PGE-1043

ACCIDENT MONITORING INSTRUMENTATION REVIEW FOR THE TROJAN NUCLEAR PLANT

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TABLES

1.0 INTRODUCTION

This report describes the program established by Portland General Electric Company (PGE) for ensuring the availability of instrumentation to monitor Plant variables and systems during and following an accident at the Trojan Nuclear Plant.

This report documents the review, performed in accordance with Supplement 1 to NUREG-0737 (Generic Letter 82-33 of December 17, 1982), of existing Trojan instrumentation against the design criteria contained in Revision 3 to Regulatory Guide 1.97. This report also serves to document the methodology employed by PGE to implement Regulatory Guide 1.97 (Revision 3) guidance and the supporting technical justification of any proposed alternatives.

Providing reliable and accurate accident monitoring instrumentation is an integral part of an ongoing process to ensure full emergency response capabilities, including Emergency Operating Procedures, Safety Parameter Display System, Emergency Response Facilities, and Detailed Control Room Design Review.

2.0 REGULATORY CRITERIA FOR ACCIDENT MONITORING INSTRUMENTATION

This chapter summarizes the regulatory criteria, guidelines and standards used to perform the review of existing Trojan accident monitoring instrumentation.

2.1 REGULATORY CRITERIA DEVELOPMENT

The NRC has established criteria for providing instrumentation to assess Plant and environs conditions during and following an accident. General Design Criterion 13, "Instrumentation and Control", of Appendix A to 10 CFR 50 includes a requirement that instrumentation be provided to monitor variables and systems over their anticipated ranges for accident conditions as appropriate to ensure adequate safety. General Design Criterion 19, "Control Room", of Appendix A to 10 CFR 50 includes a requirement that a control room be provided from which actions can be taken to maintain the nuclear power unit in a safe condition under accident conditions, including Loss-of-Coolant Accidents (LOCA), and that equipment, including the necessary instrumentation, at appropriate locations outside the control room be provided with a design capability for prompt hot shutdown of the reactor. General Design Criterion 64, "Monitoring Radioactivity Releases", of Appendix A to 10 CFR 50 includes a requirement that means be provided for monitoring the reactor Containment atmosphere, spaces containing components for recirculation of LOCA fluid, effluent discharge paths, and the Plant environs for radioactivity that may be released from postulated accidents. The Trojan Nuclear Plant was designed to meet General Design Criteria 13, 19 and 64; however, the NRC has only recently developed specific guidelines to implement these requirements for operating reactors.

ANSI/ANS 4.5-1980, Accident Monitoring Instrumentation delineates criteria for determining the variables to be monitored by the control room operator, as required for safety, during the course of an accident and during the long-term stable shutdown phase following an accident. This standard provides a list of functions to be performed, a framework to identify those variables to be monitored, an identification of two

accident time phases of interest, and an identification of three specific variable types (Types A, B, and C). ANS 4.5-1980 references a related standard under development, IEEE 497, "IEEE Standard Criteria for Accident Monitoring Instrumentation for Nuclear Power Generating Stations", as the source for specific instrumentation design criteria.

In December 1980 the NRC issued Revision 2 to Regulatory Guide 1.97 in an effort to establish a clearly defined position with regard to instrumentation to assess Plant and environ. conditions during and following an accident, thereby reducing uncertainty as to what the NRC staff considered acceptable in the area of accident monitoring. The NRC considered ANS 4.5-1980 to be generally acceptable for providing instrumentation to monitor variables for accident conditions subject to several qualifications. Revision 2 provided significant changes to previous versions of Regulatory Guide 1.97, including: (a) the use of a graded approach to qualification criteria that depended on the importance to safety of the measurement of a specific variable, (b) definition of two additional types of monitored variables (Types D and E), (c) tables providing the minimum number of variables to be monitored by the control room operating personnel during and following an accident, and (d) the requirement for operating Plant implementation prior to June 1983.

Supplement 1 to NUREG-0737, issued December 17, 1982 and titled "Requirements for Emergency Response Capability", in part required all licensees to submit a report describing how they were providing for measurement and indication of Type A, B, C, D, and E variables listed in Regulatory Guide 1.97 (Revision 2). This submittal is to include documentation for each Type A, B, C, D, and E variable concerning instrument range, environmental qualification, seismic qualification, quality assurance, redundance and sensor location, power supply, location of display, and schedule for installation or upgrade.

In May 1983, Revision 3 to Regulatory Guide 1.97 was issued to modify and update the guidance previously given. Revision 3 to Regulatory Guide 1.97 deleted any requirements for environs radiation monitors. Also, the exposure rate monitors inside buildings installed for the purpose of

detecting Containment breach were deleted from Revision 3 to the Regulatory Guide.

Other changes in Revision 3 included:

(1) Listing the provisions for the design and qualification criteria for Categories 1, 2, and 3 in a more understandable, tabular format.

(2) Changing the "range" provisions in the tables of required variables to make them consistent.

(3) Clarifying the intent of the discussions and regulatory positions.

2.2 DESIGN AND QUALIFICATION REQUIREMENTS

Revision 3 to Regulatory Guide 1.97 defines the following five types of Plant variables whose indication is required by control room operating personnel during accident situations:

(1) Type A - Those variables to be monitored that provide the primary information required to permit the control room operator to take specific manually controlled actions for which no automatic control is provided and that are required for safety systems to accomplish their safety functions for Design Basis Accident events. Primary information is information that is essential for the direct accomplishment of the specified safety functions; it does not include those variables that are associated with contingency actions that may also be identified in written procedures.

(2) Type B - Those variables that provide information to indicate whether the reactor trip, Engineered Safety Feature systems, and manually initiated safety systems and

other systems important to safety are performing their intended functions, namely, reactivity control, core cooling, maintaining Reactor Coolant System integrity, and maintaining Containment integrity.

(3) Type C - Those variables that provide information to indicate to the operators the potential for causing a gross breach of the barriers to radioactivity release (those being fuel cladding, reactor coolant pressure boundary, and Containment), and to determine if a gross breach of a barrier has occurred.

(4) Type D - Those variables that provide information to indicate the operation of individual safety systems and other systems important to safety. These variables are to help the operator make appropriate decisions in using the individual systems important to mitigating the consequences of an accident.

(5) Type E - Those variables to be monitored as required for use in determining the magnitude of the release of radioactive materials and continually assessing such releases.

Specific design and qualification criteria for the instrumentation used to measure the above five types of Plant variables are provided in Revision 3 to Regulatory Guide 1.97. The criteria are separated into three separate categories that provide a graded approach to requirements depending on the importance to safety of the measurement of a specific variable. Category 1 provides the most stringent requirements and is intended for key variables. A key variable is that single variable (or minimum number of variables) that most directly indicates the accomplishment of a safety function (in the case of Types B and C) or the operation of a safety system (in the case of Type D) or radioactive material release (in the case of Type E). Category 2 provides less stringent requirements and generally applies to instrumentation designated for indicating system operating status. Category 3 is intended to provide

requirements that will ensure that high-quality off-the-shelf instrumentation is obtained and applies to backup and diagnostic instrumentation.

Specific design and qualification criteria for accident monitoring instrumentation are listed in Regulatory Guide 1.97. The major points of these criteria are summarized in Table 2-1.

In general, Category 1 provides for full qualification, redundancy, and continuous real-time display and requires onsite (standby) power. Category 2 provides for qualification but is less stringent in that it does not include seismic qualification, redundancy, or continuous display, and requires only a high-reliability power source (not necessarily standby power). Category 3 is the least stringent. It provides for high-quality commercial-grade equipment that requires only offsite power.

A minimum set of Type B, C, D, and E variables to be monitored by the control room operating personnel during and following an accident are listed in Revision 3 to Regulatory Guide 1.97. Type A variables are not listed in the Regulatory Guide as they are Plant-specific and depend on the operations that are chosen by the utility for planned manual action.

Types B, C, D, and E are variables for following the course of an accident and are used to determine if the Plant is responding to the safety measures in operation and to inform the operator of the necessity for unplanned actions to mitigate the consequences of an accident.

2.3 REGULATORY BASIS FOR ACCIDENT MONITORING INSTRUMENTATION REVIEW

The requirement to conduct this review of Trojan accident monitoring instrumentation was specified in NRC Generic Letter 82-33 (Supplement 1 to NUREG-0737), which stated in part that each licensee shall submit a report describing how it meets the requirements of Revision 2 to Regulatory Guide 1.97. In a letter to the NRC dated September 13, 1983, PGE committed to conduct this review against the criteria of Revision 3 to Regulatory Guide 1.97.

TABLE 2-1

REGULATORY GUIDE 1.97 DESIGN AND QUALIFICATION CRITERIA

	Category 1	Category 2	Category 3
Environmental Qualification Regulatory Guide 1.89; NUREG-0588	Yes	Yes	No
Seismic Qualifications Regulatory Guide 1.100	Yes	No	No
Periodic Testing Regulatory Guide 1.118	Yes	Yes	No
Single Failure Criterion	Yes	No	No
Physical Independence Regulatory Guide 1.75	Yes	No	No
Electric Power Regulatory Guide 1.32	Yes	No	No
Indication	Continuous	On demand	On demand
Recording	Yes	As required	As required
Out of service	Tech Specs	Tech Specs	No
QA	Full	Graded	No

3.0 INSTRUMENTATION REVIEWED AS ACCIDENT MONITORING VARIABLES

This chapter discusses the scope of equipment considered in the accident monitoring instrumentation review and the methodology used to conduct this review.

3.1 SCOPE OF EQUIPMENT

The equipment reviewed within the scope of the accident monitoring instrumentation review are those instruments required to monitor the pressurized water reactor variables listed in Table 3 of Revision 3 to Regulatory Guide 1.97.

