



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555 - 0001**

March 7, 2003

Mr. Farrokh Shokooh
President and CEO
Operation Technology, Incorporated
23692 Birtcher Drive
Lake Forest, California 92630

**SUBJECT: NRC INSPECTION REPORT 99901350/2003-201 and
NOTICE OF NONCONFORMANCE**

Dear Mr. Shokooh:

On January 6-8, 2003, U.S. Nuclear Regulatory Commission (NRC) inspectors conducted an inspection at the Operation Technology, Incorporated (OTI), facility in Lake Forest, California. The enclosed report presents the details of that inspection.

The NRC inspectors reviewed the implementation of selected portions of the OTI quality assurance program, and evaluated the effectiveness and control of OTI's electrical transient analyzer program ETAP® PowerStation® (ETAP-PS) software that is used at more than 30 NRC licensed nuclear power plant facilities. During this inspection, the NRC inspectors reviewed original equipment manufacturers' (OEM's) technical information examples and the process that OTI has established and implemented for ensuring adequate and appropriate verification and validation of its ETAP-PS library design bases.

The inspectors concluded that the control of OTI's electrical transient analyzer program software was generally acceptable. The inspectors acknowledged OTI's effectiveness in the manner in which OTI implemented a continuous software process improvement program, and performed root cause determinations to address software and system errors in a systematic manner. The inspectors concluded that OTI's software lifecycle processes and the continuous improvement of those processes are generally consistent with the guidance provided in Branch Technical Position HICB-14 of NUREG 0800 and 10 CFR Part 50 Appendix B requirements.

The NRC inspectors found that the establishment and implementation of OTI's quality assurance program failed to meet certain NRC requirements imposed on you by your customers. Specifically, the inspectors determined that compliance with 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," that was contractually imposed on OTI by its nuclear utility customers was not met in certain areas. These failures to comply are characterized as nonconformances and are cited in the enclosed Notice of Nonconformance (NON). The circumstances surrounding them are described in the enclosed report. You are requested to respond to the nonconformances and should follow the instructions specified in the enclosed NON when preparing your response.

Additionally, you are requested to determine whether any of the identified nonconformances or concerns that were identified by the inspectors should be reviewed and dispositioned by OTI in accordance with your 10 CFR Part 21 program to determine whether end users need to be informed of any deviations so they may cause an evaluation, as defined in §21.21 of 10 CFR Part 21, to be performed.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be placed in the NRC's Public Document Room (PDR).

Sincerely,

/RA/

Theodore R. Quay, Chief
Equipment and Human Performance Branch
Division of Inspection Program Management
Office of Nuclear Reactor Regulation

Docket No. 99901350

Enclosures: 1. Notice of Nonconformance
2. Inspection Report 99901350/2003-201

cc: Ms. Nazan Roshdieh
Quality Assurance Manager
Operation Technology, Incorporated
23692 Birtcher Drive
Lake Forest, California 92630

Mr. Shokooch

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March 7, 2003

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Quality Assurance Manager
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23692 Birtcher Drive
Lake Forest, California 92630

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NOTICE OF NONCONFORMANCE

Operation Technology, Incorporated
Lake Forest, California 92630

Inspection Report 99901350/2003-201

Based on the results of an inspection conducted on January 6 through 8, 2003, it appeared that certain of Operation Technology, Incorporated (OTI's) activities were not conducted in accordance with NRC requirements.

- A. Criterion I, "Organization," of 10 CFR Part 50, Appendix B, stated in part, The applicant [or designee] shall be responsible for the establishment and execution of the quality assurance program . . . The quality assurance functions are those of (a) assuring that an appropriate quality assurance program is established and effectively executed and (b) verifying, such as by checking, auditing, and inspection, that activities affecting the safety-related functions have been correctly performed.

Criterion V, "Instructions, Procedures, and Drawings," of 10 CFR Part 50, Appendix B, stated in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Instructions, procedures, or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

1. Contrary to the above, as of January 8, 2003, OTI had not established appropriate quality assurance program controls/procedures to ensure that original equipment manufacturer's (OEM's) technical data, that it obtained from entities other than applicable OEMs, was verified to assure its accuracy, correctness and completeness before inputting the OEM data into its ETAP® PowerStation® (ETAP-PS) software library design bases.

Nonconformance 99901350/2003-201-01.

- B. Criterion III, "Design Control," of 10 CFR Part 50, Appendix B, stated in part, Measures shall be established to assure that applicable regulatory requirements and the design basis . . . are correctly translated into specifications, drawings, procedures, and instructions. These measures shall include provisions to assure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled.

Criterion V, "Instructions, Procedures, and Drawings," of 10 CFR Part 50, Appendix B, stated in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings . . . and shall be accomplished in accordance with these instructions, procedures, or drawings.

Criterion XVII, "Quality Assurance Records," of 10 CFR Part 50, Appendix B, stated in part, Sufficient records shall be maintained to furnish evidence of activities affecting quality. The records shall include at least the following: Operating logs and the results of reviews, inspections, tests, audits, monitoring of work performance, and materials analyses.

1. Contrary to the above, as of January 8, 2003, OTI had failed to ensure that original equipment manufacturer's (OEM's) technical data, that it obtained from entities other than applicable OEMs, was verified in accordance with documented procedures to assure its accuracy, correctness and completeness before inputting the OEM data into its ETAP-PS software library design bases, and failed to ensure that sufficient QA records were maintained for objective evidence of activities affecting quality. Examples of manufacturer's technical data that OTI obtained from other entities included:
 - 3M Firewrap® Values
 - TSI Thermo-Lag® Values
 - Westinghouse Overload Heater Values

Nonconformance 99901350/2003-201-02.

2. Contrary to the above, OTI failed to ensure that its ETAP-PS library ampacity derating design data for "free air" licensee applications was the same as that specified in the Insulated Cable Engineers Association (ICEA) Standard P-46-426 for free air values

Nonconformance 99901350/2003-201-03.

