.7 if a channel is in maintenance bypass. These provisions include reducing the required coincidence, defeating non-safety signals taken from redundant channels, or initiating protective action from the bypassed channel.	The ONS RPS has 4 channels with only 3 required by Technical Specifications. One channel can be placed in maintenance bypass, and the remaining three will perform all protective functions while continuing to meet the single-failure criterion. In this case the coincidence logic is 2/3 instead of the normal 2/4. With one channel bypassed the RPS will continue to meet the single failure and channel independence criteria. The ONS ESPS has 2 sets of 3 channels with only one set being required by Technical Specifications. All three channels of a redundant set can be removed from service for maintenance. With one channel or set of channels bypassed the ESPS will continue to meet the single failure and channel independence criteria. Individual RPS and ESPS channels can also be placed in a "TRIP" condition, if necessary, by using the RPS or ESPS logic Channel Trip keylock switches.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27AA	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 7.3, Completion of Protective Action.	The design of the execute features shall be such that once initiated, the protective actions shall go to completion. This does not preclude the use of equipment protective devices identified in 4.11, nor provision for deliberate operator interventions. When the sense and command features reset, the execute features shall not automatically return to normal; they shall require separate, deliberate operator action to be returned to normal. After the initial protective action has gone to completion, the execute features may require manual control or automatic control (i.e., cycling) of specific equipment to maintain completion of the safety function.	When the TXS RPS signals a reactor trip, the CRD breakers are opened and the reactor is tripped immediately. No provision for operator intervention is provided. The operator will proceed according to the procedural guidance in the Emergency Operating Procedure (EOP). Both RPS and ESPS reset functions require at least two separate and deliberate operator actions to return the system to normal following a trip. No reset button actuation will result in an actuated device changing back to its non-actuated state. When the TXS ESPS signals an ESF actuation signal, the system actuations will go to completion automatically. Should deliberate operator action be desired, Auto/Manual switches are provided, as described in the response to RAI 27J, above. These switches allow individual components to be controlled manually as necessary in the event manual operator action is required. In addition, the ONS TXS ESPS will feature two ESPS Emergency Override pushbuttons in order to allow manual control for software common mode failures, as described in Section 21 of Reference 9. These pushbuttons de-energize power to all odd or even output relays at the system level, in order to allow manual control.
27AB	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 6.4, Derivation of System Inputs.	To the extent feasible and practical, sense and command feature inputs shall be derived from signals that are direct measures of the desired variables as specified in the design basis.	The variables used for RPS and ESPS are the same as those currently being used at ONS. For RPS and ESPS trip functions credited as primary protection in the DBE analyses, inputs are derived from signals that are direct measures (e.g., neutron flux, pressure, temperature, and flow) of the parameters of interest, as specified in Reference 4. For backup and anticipatory trips, inputs may be derived from diverse and indirect measures (e.g. RCP motor current in lieu of RCS flow), which are specified as the desired variables per References 5, 6, and 9.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27AC	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 6.5, Capability for Testing and Calibration.	Means shall be provided for checking with a high degree of confidence the operational availability of each sense and command feature input sensor required for a safety function during reactor operation, by: (1) perturbing the monitored variable, (2) using a substitute input to the sensor of the same nature, (3) cross-checking between channels that bear a known relationship to one another.	This is addressed in TXS Topical Report Section 7.7. Calibrations will be performed on the frequency given in the ONS TSs. These calibrations will be performed by using either perturbing the monitored variable or substituting input techniques. Cross checking of channels is performed as follows. Equivalent analog signals of different measuring channels (i.e., redundant channels) will be continuously compared with each other to detect and monitor channel signal deviations. This includes the entire instrument chain consisting of sensor, transducer, input signal module and the associated equipment for signal transfer. If the signals are not within a pre-defined tolerance range, this condition is alarmed on the Unit Statalarm and input to the plant OAC. Channel deviations are not excluded from processing in the safety calculations.
27AD	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Sections 6.6 and 7.4, Operating Bypasses.	6.6/7.4 Whenever the applicable permissive conditions are not met, a safety system shall automatically prevent the activation of an operating bypass or initiate the appropriate safety function(s).	The design of the TXS RPS/ESPS for ONS includes one Operating Bypass; the RPS Shutdown Bypass, which is described in Section B.1.a of Attachment 3 to Reference 3. The position of the Shutdown Bypass switch in each channel is alarmed on the Statalarm panel in the control room. The permissive conditions for using the Shutdown Bypass are that the NI power range signal is ≤5% and the RCS narrow range pressure signal is ≤1720 psig. If the shutdown bypass keyswitch on an RPS train is moved to the Bypass position when these permissive conditions do not exist, then a reactor trip signal from that train is generated.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27AE	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Sections 6.7 and 7.5, Maintenance Bypass.	6.7 Capability of a safety system to accomplish its safety function shall be retained while equipment is in maintenance bypass. During such bypass operation, the features shall continue to meet the requirements of 5.1 and 6.3 (single failure and freedom from system interactions). 7.5 Portions of the execute features with a degree of redundancy of one shall be designed such that when a portion is placed in maintenance bypass (reducing its degree of redundancy to zero), the remaining portions provide acceptable reliability.	This is addressed in TXS Topical Report, Section 7.20. The placement of a channel into Bypass is administratively controlled by the plant operations staff. Placement of a channel into Bypass requires physical access to the channel and can not be done remotely. (Physical access via locked cabinets is also administratively controlled). The TXS RPS is designed with the capability to permit any channel to be placed into BYPASS during power operation without initiating a protective action at the system level. The ONS RPS has four redundant channels Placing a channel into BYPASS causes the RPS to go into a 2 out of 3 configuration. Provisions have been made to allow maintenance bypass of one of the ESPS voter subsystems provided the redundant voter subsystem is operable. When a channel/voter is in bypass, the remaining channels/voters are sufficient to provide protective action while continuing to meet the single failure criterion.
27AF	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 6.8, Setpoints.	The allowance for uncertainties between the process analytical limit documented in Section 4.4 and the device setpoint shall be determined using a documented methodology. Refer to ISA S67.040-1987.	This is addressed in TXS Topical Report Section 7.21. The RPS/ESPS System Instrument Setpoint Calculations, Instrument Accuracy Calculations, and Instrument Uncertainty Calculations will be updated as a result of the TXS modification. These calculations will employ a setpoint uncertainty methodology that follows the guidance in ISA S67.04-1994, as endorsed by RG 1.105, Rev. 2.
27AF		Where it is necessary to provide multiple setpoints for adequate protection for a particular mode of operation or set of operating conditions, the design shall provide positive means of ensuring that the more restrictive setpoint is used when required.	Multiple setpoints are used in the ONS TXS design, in RPS Functions 1 and 5. In each case, positive means are provided to ensure that the more restrictive setpoint is used when required. This is achieved through the use of a Shutdown Bypass keyswitch feature, which shall automatically insert the more restrictive setpoints when preparing to enter a shutdown. This feature is described in more detail in Section B.1.a of Attachment 3 to Reference 3. See also the response to RAI 27AD, above.