3.2 ACCIDENT MONITORING INSTRUMENTATION REVIEW METHODOLOGY

The following describes the review conducted to ensure the availability of instrumentation to monitor Plant variables and systems during and following an accident.

3.2.1 BACKGROUND OF REVIEW

The following plan was initiated to perform a detailed review of Trojan instrumentation against the guidance of Regulatory Guide 1.97:

(1) Evaluate current levels of qualification for the Trojan instrumentation.

(2) Justify differences between Regulatory Guide 1.97 and current levels of Trojan instrumentation qualification.

(3) Develop action plan for instrument upgrade, as appropriate.

The review was conducted by a multi-discipline task group of action engineers from the Trojan Nuclear Plant, Nuclear Plant Engineering, and Nuclear Safety and Regulation Department. Each parameter in Regulatory Guide 1.97 was evaluated for its necessity and applicability to Trojan.

Criteria for evaluation of qualification was based on the following general rules:

(1) If the parameter was considered as backup indication to another parameter, qualification of the backup parameter could be less stringent. The primary parameter should be evaluated against the Regulatory Guide.

(2) Regulatory Guide 1.97 format (parameter types and qualification categories) was retained for parameter evaluation in order to identify degree of compliance.

(3) Evaluation of parameters was based partly on the desirability for certain information for accident conditions.

The review consisted of a detailed documentation review of the existing post-accident monitoring instrumentation, and was conducted to a component level of each parameter, from sensor to indicator, by examining manufacturer-supplied specifications, test data, and field verification. Compliance with applicable Standards (ie, IEEE, ANSI, ASME, etc) and Regulatory Guides was reviewed and verified.

Documents included in the review included vendor prints and schemes, channel schematics, circuit/raceway schedules, instrument data sheets, seismic qualification documents, environmental qualification documents, instrument specification requirements, Plant operating and emergency procedures, and vendor test reports.

In accordance with Supplement 1 to NUREG-0737, "Requirements for Emergency Response Capability", the review encompassed the following goals:

(1) Compare existing instrumentation characteristics (ranges, location, recording capability, continuous display, etc) to the

Regulatory Guide's recommended characteristics and perform system evaluations to determine if modifications are necessary. For the cases where Trojan-specific design features justified no modifications, documentation was developed to support those exceptions.

(2) Establish, to the extent practical, the existing qualification level of each instrument and the degree to which it met Regulatory Guide 1.97 criteria.

This report represents the completion of the review plan. Schedules for planned instrument upgrades are provided in Table 4-1. Any deviations from Regulatory Guide 1.97 qualification guidance are explained in detail in Appendix 7.C.

3.2.2 DESIGN AND QUALIFICATION CRITERIA CLARIFICATIONS FOR REGULATORY GUIDE 1.97 CATEGORY 1 INSTRUMENTATION

During assessment of the qualification levels of the Trojan accident monitoring instrumentation, clarifications were made to the design and qualification criteria contained in Table 2-1. These clarifications, which focus on Category 1 requirements since they tend to envelop Category 2 and 3 requirements, served as guidance for the conduct of this review and were as follows:

(1) Criterion 1

The instrumentation should be qualified in accordance with Regulatory Guide 1.89, "Qualification of Class 1E Equipment for Nuclear Power Plants", and the methodology described in NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment".

Clarification to Criterion 1

Environmental qualification of electrical equipment located in a harsh environment is in accordance with the requirements of

10 CFR 50.49 as detailed in Topical Report PGE-1025[1]. A declaration within this report that an instrumentation system is environmentally qualified means that it has been evaluated per 10 CFR 50.49 and has been determined to be acceptable.

In accordance with 10 CFR 50.49, equipment located in a mild environment is exempt from environmental qualification. Wherever appropriate, this report identifies the equipment that is located in a mild environment.

(2) Criterion 2

Instrumentation whose ranges are required to extend beyond those ranges calculated in the most severe Design Basis Accident event for a given variable should be qualified using the guidance provided in Paragraph 6.3.6 of ANS 4.5.

Clarification to Criterion 2

This criterion is not applicable to any equipment installed at Trojan and has not been specifically addressed in this report. The only instrumentation with a Regulatory Guide 1.97 required range which exceeds the Design Basis Accident qualification envelopes are the wide-range Containment pressure monitors. The transmitters for this system are located outside Containment and will not be exposed to such a beyond-design-basis environment.

(3) Criterion 3

Qualification applies to the complete instrumentation channel from sensor to display where the display is a direct-indicating meter or recording device. If the instrumentation channel signal is to be used in a computer-based display, recording, or diagnostic program, qualification applies from the sensor up to and including the channel isolation device.

Clarification to Criterion 3

Environmental qualification requirements, as discussed in Criterion 1, have only been applied to equipment located in a harsh environment. Consequently, the control room displays (mild environment) have not been included within the scope of the environmental qualification review.

Seismic qualification, as discussed in Criterion 4, has been applied to the entire circuit from sensor to display.

(4) Criterion 4

The seismic portion of the qualification should be in accordance with Regulatory Guide 1.100, "Seismic Qualification of Electric Equipment for Nuclear Power Plants". Instrumentation should continue to read within the required accuracy following, but not necessarily during, a safe shutdown earthquake.

Clarification to Criterion 4

The seismic qualification review is still in progress. A preliminary review of seismic qualification has concluded that the specified components within this report are seismically qualified as clarified below; however, the final documentation and formal approval is not yet complete.

Regulatory Guide 1.100 incorporates IEEE 344-1975 with stated exceptions. The seismic qualification review of Regulatory Guide 1.97 Category 1 instrumentation will assure compliance with IEEE 344-1971, which was the basis for plant licensing as discussed in Updated FSAR Section 3.10. A declaration of seismic qualification for a given instrumentation system in this report indicates the system is considered seismically qualified from sensor to display and meets, at a minimum, IEEE 344-1971

based upon the results of the preliminary review. Any discrepancies encountered during the seismic review were input into this report. If any seismic qualification problems are uncovered which are contrary to the conclusions stated in this report, then a correction letter will be submitted.

(5) Criterion 5

No single failure within either the accident-monitoring instrumentation, its auxiliary supporting features, or its power sources concurrent with the failures that are a condition or result of a specific accident should prevent the operators from being presented the information necessary for them to determine the safety status of the plant and to bring the plant to and maintain it in a safe condition following that accident. Where failure of one accident-monitoring channel results in information ambiguity (that is, the redundant displays disagree) that could lead operators to defeat or fail to accomplish a required safety function, additional information should be provided to allow the operators to deduce the actual conditions in the plant. This may be accomplished by providing additional independent channels of information of the same variable (addition of an identical channel) or by providing an independent channel to monitor a different variable that bears a known relationship to the multiple channels (addition of a diverse channel). Redundant or diverse channels should be electrically indeperdent and physically separated from each other and from equipment not classified important to safety in accordance with Regulatory Guide 1.75, "Physical Independence of Electrical Systems", up to and including any isolation device.

Clarification to Criterion 5

The Trojan Nuclear Plant was designed prior to the issuance of Regulatory Guide 1.75. In general, the cable and raceway systems were designed and installed in accordance with IEEE

Transactions Paper 17 TP 83, as stated in Updated FSAR Section 8.3.1.4. The protection systems were designed in accordance with IEEE 279-1971 in order to meet General Design Criterion 21, as stated in Updated FSAR Section 3.1.3. The methods by which Trojan meets General Design Criteria 3 and 17 are specified in Updated FSAR Sections 3.1.1 and 3.1.2, respectively.

Regulatory Guide 1.75 is the NRC guidance for complying with IEEE 279-1971 and General Design Criteria 3, 17, and 21. The Trojan design was reviewed and approved by the NRC during the Plant licensing process, and the NRC Safety Evaluation Report of October 7, 1974 states in Section 8.4, "We have reviewed these provisions and conclude that they meet the requirements of IEEE Standard 279-1968 and Criteria 3, 17, and 21 of the Commission's General Design Criteria with respect to the physical independence of safety-related circuits and are, therefore, acceptable."

Regulatory Guide 1.97, Category 1 instrumentation meets the above Updated FSAR criteria (unless stated otherwise in this report) from the sensor to the control room. With some of the newer instrumentation installed as part of NUREG-0737 requirements, the installation meets this Updated FSAR criteria from sensor to display. Older instrumentation meets this criteria from the sensor to the isolation device located in the control room. The instrumentation circuit is then routed from the isolation device to the display without any specific separation requirements as a non-Class 1E circuit. Such cases for Category 1 instrumentation are identified within this report. The practice of signal isolation with subsequent routing as a non-Class 1E circuit is considered acceptable for indication purposes provided the display does not share a circuit with other non-Class 1E equipment. The single allowed exception in this case occurs when an instrument loop indicator or recorder shares the circuit with the non-Class 1E Plant computer. A

failure effects analysis has confirmed that any potential failure mode of the Plant computer should not result in loss of indication on the control room indicator or recorder, such that it is acceptable for the indicator or recorder to share the loop with the Plant computer.

Category 1 instrumentation is considered single-failure proof within the scope of this review provided it meets the following qualification requirements:

(a) The channels for a given parameter are redundant and meet the independence and separation requirements described above.

(b) All identified channels for a given parameter are environmentally and seismically qualified in accordance with the clarifications to Criteria 1 through 4 above.

(c) The channels are powered from station standby power sources and are battery-backed where momentary interruption is not tolerable, as discussed in Clarification to Criterion 6 below.