3. Contrary to the above, as of January 8, 2003, OTI could not provide adequate objective evidence which indicated their regression test verified the adequacy of ETAP-PS version 4.0.0N even though it was corrected by TCS-CAB-016.

Nonconformance 99901350/2003-201-04.

- C. Criterion XI, "Test Control," of 10 CFR Part 50, Appendix B stated, [a] test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents . . . Test results shall be documented and evaluated to assure that test requirements have been satisfied.

1. Contrary to the above, as of January 8, 2003, OTI failed to ensure that adequate records were developed and maintained to provide objective evidence of test results. Specifically, test results for two tests, TIR-CABLE-190 and TCS-CAB-016 (TPS-CAB-016), did not contain adequate documentation in their applicable test packages to provide evidence of satisfactory test performance to assure that test requirements had been satisfied.

Nonconformance 99901350/2003-201-05.

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555, with a copy to the Chief, Equipment and Human Performance Branch, Division of Inspection Program Management, Office of Nuclear Reactor Regulation, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each nonconformance: (1) a description of steps that have been or will be taken to correct these items; (2) a description of steps that have been or will be taken to prevent recurrence; and (3) the dates your corrective actions and preventive measures were or will be completed.

Dated at Rockville, Maryland
this 7th day of March 2003

1 INSPECTION SUMMARY

The purpose of this inspection was to evaluate the quality assurance (QA) program implementation regarding Operation Technology, Incorporated (OTI) control of selected portions of ETAP-PS software data; 10 CFR Part 21 activities; and to review concerns regarding Point Beach nuclear power plant applications of ETAP-PS software. The inspection was conducted at OTI's office facility in Lake Forest, California. The inspection bases were:

- Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Part 50 of Title 10 of the Code of Federal Regulations (Appendix B)
- 10 CFR Part 21, "Reporting of Defects and Noncompliance"
- Branch Technical Position HICB-14, "Guidance on Software Reviews for Digital Computer-Based Instrumentation and Control Systems," from Appendix 7-A, "Branch Technical Positions," of NUREG 0800, "Standard Review Plan"

The inspectors identified five nonconformances regarding Criterion I, "Organization," of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," of 10 CFR Part 50, Appendix B, and Criterion XVII, "Quality Assurance Records," of 10 CFR Part 50, Appendix B.

2 STATUS OF PREVIOUS INSPECTION FINDINGS

There have not been any NRC inspections or technical reviews performed at the OTI facility prior to this inspection.

3 INSPECTION FINDINGS AND OTHER COMMENTS

3.1 10 CFR Part 21 Program

a. Inspection Scope

The NRC inspectors reviewed OTI's documents and records related to the implementation of its program that had been established to comply with the requirements of 10 CFR Part 21.

b. Observations and Findings

The NRC inspectors found that OTI's program generally ensured that "deviations and failures to comply," as discussed in 10 CFR Part 21, are either evaluated or passed on to OTI's end users so they may cause an evaluation to be performed. Section 3.2.3, "Corrections and deficiencies," of OTI's ETAP® Software Quality Assurance Plan (SQAP) adequately discusses OTI staff responsibilities in handling identified errors, and summarizes the salient 10 CFR Part 21 responsibilities as well as referring OTI staff to Section 8 of OTI's ETAP® PowerStation and PSMS Software Quality Assurance Plan (PS-SQAP). A review of Section 8, "Problem Reporting and Corrective Action," of the PS-SQAP found that it discusses 10 CFR Part 21

requirements in more detail. However, Section 8 was found by the inspectors to need some clarification regarding Part 21 time limits and also needed clarification regarding the

requirements contained in §21.21(b). During the OTI inspection exit meeting, OTI's QA Manager committed to clarify Section 8 of the PS-SQAP within 30 days after receipt of this inspection report.

The inspectors reviewed records which indicated that OTI had been appropriately implementing its Part 21 responsibilities regarding informing end users of deviations. The inspectors found that OTI informs its 10 CFR Part 50, Appendix B customers of deviations and anomalies using ETAP-PS "Error Reporting & Corrective Action" (ERCA) and "Informative Reporting" records. The deviations and anomalies were found to include internally and externally identified deviations/concerns. These sources were found to represent errors found in OTI's library, NRC licensee notifications to OTI, OTI engineering incident reports and tests, and associated sources. The cover letter format used to transmit the error reporting and corrective action documents requested and *"informed the end user that it was required to evaluate the error reported in the letter and inform OTI if we need to make a 10CFR21 report concerning this problem."* Although the inspectors determined that the OTI cover letter met the intent of Part 21, it was noted (as discussed below) that the cover letter narrative (italicized) needed minor clarification. Examples of deviations sent to the ETAP-PS end users included:

- ERCA-PS-00-004, September 28, 2000. Affected ETAP®-PS 3.0.1N and earlier versions, classified as "minor" with reference to engineering calculation. Regarding "uniform ampacity calculation methods," RE: "cable derating module for underground systems." The ERCA discusses the nature of the problem, effect of results, work around, and the corrective action.
- ERCA-PP-02-002, May 21, 2002. Affected PowerPlot v2.5, releases 076 and earlier releases, classified as "minor" with reference to an in-house test incident report that was identified by OTI and sent to the end users for evaluation and engineering action. Regarding "Westinghouse (ABB) C02 relays and General Electric THLC4 - 250, 300, 350, and 400 Thermal Magnetics." The nature of the problem stated: "The Westinghouse (ABB) C02 relay curves in PowerPlot deviate from the manufacturer curves by more than 10%. The Westinghouse relay curves for C02 are based on cycles/current . . . The THLC4 curves for 250, 300, 350, 400 trip amps in PowerPlot deviates from the manufacturer curves by more than 10 percent. The corrective action stated "These problems will be corrected in the next release of PowerPlot."
- ERCA-PS-02-006, May 31, 2002. Affected PowerStation 4.0.0N and 4.0.4N releases regarding "Library data, Fuse," classified as a minor error and discusses the problem with General Electric fuse rating deviations. The corrective action stated was that "this problem will be corrected in the next release of PowerStation."