RAI No	RAI	IEEE 603-1991 Requirements	Response
27AG	Show how the Teleperm XS RPS/ESPS system as installed at Oconee will comply with Section 8, Power Source Requirements.	Class 1E power systems that are required to provide power to facets of the safety system are governed by the criteria of this standard (603-91), and are considered a portion of the safety systems.	No modifications were made to accommodate the replacement RPS/ESPS.
27AG		The capability of the safety systems to accomplish their safety functions shall be retained while power sources are in maintenance bypass. Portions of the power sources with a degree of redundancy of one shall be designed such that when a portion is placed in bypass (reducing its degree of redundancy to zero), the remaining portions provide acceptable reliability.	Each RPS or ESPS channel is fed by an Absopulse Power supply consisting of four 500 watt internal power supply modules, for a total power availability of 2000 watts. Each channel consumes less than 1000 watts, therefore a reserve of 100% is normally provided. Should one of the modules be removed, the remaining three modules will provide full power for the channel load with approximately 50% reserve capacity. Thus, even if two modules are removed simultaneously, the channel would retain operability. All power supply modules are hot swappable and can be replaced without affecting the redundant modules. It is not necessary to reduce the degree of redundancy to zero in order to perform maintenance on any component of the power supply. If for some reason, the entire channel must be powered down for maintenance, the remaining channels are capable of performing the required protective functions.

