



GE Nuclear Energy

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U. S. Nuclear Regulatory Commission
Washington DC 20555-0001

Attention: Robert M. Gallo, Chief
Special Inspection Branch
Division of Inspection and Support Programs
Office of Nuclear Reactor Regulation

SUBJECT: SBWR PANDA TESTING-
REPLY TO NOTICE OF NONCONFORMANCE,
NRC INSPECTION REPORT NO. 99900403/96-01

This letter addresses the NRC staff findings documented in the subject report dated May 10, 1996. In accordance with Enclosure 1 of the subject report, this letter is being sent to the Chief, Special Inspection Branch, Division of Inspection and Support Programs, Office of Nuclear Reactor Regulation. Specifically, this letter addresses Nonconformances 96-01-01 and 96-01-02 and Unresolved Items 96-01-03, 96-01-04 and 96-01-05.

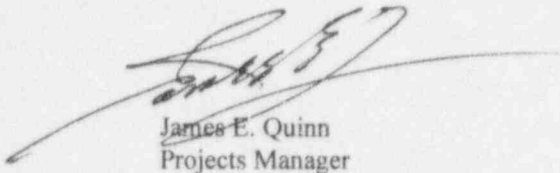
The staff's inspection report states that, "The results of the inspection indicate that GE, in general, was adequately implementing the Project Control Plan and the Quality Assurance Procedures for testing activities performed at PANDA with the exception of two nonconformances." Based on discussions with the staff during the exit meeting at the end of the inspection, we understand this statement to mean that the staff has concluded that the two nonconformances and three unresolved items do not invalidate the application of the PANDA data for qualification of the TRACG computer code. We also note that during the exit meeting the inspection team was more explicit in its affirmation of the PANDA Test Program Project Control Plan and Quality Assurance Procedures and the execution of the quality plan.

GE believes that the enclosed responses to the nonconformances and unresolved items fully address all the issues and concerns raised by the staff in the inspection report. Should there be any questions with regard to this submittal, please call John Torbeck of our staff on 408-925-6101.

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Sincerely,



James E. Quinn
Projects Manager

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GE Master File	M/C 747	(1 paper copy w/encl, plus E-Mail w/o encl.)

GE RESPONSES TO NONCONFORMANCES

Nonconformance 96-01-01

Apparent Test Results reports and Data Transmittal Reports were not prepared and issued in accordance with the Test Specification or Test Plan and Procedures. The failure to prepare ATR reports, FTRs and/or DTRs, on a time schedule consist(sp) with the applicable Test Specification and Test Plan and Procedures requirements is identified as *Nonconformance 99900403/96-01-01*.

GE Response

Background

PANDA Nonconformance Report (NCR) No. P-014 was prepared in accordance with PANDA QA Procedure PQAP-NC to address this deviation. In the closure of PANDA NCR No. P-014 it was concluded that the program objectives could be met with the delay in the schedule for the Apparent Test Results Reports (ATRs) and Data Transmittal Reports (DTRs).

Although the Test Specification and the Test Plans call for issuing the Apparent Test Results reports (ATRs) within 1 or 2 weeks, there was no specific application for the ATRs defined in the PANDA QA Procedures (PQAPs), Test Specification or Test Plans. The ATRs were intended only as a backup tool to cor.firm that the test acceptance criteria had been met to support decisions on whether or not testing should proceed as planned. The primary reviews of the test conditions and instrumentation performance against the test requirements were performed by PSI in accordance with the specific Test Procedures for the setup and conduct of each test. Review of the compliance with test acceptance criteria was done at PSI by the GE Site QA Representative, and this was communicated to others at GE through frequent discussions/communications between PSI and GE personnel by telephone/fax/e-mail. These communications, which occurred as frequently as once per day during the actual performance of the tests, assured that decisions regarding performance of subsequent tests considered evaluation of the test performance against the acceptance criteria, thereby achieving the purpose of the ATRs for which the one or two week schedule was established.

The delayed schedule for the DTRs, although not desirable, has met the PANDA and SBWR program objectives.