The inspectors informed OTI that the cover letter for the error reporting and corrective action form appropriately informed the end users that they were responsible for evaluating deviations in accordance with 10 CFR Part 21. However, it was also noted and discussed with the QA

manager that the cover letter which was used to transmit the ERCA forms contained some ambiguities that should be reviewed and revised to ensure that the letter is more concise and correct with the language contained in §21.21(b) of Part 21.

b.1 Potential Part 21 Evaluation/Notification

As a result of the ETAP-PS library data concerns discussed in Section 3.2 below, OTI will be responsible for evaluating the deviations in accordance with §21.21(a) or informing the applicable end users as expressed in §21.21(b) of 10 CFR Part 21 so they may cause an evaluation to be performed.

The 10 CFR Part 50 Appendix B program concerns delineated in Section 3.2 related to OTI accepting for use in its design basis ETAP-PS library original equipment manufacturers' (OEM) technical data from an entity other than the original equipment manufacturer (OEM) without OTI conducting any actions to verify the obtained data was accurate, correct and complete. The inspectors were told that OTI obtained this vendors and others from Tennessee Valley Authority (TVA). Examples of this are discussed in Section 3.2, including: 3.2.1, Overload Heater Values; and 3.2.3, Firewrap Derating Values. The inspectors found that OTI did not have objective evidence indicating that its design basis library data for certain vendor components had been verified by OTI to ensure data accuracy, correctness and completeness.

c. Conclusions

The NRC inspectors concluded that the OTI Part 21 program and procedures that it has adopted to implement the provisions of 10 CFR Part 21 are generally acceptable with only minor procedural clarifications that were noted to OTI. No violations of 10 CFR Part 21 were characterized in this area. However, it was noted to OTI that they are required to evaluate the results of their review of the 10 CFR Part 50, Appendix B concerns identified during this inspection in accordance with 10 CFR Part 21.

3.2 Review of ETAP-PS Technical Data

The inspectors conducted discussions with OTI engineering staff, reviewed technical data for electrical manufacturers' component specifications, compared OTI design basis data with OEM data, conducted telephone discussions with OEMs and licensee personnel to clarify specific technical aspects being reviewed, and reviewed related documents regarding the Point Beach nuclear power plant facility. Included in this review were issues contained in Point Beach corrective action program (CAP) documents CAP029824, "Discrepancies in ETAP[®] Software/Part 21 Concern," dated October 15, 2002; and CAP029744, "Potential Lack of Breaker Coordination for the Alternate Safe Shutdown Bus," dated October 8, 2002. The inspectors reviewed the following issues during this inspection:

3.2.1 Westinghouse Model FH Overload Heaters

a. Inspection Scope

Point Beach CAP029824 identified that the electrical resistance values provided in the ETAP-PS for certain Westinghouse overload heaters did not match the published values from Westinghouse.

b. Observations and Findings

The inspectors verified that OTI received the Westinghouse overload heater, model FH, resistance data from TVA, as stated in Point Beach CAP029824, instead of obtaining it directly from the OEM, Westinghouse. The inspector's review determined that OTI received the Westinghouse FH data on a plain piece of paper that was faxed from TVA. Subsequently, OTI received model H and FH overload heater data from TVA again; however, this subsequent fax was on Cutler-Hammer paper which indicated that it may have come from the responsible vendor, (Cutler-Hammer subsequently purchased the Westinghouse overload heater business). The information that was on the Cutler-Hammer paper was received from TVA on December 31, 2002. Since the Model H heater information was not in the ETAP-PS library, OTI prepared an incident report on December 31, 2002, to add the Model H overload heater data to the ETAP-PS library data.

Although it was determined that overload heater resistance values in the ETAP-PS library are within the maximum and minimum values provided by the manufacturer, it was determined that, for voltage drop calculations, slightly non-conservative results will be obtained using ETAP-PS library data. Therefore, it was noted to OTI that its library values for heaters did not contain both maximum (for voltage drop calculation) and minimum (for short circuit calculation) values, in all cases. For example, shown in the table below are the actual ETAP-PS library values that were found as compared to the actual minimum and maximum values that were expressed on the manufacturer's specification sheets.

Overload Heater Model	ETAP-PS Library Value (Resistance in Ohms)	Cutler-Hammer Data (Resistance in Ohms)	
		Minimum	Maximum
FH03	21.0	20.4	21.6
FH04	16.7	16.2	17.2
FH05	13.3	13.1	13.5
FH06	10.9	10.5	11.2
FH07	8.55	8.3	8.8
FH08	6.97	6.7	7.23
FH09	5.49	5.27	5.7

Overload Heater Model	ETAP-PS Library Value (Resistance in Ohms)	Cutler-Hammer Data (Resistance in Ohms)	
		Minimum	Maximum
FH10	4.58	4.36	4.80
FH15	1.92	1.80	2.04
FH45	0.013	0.0122	0.0134
FH50	0.005	0.00449	0.00497
FH55	0.002	0.00210	0.00232
FH57	0.00183	0.00174	0.00192
FH72	0.00977	0.00938	0.01015
FH78	0.004	0.00379	0.00409
FH80	0.003	0.00280	0.00302
FH88	0.001038	0.001023	0.001108

The inspectors asked OTI what actions it had performed and what objective evidence they could offer showing OTI's verification of the OEM data. Specifically, the inspectors asked whether OTI performed any quality assurance program actions such as, source evaluation, verifying/checking the adequacy and completeness of OEM data, engineering reviews or comparisons, auditing or other activities that would provide objective evidence of the acceptability of OEM's technical specifications from second and third party entities. This area was considered important because the OEM's technical data is used in ETAP-PS software, which is used in design basis calculations at NRC licensed facilities. If incorrect, it could affect the adequacy of plant design bases.