REFERENCES:

1. Siemens Power Corp Topical Report EMF-2110(NP), Rev. 1; "TELEPERM XS: A Digital Reactor Protection System"

2. USNRC; Safety Evaluation by the Office of Nuclear Reactor Regulation – Siemens Power Corporation Topical Report EMF-2110(NP), Rev. 1; ADAMS Accession No. ML003711856

3. License Amendment Request for Reactor Protective System/Engineered Safeguards Protective System Digital Upgrade, Technical Specification Change (TSC) Number 2004-09; ADAMS Accession No. ML050550470

4. ONS UFSAR; Chapter 7, "Instrumentation and Control" and Chapter 15, "Accident Analysis"

5. OSS-0254.00-00-2002, Revision 8, Reactor Protection System Design Basis Specification

6. OSS-0254.00-00-2003, Revision 12, Engineered Safety Features Actuation System Design Basis Specification

7. OSS-0311.00-00-0013, Reactor Protective System (RPS) Replacement Project Specification

8. OSS-0311.00-00-0012, Engineered Safeguards Features Actuation System (ESPS) Replacement Project Specification

9. OSC-8623, Rev. 2, "RPS & ESPS System Functional Description"

10. FANP Report. 66-5015893; "TXS Supplemental Equipment Qualification Summary Test"

11. OSS-0254.00-00-4005, Rev. 13; "Design Basis Specification for the Design Basis Event"

12. EM-4.17, Rev. 0; "Human Factors Engineering Procedure"

Attachment 2
Updated List of NRC Commitments
(from Duke Letters dated October 6, 2005 and November 3, 2005)

RAI	Commitment	Status
1.D	The final approved SDQA document is in preparation, review and approval and is expected to be issued by December 1, 2005. Duke will provide the final approved plan when issued. [Note: In the context used "final approved" means Revision 0 to the approved plan.]	Provided Rev. 0 11/30/05
1.F	The Software Safety Analysis Plan is in preparation, review, and approval and is expected to be issued by October 31, 2005. Duke will provide a copy of the plan when issued.	Provided 11/2/05
1.H	These documents are in preparation, review, and approval and are expected to be issued by the dates indicated below: iv. Implementation Specification — January 28, 2006 v. Integration Plan — November 30, 2005 vi. Test Plan — November 30, 2005 Duke will provide these documents when they are issued.	Integration and Test Plans provided 11/30/05
1.I	Software Design Reviews and Source Code Reviews are performed in later Software Life-cycle phases and are expected to be issued by October 31, 2005, and December 16, 2005, respectively. Duke will provide these documents when they are issued. The Verification and Validation Report is being provided in phases and are in preparation, review, and approval and are expected to be issued by: 1) design phase - November 15, 2005 2) implementation - January 30, 2006 3) testing phase – May 4, 2006 Duke will provide these reports when they are issued.	Design phase V&V report provided 11/30/05
1.J	The FAT Plan, FAT Procedure, and FAT Report are expected to be issued by the dates indicated below: FAT Plan — November 30, 2005 FAT Procedure — February 28, 2006 FAT Report — May 4, 2006 Duke will provide the FAT Plan, Procedure, and Report when issued.	FAT Plan provided 11/30/05

Updated List of NRC Commitments
(from Duke Letters dated October 6, 2005 and November 3, 2005)