Corrective Action

ATRs which contain all information specified for these reports in the Test Specification and Test Plans have been issued for all S-Series and M-Series PANDA tests. DTRs which contain all information specified for these reports in the Test Specification and Test Plans are to be complete by 1 August 96 for all PANDA tests.

Preventive Action

No additional testing is planned in support of the SBWR certification. For any additional SBWR test programs in the future, practicable schedules for the reports will be established considering the needs of the program and the scope of the reports, and the test specifications will be written accordingly. These schedules will recognize that the ATRs are not the primary means to confirm that test acceptance criteria have been met.

GE RESPONSES TO NONCONFORMANCES

Nonconformance 96-01-02

Contrary to the above, (1) when abnormal occurrences (subsequently causing matrix testing to be suspended and re-evaluated) were detected during testing, no nonconformance reports were generated to document these events; (2) PSI Procedure "Data Base Modification" (issued in March 1996) was being used by PSI testing personnel to perform activities that introduced deviations from the test control process already specified by PQAP-TC, and from the nonconformance identification process established in PQAP-NC; and (3) PSI Procedure "Data Base Modification" had not been identified or described as a Quality Assurance Procedure governed by PPCP-QA-01, i.e., as a procedure comprising the bases of the QA system implemented by PSI and GE in meeting the requirements of NEDG-31831, even though it was being used to perform quality related activities affecting PANDA test results.

Response

Background

Item (1)

During the performance of the PANDA tests several nonconformance reports (NCRs) were written to address abnormal occurrences. The attached table lists NCRs which were written during the PANDA Test Program. Some of these NCRs were written following testing in response to Surveillance Inspection Reports prepared by the GE Site QA Representative in accordance with Section 5.6.7 of PQAP-TC. NCRs No. P-001 through P-013 were in the PANDA Test File at the time of the NRC inspection. GE and PSI consider the attached list to be complete in addressing all nonconformances identified to date in the course of PANDA testing and data evaluation and reporting.

The changes to the PANDA M-series test matrix were initiated following the performance of the first M-series test, Test M3. The results for this test were very consistent with pretest calculations, and all requirements in the Test Plan and Test Procedure including the Test Acceptance Criteria were met except as noted in NCR Nos. P-007, P-011, P-012 and P-013. The changes to the matrix introducing Tests M3A and M3B were to investigate alternative approaches for configuring the PCC pools to assure the PCC pool level response was as prototypical as possible and to improve ability to perform heat balances on each of the three PCCs. This PCC heat balance capability was investigated in Tests M3A and M3B to address instrumentation problems noted in NCR P-012.

No other changes to the M-series matrix were a consequence of nonconformances identified per PQAP-NC. These other matrix changes are done to maximize the usefulness of the remaining tests.

Item (2)

PSI's Data Base Modification (DBM) Procedure (ALPHA-602) was issued on 5 February 1996, not March 1996. It is a procedure, controlled per PQAP-DC, which was developed by PSI to assure that modifications to the PANDA Data Base were done in a way which assured the quality of the final data while retaining the original data. An example of an application of the DBM procedure was to address troublesome output of the oxygen sensors when the measured oxygen partial pressure was below the lower limit of the measurement range (0.0012 bar). When the oxygen partial pressure was less than 0.0012 bar, the over flow signal was 1e38. DBM No. 1 documented the changing of the data for the oxygen sensors for Test M3 from 1e38 to 0.0012 bar when the oxygen partial pressure was less than 0.0012 bar, to assure the data in the data base were the best values possible.

GE RESPONSES TO NONCONFORMANCES

Nonconformance 96-01-02

Response

Background

Item (2), (Continued)

This DBM Procedure does not introduce deviations from the existing PANDA Project Control Plan and Quality Control Procedures including, PQAP-TC and PQAP-NC procedures, but rather supplements them. ALPHA-602 references PQAP-TC, PQAP-V, and PQAP-R. ALPHA-602 has not been used in place of PQAP-NC; that is, the PSI DBM Procedure has not been used as a substitute for preparation of nonconformance reports according to PQAP-NC. If there has been a need for a nonconformance report identified by GE or PSI, it has been prepared as noted above. One of these nonconformance reports, NCR No. P-017, led to implementation of a data base modification, DBM No. 14.