In general, two redundant channels are considered adequate for single-failure criteria; however, information ambiguity due to a failed instrument channel has been addressed in this report. The method used for resolving potential information ambiguity varied depending on the parameter.

(6) Criterion 6

The instrumentation should be energized from station standby power sources as provided in Regulatory Guide 1.32, "Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants", and should be backed up by batteries where momentary interruption is not tolerable.

Clarification to Criterion 6

As stated in Updated FSAR Sections 8.3.1.2 and 8.3.2.2, the Engineered Safety Features buses associated with the 4.16-kV, 480-V, and 120-V preferred instrument a-c and 125-V d-c systems were designed to meet IEEE 279-1971, IEEE 308-1971, General Design Criteria 17 and 18, and Regulatory Guide 1.6. The above standards and criteria assure that the Trojan electrical system is reliable. Regulatory Guide 1.32 (Revision 0) is met as stated in Updated FSAR Section 3.1.2. Regulatory Guide 1.32 (Revision 2) dated February 1977 is not considered applicable to Trojan since it was issued after the Plant was constructed. In addition, Section D of Regulatory Guide 1.32 (Revision 2) specifies that it is applicable to new construction submittals docketed on or before April 15, 1977.

Within this report, the designation that an instrument is powered from a Class 1E bus or a Class 1E battery-backed bus indicates that it is powered from one of the above Engineered Safety Features buses. When an instrument is not powered from a battery-backed bus, this report discusses the acceptability of momentary power interruption.

(7) Criterion 7

The instrumentation channel should be available prior to an accident except as provided in Paragraph 4.11, "Exception", of IEEE Standard 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations", or as specified in the Technical Specifications.

Clarification to Criterion 7

Category 1 instrumentation is available prior to an accident. Rather than address this on a parameter-by-parameter basis in the report, conformance with this criterion is discussed here.

Removal of a channel from service, as discussed in Paragraph 4.11 of IEEE 279-1971, for periodic maintenance or testing is not considered a violation of single-failure criteria since such removal is generally of short duration. In addition, much of this instrumentation is currently included in the Technical Specifications, and out-of-service intervals are based upon the Technical Specification Limiting Condition for Operation requirements.

(8) Criterion 8

The recommendations of the following Regulatory Guides pertaining to quality assurance should be followed:

Regulatory Guide 1.28	Quality Assurance Program Requirements (Design and Construction)
Regulatory Guide 1.30 (Safety Guide 30)	Quality Assurance Requirements for the Installation, Inspection, and Testing of Instrumentation and Electric Equipment
Regulatory Guide 1.38	Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Water-Cooled Nuclear Power Plants
Regulatory Guide 1.58	Qualification of Nuclear Power Plant Inspection, Examination, and Testing Personnel
Regulatory Guide 1.64	Quality Assurance Requirements for the Design of Nuclear Power Plants
Regulatory Guide 1.74	Quality Assurance Terms and Definitions
Regulatory Guide 1.88	Collection, Storage, and Maintenance of Nuclear Power Plant Quality Assurance Records
Regulatory Guide 1.123	Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants

Regulatory Guide 1.144	Auditing of Quality Assurance Programs for Nuclear Power Plants
Regulatory Guide 1.146	Qualification of Quality Assurance Program Audit Personnel for Nuclear Power Plants

Reference to the above Regulatory Guides (except Regulatory Guides 1.30 and 1.38) is being made pending issuance of a revision to Regulatory Guide 1.28 that is under development (Task RS002-5) and that will endorse ANSI/ASME NQA-1-1979, "Quality Assurance Program Requirements for Nuclear Power Plants".

Clarification to Criterion 8

The subject Regulatory Guides have been integrated into PCE's Nuclear Quality Assurance Program (PGE-8010)(2). Compliance with these Regulatory Guides is discussed in the Introduction and Supplement 2 to PGE-8010. PGE-8010 has been approved by the NRC in accordance with the requirements of 10 CFR 50.54. PGE-8010 is being followed for all work now being done. Prior to NRC approval of PGE-8010, work was done in accordance with the QA Program reviewed by the NRC in such documents as Appendix A to the PSAR and Sections 17.1 and 17.2 of the FSAR. Based on this, the quality assurance requirements are considered to be met.

(9) Criterion 9

Continuous real-time display should be provided. The indication may be on a dial, digital display, CRT, or strip-chart recorder.

Recording of instrumentation readout information should be provided for at least one redundant channel. If direct and immediate trend or transient information is essential for operator information or action, the recording should be

continuously available on redundant dedicated recorders. Otherwise, it may be continuously updated, stored in computer memory, and displayed on demand. Intermittent displays such as data loggers and scanning recorders may be used if no significant transient response information is likely to be lost by such devices.

Clarification to Criterion 9

Recording of at least one channel, and continuous display is addressed in Appendix 7.C. In this case, the report focuses primarily on deviations from these design criteria.

(10) Criterion 10

If two or more instruments are needed to cover a particular range, overlapping of instrument span should be provided. If the required range of monitoring instrumentation results in a loss of instrumentation sensitivity in the normal operating range, separate instruments should be used.

Clarification to Criterion 10

The report identifies only deviations, if any, from this design criterion. Except where noted, a single range is used to monitor a given parameter.

(11) Criterion 11

Types A, B, and C instruments designated as Categories 1 and 2 should be specifically identified with a common designation on the control panels so that the operator can easily discern that they are intended for use under accident conditions.

Clarification to Criterion 11

The recommendation of Criterion 11 was considered during the human factors evaluation in connection with the Detailed Control Room Design Review for Trojan. It was concluded that special identification of specific instrumentation on the control panels would contribute to visual noise and lead to operator confusion. Therefore such specific identification of instruments will not be accomplished.

(12) Criterion 12

The transmission of signals for other use should be through isolation devices that are designated as part of the monitoring instrumentation and that meet the provisions of Regulatory Guide 1.97.

Clarification to Criterion 12

Many of these instrumentation systems utilize isolators for transmission of signals for other use. As identified in this report, the displays often share circuits with non-Class 1E equipment. The acceptability of this design is addressed in this report. In any event, these isolation devices are designated as part of the instrumentation circuit, and they have been reviewed for compliance with Category 1 requirements.

(13) Criterion 13

Servicing, testing, and calibration programs should be specified to maintain the capability of the monitoring instrumentation. If the required interval between testing is less than the normal time interval between plant shutdowns, a capability for testing during power operation should be provided.

Whenever means for removing channels from service are included in the design, the design should facilitate administrative control of the access to such removal means.

The design should facilitate administrative control of the access to all setpoint adjustments, module calibration adjustments, and test points.

Periodic checking, testing, calibration, and calibration verification should be in accordance with the applicable portions of Regulatory Guide 1.118, "Periodic Testing of Electric Power and Protection Systems", pertaining to testing of instrument channels.

NOTE: Response time testing is not usually needed.

The location of the isolation device should be such that it would be accessible for maintenance during accident conditions.

Clarification to Criterion 13

Servicing, testing, and calibration are not addressed for any given parameter in this report. Instead, this subject will be discussed here as a Plant generic issue which applies to all systems.

Servicing, testing, and calibration intervals have been specified for these instrument systems by the manufacturer. The existing program has proved adequate to confirm the operability of these systems.

Regulatory Guide 1.118 endorses, with some clarification, IEEE 338-1977, "IEEE Standard Criteria for the Periodic Testing of Nuclear Power Generating Station Safety Systems". IEEE 338-1977 applies to safety systems and Regulatory Guide 1.118 states the following:

"The term 'safety system' is used in IEEE Standard 338-1977 in many places. For the purpose of this guide, 'safety system' should be understood to mean, collectively, the electric, instrumentation and controls portion of the protection system; the protective action systems; and the auxiliary or supporting features that must be operable for the protection system and protective action system to perform their safety-related functions."

The provision of indication per Regulatory Guide 1.97 is not considered a protective function. The indication of these parameters is intended only to assist the operators in verifying that other protective systems are operating as designed. As such, indication circuits appear to be outside the scope of Regulatory Guide 1.118.

All isolation devices associated with the subject instrumentation are located in mild environments and are accessible during accident conditions.

Removal of channels from service and adjustments to circuits are controlled by approved Plant procedures. The administrative control of this equipment is in effect.

(14) Criterion 14

The instrumentation should be designed to facilitate the recognition, location, replacement, repair, or adjustment of malfunctioning components or modules.

Clarification to Criterion 14

This criterion is not addressed in this report for any single parameter. The Trojan instrumentation is maintained and tested as discussed in the Clarification to Criterion 13. Equipment designs do include provisions for testing and maintenance.

(15) Criterion 15

The monitoring instrumentation design should minimize the development of conditions that would cause meters, annunciators, recorders, alarms, etc., to give anomalous indications potentially confusing to the operator. Human factors analysis should be used in determining type and location of displays.

Clarification to Criterion 15

The Trojan control room is currently undergoing a Detailed Control Room Design Review (DCRDR). Conditions which could lead to operator confusion or misinterpretation are within the scope of the DCRDR, and any recommendations for display relocation will be evaluated by the DCRDR team. Future modifications to the control room, including Regulatory Guide 1.97 modifications, will be subjected to a human factors analysis to determine the type and location of displays.

(16) Criterion 16

To the extent practicable, the same instruments should be used for accident monitoring as are used for the normal operations of the plant to enable the operators to use, during accident situations, instruments with which they are most familiar.

Clarification to Criterion 16

In general, Regulatory Guide 1.97-related indication is the same indication used by the operators during normal operation. It should be noted that some instrumentation may be useful only during accident and post-accident conditions (eg, Containment high-range radiation monitors, Containment wide-range pressure monitors, etc). This instrumentation, which the operators may not be as familiar with, has been located in a single panel

referred to as C09, the post-accident monitoring panel. This approach is believed to be the best method for providing this infrequently used instrumentation to the operators.