The inspectors found that the TVA supplied overload heater resistance data only contained a nominal value as compared with the minimum and maximum values that were supplied directly by the Cutler Hammer overload heater division (formerly a division of Westinghouse). Discussions with the OTI quality assurance manager determined that OTI did not perform or establish any measures to ensure that it performed independent verification of OEM data obtained from entities other than the OEM, such as TVA. The OTI staff stated that since the OEM's technical data came from TVA, an NRC licensee, they did not believe that any action was necessary to verify the accuracy, correctness or completeness of the TVA supplied data. As a result, OTI did not take any action to assess the effectiveness of the TVA quality assurance program controls that were used to control and supply the OEM technical data to OTI. As a result, the NRC inspectors were concerned about the effectiveness of OTI's quality assurance program control used to ensure the accuracy, completeness, and correctness of OEM technical information in its ETAP-PS library.

c. Conclusions

Although the overload heater resistance values in the ETAP-PS library were found to be within the maximum and minimum values provided by the manufacturer, it was expected that voltage drop calculations would be slightly non-conservative using the ETAP-PS library data because its library values for heaters did not contain both maximum (for voltage drop calculation) and minimum (for short circuit calculation) values, in all cases. Therefore, the inspectors concluded that OTI has not adequately verified all of the manufacturer's technical specifications used in its software. This is an example of Nonconformance 99901350/2003-201-01 and 02.

3.2.2 Cable Ampacity Values

a. Inspection Scope

Point Beach CAP029824 stated that the ETAP-PS library values for electrical cable ampacity values are different from those used at Point Beach even though both entities use the same Insulated Cable Engineers Association (ICEA) Standard P-46-426 values.

b. Observations and Findings

The inspectors conducted discussions with OTI engineering staff, reviewed cable ampacity values, and compared the ETAP-PS library values to the ICEA Standards ampacity values. The inspectors reviewed library data for the cable ampacity values for different size cables and applications, such as values for: Duct Bank, Buried cable, Free Air, and Conduit in free air. The inspectors determined that the base ampacity values obtained from the ETAP-PS library corresponded with ICEA ampacity values for all values sampled except for some free air applications. The inspectors informed OTI that it should review its library data for the free air application to determine whether they need to take any action applicable to 10 CFR Part 21. The ampacity values identified in the library were:

Ampacity Values From ETAP-PS Library and Ampacity Values From ICEA P-46-426

	Base Ampacity for 3/C - 500 MCM Copper, 8kV			
	Duct Bank	Buried	Free Air	Conduit in Free Air
ETAP-PS	449	560	536	458
ICEA P-46-426	449	560	536	458

	Base Ampacity for 3/C - #2 AWG Copper, 8kV			
	Duct Bank	Buried	Free Air	Conduit in Free Air
ETAP-PS	147	187	159	143
ICEA P-46-426	147	187	159	143

	Base Ampacity for 3/C 500 MCM Copper, 600 V			
	Duct Bank	Buried	Free Air	Conduit in Free Air
ETAP-PS	429	531	425	425
ICEA P-46-426	429	531	487	425

	Base Ampacity for 3/C - #2 AWG Copper, 600V			
	Duct Bank	Buried	Free Air	Conduit in Free Air
ETAP-PS	133	178	123	123
ICEA P-46-426	133	178	138	123

	Base Ampacity for 1/C - #2 AWG Copper, 8kV			
	Duct Bank	Buried	Free Air	Conduit in Free Air
ETAP-PS	178	219	195	0
ICEA P-46-426	178	219	195	N/A

	Base Ampacity for 1/C - #2 AWG Copper, 600V			
	Duct Bank	Buried	Free Air	Conduit in Free Air
ETAP-PS	176	231	130	0
ICEA P-46-426	176	231	192	NA

c. Conclusions

The inspectors informed OTI that it needed to verify the correctness of its ampacity values for free air applications against the ICEA Standard. The incorrect value is considered as an example of a QA process control implementation weakness in the OTI design control area. Nonconformance 99901350/2003-201-03 was identified in this area.

3.2.3 Firewrap Derating Values

a. Inspection Scope

Point Beach CAP029824 stated that the ETAP-PS library data for electrical cable Firewrap® derating values are from TVA, not the vendors [3M and TSI], and are different from the values listed in [the Point Beach] Design Guide E-09.

b. Observations and Findings

The inspectors determined that the ETAP-PS library contains only two fire protection encapsulation type components, 3M type 20A Firewrap® and Thermal Science, Incorporated Thermo-Lag®. However, the inspectors determined that performing a comparison of the ETAP-PS library data to the Point Beach design guide data would not be appropriate because neither product is used at Point Beach.

However, it was noted during discussions with OTI staff that both fire resistant products technical specification data was also obtained from TVA instead of the applicable OEMs. Although neither Firewrap® nor Thermo-Lag® is used at Point Beach, the inspectors performed a review of this area relevant to the source and control of the OEM data by OTI. The inspectors conducted discussions with OTI to assess OTI's control of the technical data from TVA. OTI stated that it did not take any action to verify the accuracy, correctness, nor completeness of the Thermo-Lag® or Firewrap® technical data either directly through a verification process of the supplying entity or by obtaining the data from the OEM.

c. Conclusions

The inspectors determined that the CAP029824 statements regarding the firewrap library information compared to the Point Beach firewrap design guide could not be correlated because the 3M Type 20A or TSI products were not used at Point Beach. However, the inspector's review of OTI's library data source for the firewrap material determined that OTI did not take any steps to verify the incoming OEM's product data. This was characterized as an example of safety-related component design parameters that OTI assumed was correct, complete and accurate for use in its ETAP-PS software without performing verification activities. This is an additional example of Nonconformance 99901350/2003-201-01 and 02.