ALPHA-602 gives very specific guidelines and controls for modifications to the test data, which assure that the original data records are maintained. The need for these modifications have been identified during the detailed post-test data evaluations, and in some cases (one to-date), as noted above, a nonconformance report is prepared when appropriate. In all other cases to-date, however, the modifications were not introduced to address a nonconformance.

Item (3)

Nothing in the GE PANDA Project Control Plan or QA Procedures precludes introduction of additional lower level procedures such as ALPHA-602 which help to assure the quality of the test performance or the test data handling. These additional implementing procedures provide more detailed controls to help assure compliance with the necessarily broader and more generic controls of the PQAP procedures. Members of the NRC inspection team acknowledged during the audit that application of the ALPHA-602 procedure was resulting in an improvement in data quality.

Corrective Action

Considering the additional clarification provided above, GE believes no additional corrective action is required. All nonconformances in the PANDA Test Program identified, to-date, have been documented per PQAP-NC. The PSI DBM Procedure ALPHA-602 is not in conflict with the higher level PQAP procedures, and changes to the PQAP procedures are not required for the implementation of ALPHA-602.

Preventive Action

None

PANDA NCR Number	Summary Description
P-001	Steady-state conditions not reached during shakedown test SD-1
P-002	Zero stability for flowmeters MV.P3C and MV.GRT
P-003	MV.GRT accuracy during first steady-state test, S2
P-004	Year input to DAS was 1994 instead of 1995
P-005	PCC header insulation not tight during Tests S7, S8 and S9
P-006	PCC pool level measurement error of 0.1m
P-007	MV.P3C and MV.GRT measurements during Test M3
P-008	Shutdown of control rack during Test M3A
P-009	Control of RPV heater power during Test M2
P-010	Control of RPV heater power during repeat of Test M2
P-011	Main steam line flow measurements out of range for Test M3
P-012	PCC2 feed flow measurement out of range for Test M3
P-013	Power spikes during switching of heater banks in Test M3
P-014	Schedule for ATRs and DTRs for Integral Systems Tests
P-015	Power oscillations during Test M3B
P-016	MPG.D2.2 and MPG.D2.3 failed or unavailable during Test M3B
P-017	Bypass leakage line pressure and flow measurement during Test M6/8

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GE RESPONSES TO UNRESOLVED ITEMS

Unresolved Item No. 96-01-03

The team was concerned that GE concluded in the October 1994 Readiness Review Report (without providing any justification or taking any compensatory or corrective actions) that the PANDA facility as-built measurement activities performed by Elektrowatt were satisfactory, while at the same time acknowledged that Elektrowatt had not been audited by either GE or PSI as a supplier of services affecting quality.

Response

Elektrowatt (EWI) is recognized in Switzerland as a supplier of engineering services in support of Swiss Nuclear Plants. The attached "Certificate of Good Performance" for EWI from KKL dated 7 Dec 1995 provides some evidence of this by documenting the type of work performed by EWI on the Leibstadt Nuclear Power Plant.

Although GE or PSI has not performed a general audit of EWI, the attached report from EWI, dated 2 July 1996, entitled "PANDA Geodetic As-Built Measurements", shows that EWI is well qualified for doing this specific type of work.

Unresolved Item No. 96-01-04

The GE disposition of the recommendations and specific action items identified during the October 1991 PANDA design review regarding facility design, quality assurance programmatic aspects, and technical issues could not be verified at PANDA.

Response

The records of closure of the October 1991 Design Review of the PANDA and LINX test programs exist in GE Design Record File (DRF) No. DR0-00007 which was closed in May, 1994. This DRF is separate from the PANDA Test Program DRF No. T10-00005 which is currently open. These DRFs can be reviewed by the NRC in San Jose, as necessary.

GE RESPONSES TO UNRESOLVED ITEMS

Unresolved Item No. 96-01-05

The extent and level of effectiveness of quality assurance oversight by GE over its SBWR program international technical associates was identified as *Unresolved Item No. 96-01-05*.