(17) Criterion 17

To the extent practicable, monitoring instrumentation inputs should be from sensors that directly measure the desired variables. An indirect measurement should be made only when it can be shown by analysis to provide unambiguous information.

Clarification to Criterion 17

Unless otherwise stated, the instrumentation listed in this report directly measures the desired variables.

3.2.3 IDENTIFICATION OF TYPE A VARIABLES

Regulatory Guide 1.97 recommends the minimum number of Type B, C, D, and E variables to be monitored by the control room operating personnel during and following an accident. Type A variables are not listed in the Regulatory Guide as they are Plant-specific and depend on the operations chosen for planned manual action. This section discusses the identification of Trojan Type A variables.

Type A variables are those variables to be monitored that provide the primary information required to permit the control room operator to take specific manual controlled actions for which no automatic control is provided and that are required for safety systems to accomplish their safety functions for Design Basis Accident events. Primary information is information that is essential for the direct accomplishment of the critical safety functions, and does not include those variables that are associated with contingency actions that may also be identified in written procedures.

The selection of Type A variables was based on a systems level review of the Trojan Updated FSAR, Trojan training manuals, Trojan Emergency Instructions, Trojan Functional Restoration Instructions, and design drawings. The Trojan Type A variables with appropriate comments on reasons for parameter selection as a Type A variable, are listed in Table 3-1.

3.2.4 ACCIDENT MONITORING INSTRUMENTATION REVIEW INTEGRATION WITH OTHER REGULATORY REQUIREMENTS

Supplement 1 to NUREG-0737 provides guidance for the improvement and/or implementation of Emergency Operating Procedures (EOPs), Safety Parameter Display System, Emergency Response Facilities (ERFs), DCRDR, and Regulatory Guide 1.97. Supplement 1 to NUREG-0737 also requires these five elements to be integrated. The intent of Supplement 1 to NUREG-0737 is to ensure emergency response personnel are provided with valid EOPs which are based on reliably indicated parameters in order for them to assess and mitigate or terminate an accident. The emergency response personnel in the ERFs must have emergency procedures and reliable indication of Plant parameters to enable them to assess Plant conditions, and on which they can base public protective actions.

The application of Regulatory Guide 1.97 criteria to accident monitoring instrumentation utilized in the control room are primarily done in support of the EOPs.

TABLE 3-1

TROJAN TYPE A VARIABLES

Parameter	Comments
RCS Hot-Leg Temperature	Reactor Coolant System (RCS) hot-leg temperature indication is a primary parameter used for accident and post-accident operator actions to initiate and maintain RCS cooldown. It is a key parameter that serves as an entry point for operator action to ensure maintenance of natural circulation cooldown, provides temperature indication for placing the Residual Heat Removal (RHR) System in operation, signals actions for loss of secondary heat sink, and is used to denote a point at which other procedures must be referenced. RCS hot-leg temperature indication is relied upon in most Trojan Emergency Instructions (EIs) and many Functional Restoration Instructions (FRIs). In addition, these RTDs provide input to the Reactor Vessel Level Instrumentation System (RVLIS) and the subcooling margin monitor.
RCS Cold-Leg Temperature	RCS cold-leg temperature is a primary parameter used for accident and post-accident operator actions to initiate and maintain RCS cooldown. Several Trojan EIs and FRIs rely on this parameter as an entry point for operator action to ensure maintenance of natural circulation cooldown, and to mitigate the effects of a loss of secondary heat sink. In addition, these RTDs provide input to the subcooling margin monitor.
RCS Wide-Range Pressure	Wide-range pressure indication provides primary information that is required for all phases of accident and post-accident monitoring. All Trojan EIs and many FRIs rely on wide-range pressure indication for accident mitigation. The wide-range pressure transmitters also provide input to the subcooling margin monitor, RVLIS, Overpressure Mitigation System (OMS), and RHR System suction valve interlocks.
Core Exit Thermocouples	Core exit thermocouple indication is a key parameter for accident and post-accident monitoring. The core exit thermocouples also input to the subcooling margin monitor. Almost all Trojan EIs rely on these thermocouples, and they are the primary parameter monitored for entering FRI FR-C.1, "Response to Inadequate Core Cooling". The core exit thermocouples are the most accurate indication of incore temperature when reactor

Parameter	Comments
	coolant pumps are not running, and provide temperature indication to prevent formation of steam voids in the vessel when depressurizing the RCS. The EIs and FRIs repeatedly rely on indication of subcooling margin to prevent an inadequate core cooling condition. The core exit thermocouples must be available during and after an accident to ensure that unambiguous indication of inadequate core cooling exists.
Containment Pressure	Containment pressure is the primary parameter monitored for evaluating Containment conditions. The EIs rely on this parameter for determining the need for terminating or reinitiating safety functions.
Refueling Water Storage Tank Level	The refueling water storage tank (RWST) is the primary source of water for Emergency Core Cooling Systems and Containment spray. Low RWST level is the parameter used to transfer Containment spray to recirculation mode. RWST level provides information as to the availability of this primary water source.
Pressurizer Level	Pressurizer level is an important parameter that provides necessary information for termination and reinitiation of safety injection in various EIs. Low pressurizer level is also used as a means of initiating certain steps in EIs. Pressurizer level indication, when used in conjunction with other Type A parameters for verification of subcooling margin, provides some assurance of adequate vessel water level.
Steam Generator Level	Steam generator level is a key parameter used in most Emergency Instructions to determine availability of heat sink and to verify adequate auxiliary feedwater flow. Steam generator level is a primary indicator for determination of tube rupture events.
Steam Generator Pressure	Steam generator pressure is a key parameter used in the EIs for diagnosis of a steam generator tube rupture. Pressure indication is used to verify required pressure in the nonruptured steam generators and is used to diagnose a loss of secondary coolant in conjunction with a tube rupture.

Parameter	Comments
Condensate Storage Tank Level	The condensate storage tank is the primary water source for the auxiliary feedwater pumps. Level indication is an important parameter used for determining the availability of water or the need to manually transfer suction to the Service Water System.

4.0 QUALIFICATION ASSESSMENT OF TROJAN ACCIDENT MONITORING INSTRUMENTATION

This chapter provides a detailed assessment of the Trojan accident monitoring instrumentation against the design criteria contained in Revision 3 to Regulatory Guide 1.97.

Supplement 1 to NUREG-0737 requested that PGE submit a report for NRC review describing how Trojan meets the requirements of Regulatory Guide 1.97. Section 6.2 of Supplement 1 to NUREG-0737 recommends the submittal of a table which includes information regarding instrument range, environmental qualification, seismic qualification, quality assurance, redundance and sensor location, power supply, location of display, and modification schedule for each Type A, B, C, D, and E variable shown in Regulatory Guide 1.97. Table 4-1 summarizes the requested information and is consistent in organization with Table 3 (PWR variables) of Regulatory Guide 1.97, Revision 3. The schedule for each instrument indicates when the applicable Regulatory Guide 1.97 requirements, as described in Chapter 2 of this report, will be met. Proposed upgrades to instrument systems to meet the intent of the Regulatory Guide are listed in footnotes to Table 4-1. Complete, detailed descriptions of the existing design and displays for all monitored parameters, along with any deviations from the guidance contained in Regulatory Guide 1.97, are contained in Appendix 7.C.

4.1 GENERAL NOTES FOR QUALIFICATION ASSESSMENT

Section 3.2.2 provides detailed PGE positions on each of the Regulatory Guide 1.97 qualification criteria. This section provides a summary of those positions as they apply to each category of information in Table 4-1 requested by Section 6.2 of Supplement 1 to NUREG-0737:

(1) QA (Quality Assurance) - A "yes" entry means that the provisions of the PGE Quality Assurance Program, as clarified in Section 3.2.2 of this report, are met.

(2) Instrument Range - Where the Regulatory Guide 1.97 and Trojan instrument ranges are not directly comparable due to differences in units, the Trojan ranges meet or exceed the NRC ranges unless otherwise noted.

(3) Environmental Qualification - A "yes" entry means the instrument is qualified in accordance with the qualification requirements of 10 CFR 50.49. Consistent with 10 CFR 50.49, Trojan is not required to environmentally qualify equipment located in a mild environment.

(4) Seismic Qualification - A "yes" entry means that the instrumentation system is considered seismically qualified from sensor to display and meets, at a minimum, IEEE 344-1971, which is the basis for plant licensing as discussed in Updated FSAR Section 3.10. This "yes" is also subject to the Clarification to Criterion 4 in Section 3.2.2.

(5) Schedule - A "complete" entry means PGE considers the existing instrument to be adequate for the intent of the Regulatory Guide. A "month/year" entry is the current best-estimate of the completion of the final configuration for the associated instrument including redundancy, final displays, power supplies, documentation of qualification, and official turnover to operations. The schedules are based on anticipated time for engineering, procurement and construction, accounting for Plant outage schedules and other ongoing modification work. Equipment delivery delays, environmental qualification test difficulties, or other problems, however, may cause delays in these schedules beyond our reasonable control. Most variables listed are already measured with fully operational instruments; however, the instruments are not complete until they are considered to meet applicable Regulatory Guide 1.97 requirements as described in this report.

(6) Redundant - A "yes" entry means that a minimum of two redundant electrically independent channels are provided up to and including any isolation device. The display may be a common multi-pen recorder or dual indicator.

(7) Power Supply - A "1E" entry means the instrument is powered from a Class 1E bus or a Class 1E battery-backed bus that is powered from one of the ESF buses associated with the 4.16-kV, 480-V and 120-V preferred instrument a-c and 125-V d-c systems.