3.2.4 Device Time Current Characteristic Curves (TCCs)

Point Beach CAP029824 stated that the ETAP-PS library electrical device TCCs for Westinghouse Amptector 1A, ABB K-DON Power Shield Breakers, Busmann® Fusetron FRN-R Fuses, and C&D Batteries did not match the published vendor curves.

3.2.4.1 Westinghouse Amptector 1A

a. Inspection Scope

Point Beach CAP029824 stated that the settings in the ETAP-PS program are not fully adjustable over the complete range which represented a software program limitation.

b. Observations and Findings

The inspectors reviewed records associated with Amptector 1A and conducted discussions with OTI personnel. The inspectors determined that ETAP-PS Power Plot version 2.5, Release 056 did not include all of the manufacturer's field settings. It was determined that a subsequent

version, ETAP-PS 4.0.4 Release 076 dated May 16, 2002, was enhanced to include additional settings. The Amptector 1A TCCs, obtained from Westinghouse, matched the ETAP-PS TCC values with some deviation noted. Although the issue in the CAP was confirmed by the inspectors, this represented an ETAP-PS capability function limitation; not a nonconformance.

However, a different concern was identified by the inspectors. The inspectors revealed that OTI engineers could accept up to a 13% deviation between the vendor information and data in the ETAP-PS library. The inspectors considered this to be an excessive amount of deviation but did not review the appropriateness of the 13% deviation nor the circumstances surrounding the acceptability during this inspection. Therefore, the issue of the 13% allowable deviation in this area needs to be reviewed by OTI in accordance with §21.21 of 10 CFR Part 21 to determine whether end users need to be informed of this matter.

c. Conclusions

The inspectors concluded that the statement regarding Amptector 1A on Point Beach CAP029824 was correct, in that the settings were not fully adjustable over the complete range for the software version in effect at the time and that the limited software capability was corrected in a subsequent software version release.

The inspectors identified that although the issue in the CAP was confirmed, it represented an ETAP-PS capability function limitation; not a nonconformance. In addition to the issue raised in the CAP, the inspectors were concerned about the acceptability and appropriateness of an OTI allowed 13% deviation. As a result, the inspectors discussed this matter with OTI and requested OTI to review the matter to determine the appropriateness of the 13% value.

3.2.4.2 ABB K-DON Power Shield Breakers

a. Inspection Scope

Point Beach CAP029824 stated that the ETAP-PS curve does not match the vendor curve.

b. Observations and Findings

The inspectors reviewed records associated with the ABB K-DON Power Shield Breakers and conducted discussions with OTI personnel. The inspectors evaluated the ETAP-PS library data for two K-DON breakers, breaker OB52-53B (ITE SS-4, K-DON, Sensor -4000A, Current Setting 1.0, LT Band Intermediate, Inst. NA, STPU -3 with Maximum delay) and breaker OB52-56B (ITE SS-4, K-DON, Sensor -4000A, Current Set- 0.8, LT Band -Intermediate, Inst. - NA, STPU -2 with intermediate delay).

The inspectors determined that the OEM's TCCs corresponded to the ETAP-PS library. The ETAP-PS software program appeared to plot the above two breakers correctly (there was a limited trip time coordination margin for the two breakers reviewed that was used at Point Beach). The user is able to change the settings of the breakers for better coordination if needed.

The OTI staff showed the inspectors a letter from ABB that indicated the time current characteristic shifts from threshold to threshold. For example, the time current characteristic for a SS (Power Shield) trip device shows the long time set at 1.0 and if the user selects the 0.6 setting, the curve shifts, in its entirety to the 0.6 setting maintaining the plus and minus 10% relationship around the threshold point. The NRC inspectors contacted the ABB representative who signed the letter and conducted discussions with ABB and OTI staff regarding the time current characteristic shifts that are expected to be seen on the K-DON breakers. The inspectors were satisfied that OTI properly modeled the time current characteristic shifts.

The inspectors evaluated the plot of two General Electric circuit breakers, which had SST and Power Sensor solid state trip devices installed. It was observed that the ETAP-PS plotted the two GE breakers correctly and the coordination was acceptable. The breaker with the SST device coordinated as expected (with limited trip time margin) and the breaker with the Power sensor device did not coordinate (GE TCCs, GES-6020 and GES-6033B).

The inspectors also reviewed issues on Point Beach CAP029744. The CAP discussed circuit breaker coordination conducted by Point Beach engineering using another vendor's software program. CAP029744 indicated that incorrect results would result using the ETAP-PS program and the other vendor's software would provide correct results. However, the inspector's review determined that correct results were obtained using the ETAP-PS program and concluded that the statement in CAP29744 was not correct.

c. Conclusions

The inspectors did not identify any problems with the circuit breaker examples that were processed within the ETAP-PS software program. Further, a comparison of the manufacturer's TCCs to the ETAP-PS TCCs did not identify any significant differences. It was found that breakers' OB52-53B and OB52-56B coordinated, with limited margin, using the ETAP-PS program. No nonconformance was identified in this area.

3.2.4.3 Bussmann® Fusetron FRN-R Fuse

a. Inspection Scope

Point Beach CAP029824 stated that the ETAP-PS library curve for the Bussmann® Fusetron FRN-R fuse did not match the published vendor curve.

b. Observations and Findings

A comparison of TCCs identified that the curves did not match as identified in Point Beach CAP029824. However, further review showed that correlation existed between Power Plot curves and manufacturers' curves at several particular points (i.e., 0.01, 0.1, 1.0, 10, 100, and 1000 seconds). That is, although some sections of the TCCs matched, others did not. It was noted that some of the readings appeared to be non-conservative and this was discussed with the OTI personnel. The inspectors did not attempt to perform any verification for the

intermediate points (e.g., 2 seconds to 8 seconds). As a result of the finding regarding the TCCs, the inspectors informed OTI that it should perform a review of the discrepancies relating to the manufacturers' fuse curves in accordance with its 10 CFR Part 21 program requirements.

c. Conclusions

The inspectors concluded that Bussmann® Fusetron FRN-R fuse curves obtained from the ETAP-PS library did not match the published vendor curves at each point. Since some sections of the TCCs matched and others did not, the inspectors characterized this as a weakness and requested OTI to review its library fuse data obtained from other vendors to determine whether this is an isolated case or other examples exist such that OTI needs to inform its end users of discrepancies in accordance with its 10 CFR Part 21 program.