Response

This unresolved item is related to the TRACG analysis work related to the PANDA Test Program done by International Technical Associates (ITAs) under GE's supervision. This work was not done under the PANDA Project Control Plan, but was done under the GE QA Program.

GE ITAs have participated in the PANDA analysis activities, using the GE analysis code TRACG. These organizations and individuals included: PSI, KEMA and Jaime Morales of IIE. ECN was not involved. In these activities, a controlled version of the TRACG code was employed. The code configuration is controlled at GE, and the ITAs have access only to the executable code version. The individuals performing the work were trained in the use of TRACG by GE, and frequent interactions occurred with the responsible GE engineer during the course of the work.

All work performed at PSI and IIE has undergone verification according to GE procedures with final review and management approval by GE. The Design Record Files for all work done are maintained at GE.

KEMA has an approved quality assurance program and has been audited by GE. Work done by KEMA engineers was performed and verified under the KEMA quality assurance requirements. This work culminated in the KEMA report "Post Test Calculations of PANDA PCC Steady State Tests" which was reviewed by a GE technical expert and approved by GE management. Outputs from the KEMA work (including the reports) are maintained in a Design Record File at GE. The next page provides details of ITA TRACG analysis activities related to PANDA and the GE control actions.

Details of ITA TRACG Analysis Activities for PANDA and GE Control Actions

PSI:

Developed TRACG PANDA input deck and performed pre-test and post-test calculations.

GE Control Actions:

P. Coddington of PSI spent 3 months at GE (learning to use TRACG under the guidance of GE experts) prior to use of TRACG for PANDA applications.

Input model reviewed by GE Technical Review Team.

Input deck verified by J. Morales of IIE following GE EOPs, and reviewed by GE responsible engineer.

TRACG code configuration controlled by GE; PSI only has executable version.

Design Record Files maintained by GE.

Post-test analysis input verified by GE and PSI.

GE management signoff on verification packages.

Continuous GE/PSI interactions during post-test analysis - e-mail and telephone calls on daily basis. GE responsible engineer spent 1 month at PSI during this period.

KEMA:

Developed initial conditions for tests and performed pre- and post-test analysis of steady-state tests.

Performed verification of these activities.

GE Control Actions:

KEMA has an approved QA program and has been audited by GE. KEMA work was performed and verified under KEMA program.

The Design Record Files for this analysis are maintained by KEMA. Work outputs are maintained in a DRF by GE.

Initial conditions for PANDA tests and results of pre- and post-test analysis were reviewed and approved by GE.

Frequent technical interactions occurred between KEMA and GE during the period of analysis, including 4 meetings of 2-3 days length. The GE responsible engineer visited KEMA and met with the responsible KEMA engineers.

IIE:

Jaime Morales of IIE performed verification of the PANDA input deck.

GE Control Actions:

Morales spent several months at GE prior to his activities on PANDA. He was trained in the use of TRACG by working with an experienced GE engineer. He was also provided with GE EOPs pertaining to verification. Verification results were reviewed and approved by GE responsible engineer. During the course of the work, there were frequent interactions with the GE responsible engineer, including 4 meetings of 2-3 days in length. The GE responsible engineer also visited IIE and met with Morales at Cuernavaca.

(IIE engineers under the direction of J. Morales also developed a processor for TRACG which develops nodalization diagrams from the input data. The nodalization diagrams generated by this input processor have been displayed in the PANDA analysis reports. These are to aid the reader in following the nodalization and have no impact on the results.)

KERNKRAFTWERK LEIBSTADT AG

**E W I**Elektrowatt Ingenieurunternehmung AG
Bellerivestrasse 36**8034 Zürich**

Ihre Zeichen:

Ihre Nachricht vom:

Unsere Zeichen:

HE/WGA

5325 Leibstadt

07. December 1995

CERTIFICATE OF GOOD PERFORMANCE

Between 1970 and 1985, Electrowatt Engineering Services Ltd. (EWI) has been intensely involved, first in site preparation, general station layout and other planning work, and later in the actual implementation of the 1'000 MWe Leibstadt Nuclear Power Station, the largest in Switzerland. This station - which is equipped with a boiling water reactor - has been built by a supplier consortium made up of Brown Boveri & Co. Ltd. (BBC, today ABB) and General Electric Technical Services Company (GETSCO). It has a cumulated load factor in the order of 85 % since going on the grid by the end of 1984. Its power rating has been gradually increased twice during recent years.