(8) Location of Display - Specific locations of all displays and recorders in the control room are listed in Appendixes 7.A and 7.B. A "yes" entry under TSC means the parameter may be monitored in the Technical Support Center on a CRT.

4.2 QUALIFICATION COMPLIANCE OF EFFLUENT MONITORS AND IODINE AND PARTICULATE SAMPLING CAPABILITY

Regulatory Guide 1.97 specifies that Category 3 instrumentation "should be of high-quality commercial grade and should be selected to withstand the specified service environment". Generally, the specified service environment is the normal environment; however, for several Category 3 post-accident instruments at Trojan, it is appropriate to specify the service environment as the post-accident environment. It was also considered appropriate to recategorize several post-accident instruments from Category 2 to Category 3 on the basis of previous requirements specified by NUREG-0737.

The instrumentation in question concerns the Post-Accident Sampling System (NUREG-0737, Item II.B.3), the noble gas effluent monitors (II.F.1.1), and the iodine and particulate sampling capability (II.F.1.2). NUREG-0737 specifies environmental qualification requirements for the noble gas effluent monitors. This requirement appears in Table II.F.1-1 and states that "the instruments shall provide sufficiently accurate responses to perform the intended function in the environment to which they will be exposed during accidents". NUREG-0737 does not specify any environmental

qualification requirements for the Post-Accident Sampling System or iodine/particulate sampling capability.

Subsequent to NUREG-0737, 10 CFR 50.49 was promulgated and requires environmental qualification of "certain post-accident monitoring equipment" specified as Category 1 and 2 in Regulatory Guide 1.97. The noble gas effluent monitors are listed in Regulatory Guide 1.97 as Category 2. The Post-Accident Sampling System and iodine/particulate sampling capability are listed in Regulatory Guide 1.97 as Category 3.

The various environmental qualification requirements for the aforementioned equipment are summarized in Table 4-2. With respect to the noble gas effluent monitors, PGE has adopted the position that Regulatory Guide 1.97 Category 3 design and qualification criteria will be applied to this equipment. This position is justified on the basis that:

(1) Category 3 criteria are equivalent to the NUREG-0737 criteria under which this equipment was installed.

(2) Effluent radiation monitors are not necessary for the safe shutdown of the reactor, long-term core cooling, or Containment of radioactive material following an accident.

(3) More rigorous demonstration of environmental qualification as would be required by imposition of Category 2 criteria is not justified by the importance of the safety function this equipment performs.

The approach used to review the environmental qualification of the above equipment is described in Section 5.3 of Topical Report PGE-1025[1].

TABLE 4-1

ASSESSMENT OF REGULATORY GUIDE 1.97
TO TROJAN INSTRUMENTATION

Variable	NRC	Trojan
RCS Hot-Leg Water Temp (A-1)		
Category	1	1
QA	Yes	Yes
Instrument Range	50 to 700°F	0 to 700°F
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1986 outage
Redundant	Yes	Yes - See Appendix 7.C
Power Supply	1E	1E
Control Room Indication	Continuous recording	Continuous recording
TSC	-	Yes
EOF	-	[a]
Comments	-	[b]
RCS Cold-Leg Water Temp (A-2)		
Category	1	1
QA	Yes	Yes
Instrument Range	50 to 700°F	0 to 700°F
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1986 outage
Redundant	Yes	Yes - See Appendix 7.C
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[c]
RCS Pressure (A-3)		
Category	1	1
QA	Yes	Yes
Instrument Range	0 to 3000 psig	0 to 3000 psig
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1986 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[d]

Variable	NRC	Trojan
Core Exit Temp (A-4)		
Category	1	1
QA	Yes	Yes
Instrument Range	200 to 2300°F	200 to 2300°F
Environmental Qualification	Yes	No
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	Non-1E
Control Room Indication	Continuous indication	Plant computer
TSC	-	Yes
EOF	-	[a]
Comments	-	[e]
Containment Pressure (A-5)		
Category	1	1
QA	Yes	Yes
Instrument Range	0 to design pressure (psig)	-10 to 190 psig (3.17 x design pressure)
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[f]
RWST Level (A-6)		
Category	1	1
QA	Yes	Yes
Instrument Range	Top to bottom	6 to 100%
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	Yes
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[g]

Variable	NRC	Trojan
Pressurizer Level (A-7)		
Category	1	1
QA	Yes	Yes
Instrument Range	Bottom to top	3.7 to 96.3%
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[h]
Steam Generator Level (A-8)		
Category	1	1
QA	Yes	Yes
Instrument Range	From tube sheet to separators	+7 to -41 ft (wide range) +7 to -5 ft (narrow range)
Environmental Qualification	Yes	Wide range - No Narrow range - Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	Wide range - No Narrow range - Yes
Power Supply	1E	Wide range - No Narrow range - 1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[i]
Steam Generator Pressure (A-9)		
Category	1	1
QA	Yes	Yes
Instrument Range	ATM to 20% above lowest relief valve setting	ATM to 7% above lowest relief valve setting
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	Yes
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[j]

Variable	NRC	Trojan
Condensate Storage Tank Level (A-10)		
Category	1	1
QA	Yes	Yes
Instrument Range	Plant-specific	1.8 to 97.6%
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	Non-1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[k]
Neutron Flux (B-1)		
Category	1	1
QA	Yes	Yes
Instrument Range	10^{-6} to 100% full power	10^{-9} to 200% full power
Environmental Qualification	Yes	No
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[l]
Control Rod Position (B-2)		
Category	3	3
QA	No	No
Instrument Range	Full in or not full in	Actual position indication from bottom to top
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	-
Control Room Indication	Continuous indication	Continuous indication
TSC	-	No
EOF	-	[a]
Comments	-	Comply

Variable	NRC	Trojan
RCS Soluble Boron Concentration (B-3)		
Category	3	
QA	No	
Instrument Range	0 to 6000 ppm	
Environmental Qualification	No	
Seismic Qualification	No	
Schedule	-	
Redundant	No	
Power Supply	-	
Control Room Indication	Continuous indication	
TSC	-	
EOF	-	
Comments	-	This instrument does not exist at Trojan. See Appendix 7.C for discussion.
RCS Cold-Leg Water Temp (B-4)		
Category	1	1
QA	Yes	Yes
Instrument Range	50 to 700°F	0 to 700°F
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1986 outage
Redundant	Yes	Yes - See Appendix 7.C
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[c]
RCS Hot-Leg Water Temp (B-5)		
Category	1	1
QA	Yes	Yes
Instrument Range	50 to 700°F	0 to 700°F
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1986 outage
Redundant	Yes	Yes - See Appendix 7.C
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[b]

Variable	NRC	Trojan
RCS Cold-Leg Water Temp (B-6)		
Category	1	1
QA	Yes	No
Instrument Range	50 to 700°F	0 to 700°F
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1986 outage
Redundant	Yes	Yes - See Appendix 7.C
Power Supply	1E	-
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[c]
RCS Pressure (B-7)		
Category	1	1
QA	Yes	Yes
Instrument Range	0 to 3000 psig	0 to 3000 psig
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1986 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[d]
Core Exit Temp (B-8)		
Category	1	1
QA	Yes	Yes
Instrument Range	200 to 2300°F	200 to 2300°F
Environmental Qualification	Yes	No
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	Non-1E
Control Room Indication	Continuous indication	Plant computer
TSC	-	Yes
EOF	-	[a]
Comments	-	[e]

Variable	NRC	Trojan
Coolant Inventory (B-9)		
Category	1	1
QA	Yes	Yes
Instrument Range	Bottom of hot leg to top of vessel	Bottom of core to top of vessel (RVLIS)
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	Yes
Schedule	-	Complete
Redundant	Yes	Yes
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply, however not yet operational. See Appendix 7.C for discussion.
Degrees of Subcooling (B-10)		
Category	2	2
QA	Yes	Yes
Instrument Range	200°F subcooling to 35°F superheat	200°F subcooling to 2000°F superheat
Environmental Qualification	Yes	No
Seismic Qualification	No	No
Schedule	-	See Appendic 7.C for discussion.
Redundant	No	No
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Being resolved as NUREG-0737 issue. See Appendix 7.C for discussion.
RCS Pressure (B-11)		
Category	1	1
QA	Yes	Yes
Instrument Range	0 to 3000 psig	0 to 3000 psig
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1986 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[d]

Variable	NRC	Trojan
Containment Sump Water Level (B-12)		
Category	1 (wide range) 2 (narrow range)	1 (wide range) 2 (narrow range)
QA	Yes	Yes
Instrument Range	Plant-specific (wide range) - Top to bottom of sump (narrow range)	0 to 188" (wide range) 0 to 32" (narrow range)
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[m]
Containment Pressure (B-13)		
Category	1	1
QA	Yes	Yes
Instrument Range	0 to design pressure (psig)	-10 to 190 psig (3.17 x design pressure)
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[f]
Containment Isolation Valve Position (B-14)		
Category	1	1
QA	Yes	Yes
Instrument Range	Closed - Not closed	Closed - Not closed
Environmental Qualification	Yes	Various
Seismic Qualification	Yes	Various
Schedule	-	End of 1987 outage
Redundant	Yes	Various
Power Supply	1E	Various
Control Room Indication	Continuous indication	Various
TSC	-	Various
EOF	-	[a]
Comments	-	See Appendix 7.C for qualification status of each valve. [n]

Variable	NRC	Trojan
Containment Pressure (B-15)		
Category	1	1
QA	Yes	Yes
Instrument Range	-5 to design pressure (psig)	-10 to 190 psig (3.17 x design pressure)
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[f]
Core Exit Temperature (C-1)		
Category	1	1
QA	Yes	Yes
Instrument Range	200 to 2300°F	200 to 2300°F
Environmental Qualification	Yes	No
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	Non-1E
Control Room Indication	Continuous indication	Plant computer
TSC	-	Yes
EOF	-	[a]
Comments	-	[e]
Radiation Level in Circulating Primary Coolant (C-2)		
Category	1	
QA	Yes	
Instrument Range	1/2 Tech Spec limit to 100 X Tech Spec limit	
Environmental Qualification	Yes	
Seismic Qualification	Yes	
Schedule	-	
Redundant	Yes	
Power Supply	1E	
Control Room Indication	Continuous recording	
TSC	-	
EOF	-	
Comments	-	This instrument does not exist at Trojan. See Appendix 7.C for discussion.