3.2.4.4 C&D Type LCR-21 Battery Curve

a. Inspection Scope

Point Beach CAP029824 stated that the ETAP-PS library data points for battery ampere-hours did not match the published vendor ampere-hours. However, subsequent discussions with Point Beach engineering determined that the actual concern, which was not stated in CAP029824, was that the ETAP-PS software did not appropriately calculate battery terminal voltage using 1600 amperes for a 1-minute duration.

b. Observations and Findings

The inspectors reviewed documentation and conducted discussions with the OTI personnel. One calculation run as a demonstration for the inspectors determined that the battery terminal voltage was calculated at 105 volts when using the fixed ampere-hour method, with a battery temperature correction of 25C and an aging factor of 1.0. However, when using a battery temperature of 15C and an aging factor of 1.25 for the fixed ampere-hour method, the calculated battery terminal voltage was 99.887 volts. These results confirmed that the ETAP-PS program correctly calculated the terminal voltage.

c. Conclusions

The inspectors concluded that the battery discharge calculation using a fixed ampere-hour method would accurately calculate the terminal voltage. No nonconformances were identified in this area.

3.2.5 Load Flows

a. Inspection Scope

Point Beach CAP029824 indicated that load flows are not the same between different versions of ETAP-PS software. CAP029824 stated that a preliminary electrical system model and load flow calculation was performed using ETAP-PS version 3.0.2N. When version 4.0.N was received, the existing files were converted and the load flow calculation was performed again with different results. CAP029824 indicated that OTI told Point Beach personnel that the results were different because of a change in how low impedance circuits were handled in

version 4.0N. The concern expressed in CAP029824 is that it is not clear that all calculations must be redone when a new version of the ETAP-PS software is issued. CAP029824 further states that “the only action that most users are aware of is to convert the files to the latest version.”

b. Observations and Findings

The inspectors determined that the load flow results obtained from ETAP-PS version 3.0.2N may be erroneous if calculation error messages were obtained (Load flow calculation did not converge in the specified maximum number of iterations and/or Load flow calculation results indicate large power mismatch (>0.1 MW) at buses). For example, the load flow results from ETAP-PS version 3.0.2N with an error message cannot be compared with load flow results from ETAP-PS version 4.0.N with no error message. OTI also indicated to the inspectors that licensees would typically not be required to perform all the calculations when a new version of the ETAP-PS software is issued. However, OTI informs end users in accordance with their Part 21 program when problems are identified.

c. Conclusions

The inspectors did not substantiate that all calculations must be redone when a new version of the ETAP-PS software is issued. The inspectors found that OTI distributes ETAP-PS software to its customers on compact disc (CD) media. The vendor includes on each CD a New Enhancement Capabilities Corrections Report, which summarizes the enhancements, corrections, and added capabilities that were applied to the ETAP-PS software version on that disk. The ETAP-PS customer is responsible for reviewing this report and other included documents to ensure the newest version of ETAP-PS is appropriate for its licensing applications. The inspectors reviewed the New Enhancement Capabilities Corrections Report for ETAP-PS version 4.7.0N, and found the information in the report was presented in a clear, concise, unambiguous manner.

3.2.6 Battery Load Profile

a. Inspection Scope

Point Beach CAP029824 stated that if the battery load profile is outside the published fan curves, higher non-conservative battery voltage results are calculated by the ETAP-PS DC program. CAP029824 stated that OTI was verbally notified of Point Beach’s concern, had concurred, and was resolving this issue.

b. Observations and Findings

An OTI representative performed battery voltage calculations using the load profile shown below.

Load Profile					
Time (min)	1	2	3	59	60
Corrected Load (amps)	1082.36	488.60	457.72	483.88	513.30

The results of the calculated voltages using ETAP-PS 4.0.0 and 4.7.0 were compared with the voltages calculated using an industry battery software program, Battpro®, as shown below.

Calculated Voltage Profile			
	Terminal Voltage in Volts		
Time in Minutes	Using Battpro® 2.1	Using ETAP® 4.0.0 (12/17/01) Fixed Amp =0 (Fixed Amphour)	Using ETAP® 4.7.0 (03/04/02) Fixed Amp =0 (Fixed Amphour)
1	110.34	109.83	109.19
2	116.35	114.24	114.27
3	116.58	114.24	114.27
10	115.93	114.23	114.26
20	115.37	114.22	114.26
30	114.79	114.21	114.25
40	114.39	114.20	113.92
50	113.99	114.18	113.73
57	113.60	114.17	113.52
58	113.55	113.81	113.13
59	113.23	113.40	112.70
60	112.88	113.39	112.63

The Battpro® results were found to be generally equivalent to the ETAP-PS results for Fixed ampere-hour (fixed amp = 0) method. However, the inspectors noted that the calculated voltages using ETAP-PS may vary considerably when using the other method, fixed current (fixed amp = 1).

c. Conclusions

The inspectors concluded that it is possible that higher non-conservative battery voltages can be obtained by end users when using the fixed current (fixed amp =1) method. Conversely, the inspectors noted that acceptable results can be obtained in ETAP-PS when using the fixed ampere-hour method (fixed amp = 0). This area needs to be reviewed in accordance with §21.21 of 10 CFR Part 21 to determine whether customers need to be informed of this matter.

3.3 Software Development Processes

The NRC inspectors examined vendor documentation related to software development processes for the ETAP-PS software. This part of the review focused on activities regarding supporting documentation associated with the qualification and certification of a selected sample of ETAP-PS software development records.