Originally, EWI prepared the bid invitation documents for this station and evaluated the various turnkey bids technically and commercially, on behalf of the Leibstadt Study Consortium and assisted in contract negotiations with the bidders.

In late 1973, the Kernkraftwerk Leibstadt AG (KKL) signed the contract with the supplier consortium and commissioned EWI to perform design, engineering, procurement, construction and erection supervision as well as start up of the balance of plant systems, buildings and structures (outside of the station's nuclear island). These included cooling water systems (wet main cooling tower with circulating water system, station service water system, emergency service water system), water treatment plants (for make up of cooling tower and demineralized water), water supply and disposal systems (for potable water, fire lighting water, sewage water treatment), electrical systems such as main station transformers, 380 kV switchyard, 50 kV indoor switchgear station, and emergency diesel



generator plants with individual auxiliary cooling towers. The scope also included associated buildings and a variety of other civil structures. EWI covered within its scope also the numerous resulting interfaces with the nuclear and turbine islands, designed and supplied by Brown Boveri & Co. Ltd. and GETSCO.

Under this comprehensive contract, but within the station's nuclear island, EWI designed, engineered, supplied and started up also all the required systems and facilities for the treatment of the station's generated liquid radioactive liquids and the conditioning of the resulting slurries, concentrates and solid wastes, including a special building for their long term intermediate storage, in solidified form, suited for later disposal in a low level waste repository.

For all the these balance of plant systems, buildings and structures, including the radioactive waste treatment, conditioning and storage systems and buildings, EWI also prepared the necessary detailed start up procedures as well as all the operation and maintenance manuals for the station operators and maintenance personnel.

Furthermore, EWI's civil engineering department acted as a subcontractor for BBC, Mannheim, Germany, and performed statical and partly dynamical calculations of all the station's buildings and civil structures. This department's designers and draftsmen also prepared all the necessary drawings and other documents, needed by the civil contractors (e.g. form drawings, rebar lists, etc.) and later supervised the actual erection of all the buildings and civil structures.

On behalf of the Kernkraftwerk Leibstadt AG (KKL) and its leading partner Electrowatt Ltd., other EWI engineers and specialists, under a different contract, were also assigned the technical project management during the implementation of the Leibstadt Nuclear Power Station. These tasks included among others: Necessary liaison with involved federal, cantonal and communal authorities, involved in the licensing and approval of many of the station's systems, preparation of technical and financial decisions on behalf of the project's Technical Committee, preparation of safety studies and reports, coordination of the numerous contractors involved at the site, organization and supervision of the overall construction site management, supervision of contracts with main equipment suppliers and civil contractors, settlement of disputes with the supplier consortium, preparation of budgets and time schedules, overall project time and cost control, selection and training of the station's lead operating personnel, design reviews, quality assurance and quality control for systems, components and civil structures, public relations.



EWI specialists also performed calculations in the area of the nuclear fuel cycle and were involved in the in core and the out of core fuel management of the Leibstadt nuclear power station.

Between 1970 and 1985, engineers, technicians, draftsmen and other specialists of Electrowatt Engineering Services Ltd. (EWI) in the technical fields of mechanical, process, electrical, instrumentation / control and civil engineering as well as in quality assurance /quality control, procurement, construction / installation supervision, time and cost control, documentation control and other specific areas have spent almost 2 million working hours towards the successful completion and operation of the Leibstadt Nuclear Power Station.

We hereby certify that Electrowatt Engineering Services Ltd. (EWI), of Zurich, Switzerland, have rendered services of high professional standard and that all their engineers and specialists have worked to our full satisfaction.

KERNKRAFTWERK LEIBSTADT AG

P. Harder

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