Variable	NRC	Trojan
Analysis of Primary Coolant (C-3)		
Category	3	3
QA	No	No
Instrument Range	10 µCi/ml to 10 Ci/ml	Various
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	-
Control Room Indication	Continuous recording	No
TSC	-	No
EOF	-	[a]
Comments	-	Post-Accident Sampling System complies. See Appendix 7.C for discussion.
RCS Pressure (C-4)		
Category	1	1
QA	Yes	Yes
Instrument Range	0 to 3000 psig	0 to 3000 psig
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1986 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[d]
Containment Pressure (C-5)		
Category	1	1
QA	Yes	Yes
Instrument Range	-5 psig to design pressure (psig)	-10 to 190 psig (3.17 x design pressure)
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[f]

Variable	NRC	Trojan
Containment Sump Water Level (C-6)		
Category	1 (wide range) 2 (narrow range)	1 (wide range) 2 (narrow range)
QA	Yes	Yes
Instrument Range	Plant-specific (wide range) - Top to bottom of sump (narrow range)	0 to 188" (wide range) 0 to 32" (narrow range)
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[m]
Containment Area Radiation (C-7)		
Category	3	3
QA	No	Yes
Instrument Range	1 to 10^4 R/hr	1 to 10^7 R/hr
Environmental Qualification	No	No
Seismic Qualification	No	Yes
Schedule	-	Complete
Redundant	No	Yes
Power Supply	-	1E
Control Room Indication	Continuous recording	Continuous recording
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
Effluent Radioactivity Noble Gas Effluent From Condenser Air Removal System Exhaust (C-8)		
Category	3	-
QA	No	-
Instrument Range	10^{-6} to 10^{-2} µCi/cc	-
Environmental Qualification	No	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	-	-
Control Room Indication	Continuous recording	-
TSC	-	-
EOF	-	[a]
Comments	-	NUREG-0737 action. See Appendix 7.C for discussion.

Variable	NRC	Trojan
RCS Pressure (C-9)		
Category	1	1
QA	Yes	Yes
Instrument Range	0 to 3000 psig	0 to 3000 psig
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1986 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[d]
Containment Hydrogen Concentration (C-10)		
Category	1	1
QA	Yes	Yes
Instrument Range	0 to 10 vol%	0 to 10 vol% low range 0 to 30 vol% high range
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous recording	Continuous recording
TSC	-	Yes
EOF	-	[a]
Comments	-	[o]
Containment Pressure (C-11)		
Category	1	1
QA	Yes	Yes
Instrument Range	-5 psig to 3 x design pressure (psig)	-10 to 190 psig (3.17 x design pressure)
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[f]

Variable	NRC	Trojan
Containment Effluent Radioactivity Noble Gases From Identified Release Points (C-12)		
Category	2	-
QA	Yes	-
Instrument Range	10^{-6} to 10^{-2} µCi/cc	-
Environmental Qualification	Yes	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	Highly reliable	-
Control Room Indication	Continuous indication	-
TSC	-	-
EOF	-	[a]
Comments	-	NUREG-0737 action. See Appendix 7.C for discussion.
Effluent Radioactivity - Noble Gases (C-13)		
Category	2	-
QA	Yes	-
Instrument Range	10^{-6} to 10^{-2} µCi/cc	-
Environmental Qualification	Yes	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	Highly reliable	-
Control Room Indication	Continuous indication	-
TSC	-	-
EOF	-	[a]
Comments	-	NUREG-0737 action. See Appendix 7.C for discussion.
RHR System Flow (D-1)		
Category	2	2
QA	Yes	Yes
Instrument Range	0 to 110% design flow	0 to 167% design flow
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply

Variable	NRC	Trojan
RHR Heat Exchanger Outlet Temp (D-2)		
Category	2	2
QA	Yes	Yes
Instrument Range	40 to 350°F	50 to 400°F
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
Accumulator Tank Level and Pressure (D-3)		
Category	2	2
QA	Yes	Yes
Instrument Range	10 to 90% vol 0 to 750 psig	53 to 79% vol 0 to 700 psig
Environmental Qualification	Yes	No
Seismic Qualification	No	No
Schedule	-	End of 1987 outage
Redundant	No	No
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[p]
Accumulator Isolation Valve Position (D-4)		
Category	2	2
QA	Yes	Yes
Instrument Range	Closed or open	Closed or open
Environmental Qualification	Yes	No
Seismic Qualification	No	No
Schedule	-	End of 1987 outage
Redundant	No	No
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[p]

Variable	NRC	Trojan
Boric Acid Charging Flow (D-5)		
Category	2	2
QA	Yes	Yes
Instrument Range	0 to 110% design	0 to 267% design flow
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
HPSI Flow (D-6)		
Category	2	2
QA	Yes	Yes
Instrument Range	0 to 110% design	0 to 267% design flow
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
LPI Flow (D-7)		
Category	2	2
QA	Yes	Yes
Instrument Range	0 to 110% design	0 to 123% design flow
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply

Variable	NRC	Trojan
RWST Level (D-8)		
Category	2	1
QA	Yes	Yes
Instrument Range	Top to bottom	6 to 100%
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	End of 1987 outage
Redundant	No	Yes
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[g]
Reactor Coolant Pump Status (D-9)		
Category	3	3
QA	No	No
Instrument Range	Motor current	0 to 400 amps
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	-
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
Primary System PORV and Safety Relief Valves (D-10)		
Category	2	2
QA	Yes	Yes
Instrument Range	Closed - Not closed	Closed - Not closed (PORV) <1 to 100% flow (safety valves)
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	End of 1987 outage
Redundant	No	No
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	No
EOF	-	[a]
Comments	-	[q]

Variable	NRC	Trojan
Pressurizer Level (D-11)		
Category	1	1
QA	Yes	Yes
Instrument Range	Bottom to top	3.7 to 96.3%
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	No
EOF	-	[a]
Comments	-	[h]
Pressurizer Heater Status (D-12)		
Category	2	2
QA	Yes	Yes
Instrument Range	Electric current	0 to 800 amps
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	Highly reliable	Highly reliable
Control Room Indication	Continuous indication	Continuous indication
TSC	-	No
EOF	-	[a]
Comments	-	Comply
Quench Tank Level (D-13)		
Category	3	3
QA	No	No
Instrument Range	Top to bottom	6 to 94% level
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply

Variable	NRC	Trojan
Quench Tank Temp (D-14)		
Category	3	3
QA	No	No
Instrument Range	50 to 750°F	0 to 300°F
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
Quench Tank Pressure (D-15)		
Category	3	3
QA	No	No
Instrument Range	0 to design pressure	0 to 100 psig (design pressure)
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
Steam Generator Level (D-16)		
Category	1	1
QA	Yes	Yes
Instrument Range	From tube sheet to separators	+7 to -41 ft (wide range) +7 to -5 ft (narrow range)
Environmental Qualification	Yes	Wide range - No Narrow range - Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	Wide range - No Narrow range - Yes
Power Supply	1E	Wide range - No Narrow range - 1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[i]

Variable	NRC	Trojan
Steam Generator Pressure (D-17)		
Category	2	1
QA	Yes	Yes
Instrument Range	ATM to 20% above lowest relief valve setting	ATM to 7% above lowest relief valve setting
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	End of 1987 outage
Redundant	No	No
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[j]
Secondary System Safety/Relief Valve Position or Main Steam Flow (D-18)		
Category	2	2
QA	Yes	Yes
Instrument Range	Closed - Not closed	Main steam flow 0 to 4.8 X 10^6 lb/hr
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	Highly reliable	Highly reliable
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
Main Feedwater Flow (D-19)		
Category	3	3
QA	No	No
Instrument Range	0 to 110% design	0 to 126% design flow
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	-
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply

Variable	NRC	Trojan
AFW Flow (D-20)		
Category	2	2
QA	Yes	Yes
Instrument Range	0 to 110% design flow	0 to 205% design flow
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	Highly reliable	Highly reliable
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
Condensate Storage Tank Water Level (D-21)		
Category	1	1
QA	Yes	Yes
Instrument Range	Plant-specific	1.8 to 97.6%
Environmental Qualification	Yes	Yes
Seismic Qualification	Yes	No
Schedule	-	End of 1987 outage
Redundant	Yes	No
Power Supply	1E	Non-1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[k]
Containment Spray Flow (D-22)		
Category	2	2
QA	Yes	Yes
Instrument Range	0 to 110% design	0 to 300 psig (pressure only)
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply

Variable	NRC	Trojan
Heat Removal by the Containment Fan Heat Removal System (D-23)		
Category	2	2
QA	Yes	Yes
Instrument Range	Plant-specific	On-Off indicating light
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	Highly reliable	Highly reliable
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
Containment Atmosphere Temperature (D-24)		
Category	2	2
QA	Yes	Yes
Instrument Range	40 to 400°F	0 to 300°F
Environmental Qualification	Yes	No
Seismic Qualification	No	No
Schedule	-	End of 1987 outage
Redundant	No	No
Power Supply	Highly reliable	Highly reliable
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	[r]
Containment Sump Water Temperature (D-25)		
Category	2	
QA	Yes	
Instrument Range	50 to 250°F	
Environmental Qualification	Yes	
Seismic Qualification	No	
Schedule	-	
Redundant	No	
Power Supply	Highly reliable	
Control Room Indication	Continuous indication	
TSC	-	
EOF	-	
Comments	-	This instrument does not exist at Trojan. See Appendix 7.C for discussion.