The inspectors evaluated the process by which OTI addressed errors discovered in its software products, reviewed OTI software quality assurance procedures to evaluate the adequacy of the procedures, and reviewed the procedures regarding software maintenance activities. The inspectors reviewed OTI quality assurance procedure documents, including:

- ETAP® Quality System Plan, Rev. 7, dated March 1, 2002
- ETAP® Quality Assurance Program, Rev. 7, dated February 27, 2002
- ETAP® PowerStation and PSMS Software Quality Assurance Plan (PS-SQAP), Rev. 7, dated February 27, 2002
- ETAP® Operation Quality Assurance Plan, Rev. 7, dated March 1, 2002

The inspectors found these documents to be generally acceptable for controlling software maintenance activities.

3.3.1 Software Error Correction Activities

a. Inspection Scope

The inspectors performed reviews and conducted discussions to evaluate the control of software errors.

b. Observations and Findings

The inspectors evaluated the process by which OTI addressed errors discovered in its software products, and reviewed documentation that described errors that had been corrected in previous versions of the ETAP-PS software (version 4.0.0N) in the process of developing the current version of the ETAP-PS software (version 4.7.0N). The inspectors selected an error from the New Enhancement Capabilities Corrections Report for ETAP-PS version 4.7.0N, Category: Error Reporting and Corrective Action. The error correction reviewed by the inspectors was ERCA-PS-02-004 - Cable Editor, Sizing page, A/G Tray [above ground tray], ICEA Method.

In an earlier version of ETAP-PS, the ICEA Method for A/G trays was not used for cable sizing in a related calculation function, which constituted a deviation from system requirements. In response to the error condition, the vendor created a Technical Incident Report (TIR), TIR-CABLE-190, dated April 22, 2002, applicable to ETAP-PS Version 4.0.4.

The inspectors noted that when this error was discovered, OTI informed applicable nuclear power plant licensees using the applicable version of ETAP-PS concerning the error. OTI initially addressed the issue with TIR-CABLE-190 in ETAP-PS version 4.0.0N by disabling the sizing calculation for the ICEA (A/G Tray) option. OTI determined that disabling this function prevented customers from using the ICEA method to calculate cable sizing for above ground cable trays. The permanent correction of the error was implemented for a later release of ETAP-PS, Version 4.7.0N. The inspector reviewed the ETAP-PS version 4.0.0N code documentation of the temporary correction, and ETAP-PS version 4.7.0N for the permanent correction. The coding was appropriately documented.

c. Conclusions

The inspectors concluded that OTI's documentation, correction, and dissemination of information regarding this error were acceptable and met the intent of 10 CFR Part 21.

3.3.2 Reporting of Errors to Customers

a. Inspection Scope

The inspectors reviewed the methodology OTI employed to inform its customers of software problems.

b. Observations and Findings

The inspectors found that OTI distributes ETAP-PS software to its customers on CD media. The vendor includes on each CD a New Enhancement Capabilities Corrections Report, which summarizes the enhancements, corrections, and added capabilities that were applied to the ETAP-PS software version on that disk. The ETAP-PS customer is responsible for reviewing this report and other included documents to ensure the newest version of ETAP-PS is appropriate for its licensing applications. The inspectors reviewed the New Enhancement Capabilities Corrections Report for ETAP-PS version 4.7.0N, and found the information in the report was presented in a clear, concise, unambiguous manner.

c. Conclusions

The inspectors concluded that OTI has established and implemented satisfactory measures to assure that documents, including changes, are reviewed for adequacy and approved for release by authorized personnel and are distributed to and used at the location where the prescribed activity is performed. No nonconformances were identified in this area.

3.3.3 Software Verification and Validation (V&V) Activities

a. Inspection Scope

The inspectors conducted discussions with OTI personnel and reviewed Section 7 of the ETAP-PS software quality assurance plan (SQAP), which required programmers to verify/validate all options of the program; perform a number of sample program calculations to compare the results with known standards; and verify all programs, sub programs, menus, etc. involved in the change.

b. Observations and Findings

The inspectors reviewed TIR-CABLE-190, dated April 22, 2002, applicable to ETAP-PS version 4.0.4; and Task TCS-CAB-016 and its associated test plan, TPS-CAB-016, which consisted of a listing of the affected software requirements, consisting of Section 3.1.70, Cable-Sizing, requirements' 1.10, 1.13-1.23, and a description of the test procedure.

On the basis of the documentation provided in the test results report, the inspectors could not verify that all options of the program were tested for the Cable Sizing modifications in ETAP-PS version 4.0.0N, and could not verify the test results for the ETAP-PS version 4.7.0N, "Cable Sizing Modifications," because these results were not included in the modification package.

The inspectors identified that even though the cable sizing modification results were not included in the modification packages in both versions of ETAP-PS, the packages were approved by the appropriate managers.

The Software Verification and Validation Report (SVVR) documentation was not included in the TIR package, as required by the vendor's quality assurance program. The objective evidence of V&V results that was included in the TIR package for the temporary change consisted of test results documentation that verified the function had been disabled. The test results for the temporary correction consisted of several pages of ETAP-PS screen images from a computer display depicting the results of the test using the corrected program. The temporary correction was checked as "Passed" by A.M. on April 23, 2002. The Tester ID was AM-187. This task was assigned Modification Request (MR) 1131.

The inspectors identified that the test procedure documentation was not consistent with the test procedure documentation in OTI's test procedure library, which controlled the testing of other ETAP-PS functional requirements. As a result, the inspectors could not verify that the vendor had appropriately verified the test procedure before performing the validation testing for this functional requirement. Further, even though OTI has procedures for coordinating among participating design organizations for the review, approval, release, distribution, and revision of documents involving design interfaces, as required by 10 CFR Part 50 Appendix B Criterion III, "Design Control," and Criterion XI, "Test Control," the inspectors did not find any objective evidence to show the activities were satisfactorily accomplished in accordance with the requirements. Nonconformance 99901350/2003-201-05 was identified in this area.