RAI	Commitment	Status
1.J	The Site Acceptance Test (SAT) Plan, SAT Procedure, and SAT Report are expected to be issued by the dates indicated below: SAT Plan February 28, 2006 SAT Procedure March 28, 2006 SAT Report June 30, 2006 Duke will provide the SAT Plan, Procedure, and Report when they are issued.	In progress
1.K	The Oconee User Instruction Manual is in preparation, review, and approval and is expected to be issued by December 15, 2005. Duke will provide this document when it is issued.	In progress
1.K	Duke will submit an explanation of what training has been provided by FANP to Duke by November 3, 2005.	Provided 11/3/05
1.K	Training for control room operators, I&C maintenance personnel and plant engineering is being developed as part of the modification process. Duke will provide additional explanation of this training by January 12, 2006.	In progress
1.L	The requirements matrix is a living document, and is updated at the end of each V&V phase. Duke expects to issue the next updates by February 14, 2006, and May 4, 2006. Duke will provide these updates when they are issued.	In progress
1.O	The FMEA is in preparation, review, and approval and is expected to be issued by December 15, 2005. Duke will provide a copy of the FMEA when it is issued.	In progress
1.Q	These calculations (Setpoint) require revision as a result of the RPS/ESPS digital modification. The revised calculations will address any margin gains or losses. The required revisions are in preparation, review, and approval and are expected to be issued by December 31, 2005. Duke will provide a summary of the results of the revised calculations when issued.	In progress
1.R	Additional information related to the qualification of the SIVAT simulation tool is in preparation and will be submitted as a revision to this RAI response by December 1, 2005.	Provided 11/3/05

Updated List of NRC Commitments
(from Duke Letters dated October 6, 2005 and November 3, 2005)

RAI	Commitment	Status
1.T	The Software Installation Plan is in preparation, review, and approval and is expected to be issued by December 31, 2005.	In progress
1.U	The Software Safety Plan is in preparation, review, and approval and is expected to be issued by November 30, 2005.	Provided 11/2/05
1.V	Duke will provide a date when Software Operations Plan can be provided by November 3, 2005.	Provided 11/3/05
4.A & 4.C	The response to RAI 4.A and 4.C will be included in Duke's response to RAI 30. The response to RAI 4.B is in preparation and will be submitted by November 3, 2005.	Provided 11/3/05
4.B	Test Report # 968/K 110.00/02 is currently being translated from German to English. Duke will provide this document to the NRC staff when it is available.	Provided 11/30/05
4.B	A qualification summary report addressing Oconee specific equipment such as relays, breakers, transmitters, etc., is in preparation, review and approval and is expected to be issued by December 22, 2005. Duke will provide this document when it is issued.	In progress
6	Duke will respond to the question related to channel independence in our response to RAI-27. [Note – this question was addressed in response to RAI 6.]	Provided 11/3/05
6	Duke's response to the question related to communications and data exchange is in preparation and will be submitted by November 3, 2005.	Provided 11/3/05
7c	Duke will submit more information regarding the hardware solution by November 3, 2005.	Provided 11/3/05
10	Duke provided a preliminary response to this question on June 30, 2005. After discussions with the staff on August 17, 2005, Duke agreed to revise this response. The response to this RAI is in preparation and will be submitted by November 3, 2005.	Provided 11/3/05
15	The response to this RAI is in preparation and will be submitted by December 1, 2005.	Provided 11/3/05
18	The response to this RAI is in preparation and will be submitted by January 12, 2006. Duke will provide the system response time reports to NRC (expected to be submitted by May 4, 2006).	In progress

Updated List of NRC Commitments
(from Duke Letters dated October 6, 2005 and November 3, 2005)

RAI	Commitment	Status
21,22	Duke discussed the preliminary response provided to the draft RAI in the August 17, 2005, Duke/NRC RAI meeting and agreed to revise this response. This response is in preparation and will be submitted by November 3, 2005.	Provided 11/3/05
27	The response to this RAI is in preparation and will be submitted by December 1, 2005.	Provided 12/1/05
29	The response to this RAI is in preparation and will be submitted by December 1, 2005.	Provided 11/3/05
30	The response to this RAI is in preparation and will be submitted by December 1, 2005.	Provided 11/3/05
31	The response to this RAI is in preparation and will be submitted by December 1, 2005.	Provided 11/3/05