Variable	NRC	Trojan
Makeup Flow-In (D-26)		
Category	2	2
QA	Yes	Yes
Instrument Range	0 to 110% design	0 to 200% design flow
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
Letdown Flow-Out (D-27)		
Category	2	2
QA	Yes	Yes
Instrument Range	0 to 110% design	0 to 166% design flow
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
Volume Control Tank Level (D-28)		
Category	2	2
QA	Yes	Yes
Instrument Range	Top to bottom	18 to 82% volume
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	Highly reliable	1E
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply

Variable	NRC	Trojan
Component Cooling Water Temp to ESF System (D-29)		
Category	2	2
QA	Yes	Yes
Instrument Range	40 to 200°F	0 to 300°F
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	Highly reliable	Highly reliable
Control Room Indication	Continuous indication	Continuous display on demand
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
Component Cooling Water Flow to ESF System (D-30)		
Category	2	
QA	Yes	
Instrument Range	0 to 110% design	
Environmental Qualification	Yes	
Seismic Qualification	No	
Schedule	-	
Redundant	No	
Power Supply	Highly reliable	
Control Room Indication	Continuous indication	
TSC	-	
EOF	-	
Comments	-	This instrument does not exist at Trojan. See Appendix 7.C for discussion.
High-Level Radioactive Liquid Tank Level (D-31)		
Category	3	3
QA	No	No
Instrument Range	Top to bottom	13.6 to 100%
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	-
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply

Variable	NRC	Trojan
Radioactive Gas Holdup Tank Pressure (D-32)		
Category	3	3
QA	No	No
Instrument Range	0 to 150% design	0 to 160% design waste gas decay tank 0 to 40% design waste gas surge tank
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	-
Control Room Indication	Continuous indication	Yes (on demand) waste gas decay tank Yes waste gas surge tank
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
Emergency Ventilation Damper Position (D-33)		
Category	2	2
QA	Yes	Yes
Instrument Range	Open - Closed	Open - Closed (CV-1 only)
Environmental Qualification	-	Yes
Seismic Qualification	Yes	No
Schedule	No	Complete
Redundant	-	No
Power Supply	Highly reliable	Highly reliable
Control Room Indication	Continuous indication	Continuous indication
TSC	-	No
EOF	-	[a]
Comments	-	Complete

Variable	NRC	Trojan
Status of Standby Power and Other Energy Sources Important to Safety (D-34)		
Category	2	2
QA	Yes	Yes
Instrument Range	Voltages, currents, pressures	Voltage and current
Environmental Qualification	Yes	Yes
Seismic Qualification	No	No
Schedule	-	End of 1986 outage
Redundant	No	No
Power Supply	Highly reliable	Highly reliable
Control Room Indication	Continuous indication	Various
TSC	-	Yes
EOF	-	[a]
Comments	-	See Appendix 7.C for discussion.[s]
Containment Area Radiation High Range (E-1)		
Category	1	1
QA	Yes	Yes
Instrument Range	1 to 10^7 R/hr	1 to 10^7 R/hr
Environmental Qualification	Yes	No
Seismic Qualification	Yes	Yes
Schedule	-	End of 1985 or 1986 outage
Redundant	Yes	No
Power Supply	1E	1E
Control Room Indication	Continuous recording	Continuous recording
TSC	-	Yes
EOF	-	[a]
Comments	-	[t]
Radiation Exposure Rate (Inside Buildings) (E-2)		
Category	3	3
QA	Yes	Yes
Instrument Range	10^{-1} to 10^4 R/hr	10^{-1} to 10^4 R/hr
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	1E
Control Room Indication	Continuous recording	Continuous recording
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply

Variable	NRC	Trojan
Containment or Purge Effluent - Noble Gas and Vent Flow Rate (E-3A)		
Category	2	-
QA	Yes	-
Instrument Range	10^{-6} to 10^{5} µCi/cc 0 to 110% flow	-
Environmental Qualification	Yes	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	Highly reliable	-
Control Room Indication	Continuous recording	-
TSC	-	-
EOF	-	[a]
Comments	-	NUREG-0737 action. See Appendix 7.C for discussion.
Reactor Shield Building Annulus - Noble Gas and Vent Flow Rate (If In Design) (E-3B)		
Category	2	
QA	Yes	
Instrument Range	10^{-6} to 10^{4} µCi/cc 0 to 110% flow	
Environmental Qualification	Yes	
Seismic Qualification	No	
Schedule	-	
Redundant	No	
Power Supply	Highly reliable	
Control Room Indication	Continuous recording	
TSC	-	
EOF	-	
Comments	-	Not in design.

Variable	NRC	Trojan
Auxiliary Building - Noble Gas and Vent Flow Rate (E-3C)		
Category	2	-
QA	Yes	-
Instrument Range	10^{-6} to 10^{3} µCi/cc 0 to 110% flow	-
Environmental Qualification	Yes	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	Highly reliable	-
Control Room Indication	Continuous recording	-
TSC	-	-
EOF	-	[a]
Comments	-	NUREG-0737 action. See Appendix 7.C for discussion.
Condenser Air Removal System EXH - Noble Gas and Vent Flow Rate (E-3D)		
Category	2	-
QA	Yes	-
Instrument Range	10^{-6} to 10^{5} µCi/cc 0 to 110% flow	-
Environmental Qualification	Yes	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	Highly reliable	-
Control Room Indication	Continuous recording	-
TSC	-	-
EOF	-	[a]
Comments	-	NUREG-0737 action. See Appendix 7.C for discussion.

Variable	NRC	Trojan
Common Plant Vent - Noble Gas and Vent Flow Rate (E-3E)		
Category	2	-
QA	Yes	-
Instrument Range	10^{-6} to 10^{3} µCi/cc 0 to 110% flow	-
Environmental Qualification	Yes	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	Highly reliable	-
Control Room Indication	Continuous recording	-
TSC	-	-
EOF	-	[a]
Comments	-	NUREG-0737 action. See Appendix 7.C for discussion.
Vent From S/G Safety Relief Valves of Atmospheric Dump Valves - Noble Gas (E-3F)		
Category	2	-
QA	Yes	-
Instrument Range	10^{-1} to 10^{3} µCi/cc 0 to 110% flow	-
Environmental Qualification	Yes	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	Highly reliable	-
Control Room Indication	Continuous recording	-
TSC	-	-
EOF	-	[a]
Comments	-	NUREG-0737 action. See Appendix 7.C for discussion.

Variable	NRC	Trojan
All Other Identified Release Points - Noble Gas and Vent Flow Rate (E-3G)		
Category	2	-
QA	Yes	-
Instrument Range	10^{-6} to 10^{2} µCi/cc 0 to 110% flow	-
Environmental Qualification	Yes	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	Highly reliable	-
Control Room Indication	Continuous recording	-
TSC	-	-
EOF	-	[a]
Comments	-	NUREG-0737 action. See Appendix 7.C for discussion.
All Identified Plant Release Points Particulates and Halogens (E-4)		
Category	3	-
QA	No	-
Instrument Range	10^{-3} to 10^{2} µCi/cc 0 to 110% flow	-
Environmental Qualification	No	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	-	-
Control Room Indication	Not required (portable)	-
TSC	-	-
EOF	-	[a]
Comments	-	NUREG-0737 action. See Appendix 7.C for discussion.
Airborne Radiohalogens and Particulates (E-5)		
Category	3	3
QA	No	No
Instrument Range	10^{-9} to 10^{-3} µCi/cc	10^{-9} to 10^{-3} µCi/cc
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	-
Control Room Indication	Not required (portable)	Portable
TSC	-	No
EOF	-	[a]
Comments	-	Comply

Variable	NRC	Trojan
Plant and Environs Radiation (E-6)		
Category	3	3
QA	No	No
Instrument Range	10^{-3} to 10^{4} R/hr photon 10^{-3} to 10^{4} rad/hr beta and low energy photons	5×10^{-5} to 2×10^{4} R/hr photon 2.5×10^{-4} to 2×10^{4} rad/hr beta (Appendix 7.C contains complete breakdown of ranges)
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	-
Control Room Indication	Not required (portable)	Portable
TSC	-	No
EOF	-	[a]
Comments	-	Comply
Plant and Environs Radioactivity (E-7)		
Category	3	3
QA	No	No
Instrument Range	Isotopic analysis	Post-Accident Sampling System
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	-
Control Room Indication	Not required (portable)	Portable
TSC	-	No
EOF	-	[a]
Comments	-	Comply
Wind Direction (E-8A)		
Category	3	3
QA	No	No
Instrument Range	[u]	[u]
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	-
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply

Variable	NRC	Trojan
Wind Speed (E-8B)		
Category	3	3
QA	No	No
Instrument Range	[u]	[u]
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	-
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
Estimation of Atmospheric Stability (E-8C)		
Category	3	3
QA	No	No
Instrument Range	[u]	[u]
Environmental Qualification	No	No
Seismic Qualification	No	No
Schedule	-	Complete
Redundant	No	No
Power Supply	-	-
Control Room Indication	Continuous indication	Continuous indication
TSC	-	Yes
EOF	-	[a]
Comments	-	Comply
Primary Coolant and Sump - Gross Activity (E-10A)		
Category	3	-
QA	No	-
Instrument Range	1 μCi/ml to 10 Ci/ml	-
Environmental Qualification	No	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	-	-
Control Room Indication	-	-
TSC	-	-
EOF	-	-
Comments	-	Comply. Post-Accident Sampling System. See Appendix 7.C for discussion.