The permanent correction for the subject software error was designated Task TCS-CAB-016. The test plan, TPS-CAB-016 consisted of a listing of the affected software requirements, consisting of Section 3.1.70, Cable-Sizing, requirements' 1.10, 1.13-1.23, and a description of the test procedure. A listing of the expected and observed values for the test case was not included in the test plan, although the source of the expected values was referenced in the test plan. The coding changes were maintained in the documented code.

The vendor's electronic-based configuration management (CM) system was polled for the test case and the results of the V&V activities for this modification. Reference to the V&V results was not included in the CM system electronic folder SS_PalmVV/ . . . /TDSCAB1/ TESTFILE/ TCS-CAB-016. The files in this electronic folder were Dyn_link_cable.CPX, Dyn_link_cable.MDB, Dyn_link_cable.OTI, Dyn_link_cable.PSO, and etablib3.lib. The V&V report was not included as an electronic file, but was maintained as a printed report.

The inspectors noted that OTI stated that it conducts a complete set of regression tests for each new version of ETAP-PS. These tests are intended to address all functions of ETAP-PS, and are verified by the appropriate vendors' product development organizations. The inspectors were provided with a listing of the regression test cases. The extensive number of ETAP-PS functional requirements and corresponding test cases was such that, over the inspection period, the inspectors could not conclude that all software requirements are tested per the OTI's software quality assurance procedures.

However, given the error that was to be corrected by task TCS-CAB-016, which should have been detected by testing prior to the release of ETAP-PS version 4.0.0N, the inspectors could not conclude that all functions are validated for each new version of ETAP-PS. Appendix B Criterion III requires that, where a test program is used to verify the adequacy of a specific design feature in lieu of other verifying or checking processes, the test program shall include suitable qualifications testing of a prototype unit under the most adverse design conditions.

Conclusions

The inspectors concluded that OTI was not in conformance with Criterion III of Appendix B, in that the set of regression tests used to verify the adequacy of design did not detect the failure in ETAP-PS version 4.0.0N that was corrected by TCS-CAB-016. Nonconformance 99901350/2003-201-04 was identified in this area.

Additionally, since the test results were not recorded in one test documentation package, and a test procedure was not documented in another test package, the inspectors concluded that the two tests that were reviewed by the inspectors were not controlled in accordance with Appendix B, Criterion XI, "Test Control." Criterion XI requires that test results be documented and evaluated to assure that test requirements have been satisfied. Since OTI did not record the test results in the test documentation package, the inspectors could not verify that OTI had independently verified the test results for those two tests, as required. Nonconformance 99901350/2003-201-05 was identified in this area.

3.3.4 Software Development Process Improvement Activities

a. Inspection Scope

The inspectors reviewed the vendor's software development process improvement activities, including OTI quality assurance requirements to conduct post mortem reviews of each ETAP-PS software release.

b. Observations and Findings

OTI requires and conducts a post mortem review of the lessons learned during the development cycle for each version of software released. The inspectors reviewed the post mortem report for ETAP-PS version 4.7.0N. The post mortem review summarized the development work and described measures that should be considered that could improve the efficiency of the development process. The post mortem review activity was conducted by OTI upper management, and, therefore, was in accordance with 10 CFR Part 50 Appendix B, Criterion I, "Organization," in that the personnel performing the post mortem review had sufficient authority and organizational freedom to identify quality problems; to initiate, recommend, or provide solutions; and to verify implementation of solutions. The post mortem review activity is also in conformance with 10 CFR Part 50 Appendix B, Criterion II, "Quality Assurance Program," in that the vendor regularly reviews the status and adequacy of the quality assurance program.

Section 3.2.3, "Corrections and deficiencies," of the ETAP-PS SQAP requires that, upon discovery of program problems or deficiencies, the vendor review the testing plans and their implementation to ensure their effectiveness. Discussions with the vendor revealed that, because the Cable Sizing error discussed herein was considered by the vendor to be minor or cosmetic in nature, the detection of this error in ETAP-PS version 4.0.0N was not included in the scope of the post-mortem meeting discussions of test program improvements for ETAP-PS version 4.7.0N.

However, the ETAP-PS SQAP does not address anomalies and deviations that are to be excluded from post mortem meetings. Since the vendor excluded minor or cosmetic errors from the post mortem discussion, the inspector could not conclude that every deviation from the vendor's quality assurance requirements was controlled per the requirements of Appendix B Criterion II, "Quality Assurance Program."

c. Conclusions

The inspectors concluded that the ETAP-PS development processes are acceptable, even though some discrepancies were identified in documentation, the adequacy of QA activities, the scope of software testing, and the scope of the post mortem reviews.

The inspectors acknowledged OTI's effectiveness in the manner in which OTI implemented a continuous software process improvement program, and performed root cause determinations to address software and system errors in a systematic manner. The inspectors concluded that OTI's software lifecycle processes and the continuous improvement of those processes are generally consistent with the guidance provided in Branch Technical Position HICB-14 of NUREG 0800 and 10 CFR Part 50 Appendix B requirements.

3.4 Entrance and Exit Meetings

In the entrance meeting on January 6, 2003, the NRC Inspectors discussed the scope of the inspection, outlined the areas to be inspected, and established interfaces with the OTI management. In the exit meeting on January 9, 2003, the NRC Inspectors discussed their concerns and on February 28, 2003, discussed its findings with the OTI QA Manager.

3.5 Entrance and Exit Meeting Attendees:

Farrokh Shokooh	President	OTI
Nazan Roshdieh	QA Manager	OTI
Mary Beal	Sales/Operations	OTI
Jun Qiu **	V.P. Engineering	OTI
M.E. Waterman	NRR/DE	NRC
A.N. Pal	NRR/DE	NRC
J.J. Petrosino	NRR/DIPM	NRC

** Attended exit meeting only.