Variable	NRC	Trojan
Primary Coolant and Sump - Gamma Spectrum (E-10B)		
Category	3	-
QA	No	-
Instrument Range	Isotopic analysis	-
Environmental Qualification	No	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	-	-
Control Room Indication	-	-
TSC	-	-
EOF	-	-
Comments	-	Comply. Post-Accident Sampling System. See Appendix 7.C for discussion.
Primary Coolant and Sump - Boron Content (E-10C)		
Category	3	-
QA	No	-
Instrument Range	0 to 6000 ppm	-
Environmental Qualification	No	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	-	-
Control Room Indication	-	-
TSC	-	-
EOF	-	-
Comments	-	Comply. Post-Accident Sampling System. See Appendix 7.C for discussion.

Variable	NRC	Trojan
Primary Coolant and Sump - Ci Content (E-10D)		
Category	3	-
QA	No	-
Instrument Range	0 to 20 ppm	-
Environmental Qualification	No	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	-	-
Control Room Indication	-	-
TSC	-	-
EOF	-	-
Comments	-	Comply. Post-Accident Sampling System. See Appendix 7.C for discussion.
Primary Coolant and Sump - Dissolved H_2 and Total Gas (E-10E)		
Category	3	-
QA	No	-
Instrument Range	0 to 2000 cc (stp)/kg	-
Environmental Qualification	No	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	-	-
Control Room Indication	-	-
TSC	-	-
EOF	-	-
Comments	-	Comply. Post-Accident Sampling System. See Appendix 7.C for discussion.

Variable	NRC	Trojan
Primary Coolant and Sump - Dissolved Oxygen (E-10F)		
Category	3	-
QA	No	-
Instrument Range	0 to 20 ppm	-
Environmental Qualification	No	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	-	-
Control Room Indication	-	-
TSC	-	-
EOF	-	-
Comments	-	Comply. Post-Accident Sampling System. See Appendix 7.C for discussion.
Primary Coolant and Sump - pH (E-10G)		
Category	3	-
QA	No	-
Instrument Range	1 to 13	-
Environmental Qualification	No	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	-	-
Control Room Indication	-	-
TSC	-	-
EOF	-	-
Comments	-	Comply. Post-Accident Sampling System. See Appendix 7.C for discussion.
Containment Air - Hydrogen Content (E-10H)		
Category	3	-
QA	No	-
Instrument Range	0 to 10 vol%	-
Environmental Qualification	No	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	-	-
Control Room Indication	-	-
TSC	-	-
EOF	-	-
Comments	-	Comply. Post-Accident Sampling System. See Appendix 7.C for discussion.

Variable	NRC	Trojan
Containment Air - Oxygen Content (E-10I)		
Category	3	-
QA	No	-
Instrument Range	0 to 30 vol%	-
Environmental Qualification	No	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	-	-
Control Room Indication	-	-
TSC	-	-
EOF	-	-
Comments	-	Comply. Post-Accident Sampling System. See Appendix 7.C for discussion.
Containment Air - Gamma Spectrum (E-10J)		
Category	3	-
QA	No	-
Instrument Range	Isotopic analysis	-
Environmental Qualification	No	-
Seismic Qualification	No	-
Schedule	-	-
Redundant	No	-
Power Supply	-	-
Control Room Indication	-	-
TSC	-	-
EOF	-	-
Comments	-	Comply. Post-Accident Sampling System. See Appendix 7.C for discussion.

[a] EOF Displays - The Visitors Information Center (VIC) is the interim EOF for the Trojan Nuclear Plant. Although this building does not meet all of the radiation shielding and ventilation criteria given in Section 8.4.1.b of Supplement 1 to NUREG-0737, the exceptions were identified and justified in numerous letters and during meetings with the NRC held specifically for this issue (see PGE to NRC letter dated May 3, 1982 for a complete discussion). An exemption to permit use of the VIC as the primary EOF was denied by the NRC. PGE to NRC letter dated January 27, 1984 committed to the construction of a new EOF that will contain a data transmission system from the TSC displaying, as a minimum, information on Containment conditions, radiological releases, and meteorology as listed in Regulatory Guide 1.97, Revision 3. It is anticipated that the engineering of the EOF will be completed by mid-1985, and the facility will be completed and operational by December 31, 1986. Approval of the new EOF's location and habitability was granted by the NRC in a letter dated April 25, 1984.

[b] RCS Hot Leg Temperature - Request for Design Change (RDC) 84-043 will replace the control room recorders with seismically qualified equivalents and change their power source to preferred instrument buses. In addition, all indication will be isolated from non-Class 1E equipment with the exception of the Plant computer as discussed in the Clarification to Criterion 5 (Section 3.2.2).

[c] RCS Cold Leg Temperature - RDC 84-043 will replace the control room recorders with seismically qualified equivalents and change their power source to preferred instrument buses. In addition, all indication will be isolated from non-Class 1E equipment with the exception of the Plant computer as discussed in the Clarification to Criterion 5 (Section 3.2.2).

[d] RCS Pressure - RDC 84-094 will replace the control room recorders and indicators with seismically qualified equivalents. The recorder power source will be changed to a preferred instrument bus.

[e] Core Exit Temperature - The extent to which the core exit thermocouples (CET) will be upgraded is being resolved as a NUREG-0737, Item II.F.2, Inadequate Core Cooling, issue. The PGE to NRC commitment regarding a CET upgrade is scheduled for transmittal to the NRC by the end of 1984.

[f] Containment Pressure - RDC 84-101 will replace the control room narrow-range indicators with seismically qualified indicators.

[g] RWST Level - RDC 84-101 will replace the control room indicators with seismically qualified equivalents.

[h] Pressurizer Level - RDC 84-092 will replace the control room recorder and indicators with seismically qualified equivalents. The recorder power supply will be upgraded to Class 1E. The indication signals will be isolated from non-Class 1E equipment.

[i] Steam Generator Level - RDC 84-093 will upgrade the system to meet environmental, seismic, and Class 1E requirements. The wide-range control room recorders and narrow-range indicators will be replaced with seismically qualified equivalents.

[j] Steam Generator Pressure - RDC 84-101 will replace the control room indicators with seismically qualified equivalents.

[k] CST Level - RDC 84-096 will upgrade the system so that both level transmitters are powered from Class 1E, battery-backed buses.

[l] Neutron Flux - RDC 83-044 will install a single new channel that meets applicable design criteria.

[m] Containment Sump Water Level - RDC 84-101 will replace the control room indicators with seismically qualified equivalents.

[n] Containment Isolation Valve Position - RDC 84-103 will replace unqualified limit switches with environmentally qualified equivalents. RDC 84-107 will provide indication to the TSC.

[o] Containment Hydrogen Concentration - RDC 84-101 will replace the control room indicators with seismically qualified equivalents.

[p] Accumulator Tank Level and Pressure Accumulator Isolation Valve Position - RDC 84-095 will environmentally qualify one pressure transmitter in each accumulator, and the outlet isolation valve and valve position indication for each accumulator.

[q] Primary System PORV and Safety Valves - RDC 84-107 will provide indication to the TSC.

[r] Containment Atmosphere Temperature - RDC 84-102 will environmentally qualify one in-Containment RTD.

[s] Status and Standby Power and Other Energy Sources Important to Safety - RDC 81-057 will provide control room indication or annunciation of station battery breaker position.

[t] Containment Area Radiation High Range - RDC 83-036 will upgrade the environmental qualification of the system (the detector to cable connectors are unqualified). PGE is awaiting the results of a qualification test on RTV sealed connectors that is being sponsored by another utility. If the test is successful, the PGE connectors will be sealed with RTV by the end of the 1985 refueling outage. If the test is unsuccessful the cable and/or detectors will be replaced with an environmentally qualified system by the end of the 1986 refueling outage.

[u] Wind Direction, Wind Speed, Speed Estimation of Atmospheric Stability - Required and installed ranges, too lengthy for this table, are listed in Appendix 7.C.

TABLE 4-2

SUMMARY OF NRC ENVIRONMENTAL QUALIFICATION
REQUIREMENTS FOR NUREG-0737
ITEMS II.B.3, II.F.1.1, and II.F.1.2

NUREG-0737 Item No.	Description	NRC Environmental Qualification Requirements		
		NUREG-0737	Regulatory Guide 1.97 (Rev. 3)	10 CFR 50.49
II.B.3	Post-Accident Sampling System	No requirement[a]	Category 3[d]	No requirement
II.F.1.1	Noble gas effluent monitors (PRM 1, 2, 6, 16)	[b]	Category 2[c]	Regulatory Guide 1.97 Category 1 and 2
II.F.1.2	Iodine and particulate sampling capability (PRM 1, 2, 6, 16)	No requirement	Category 3[d]	No requirement

[a] An NRC letter dated June 30, 1982 transmitted an attachment entitled "NUREG-0737, II.B.3 Evaluation Criteria Guidelines", which provided the following clarification: "It should be verified that valves which are not accessible after an accident are environmentally qualified for the conditions in which they must operate".

[b] NUREG-0737 Table II.F.1-1 requires that "the instruments shall provide sufficiently accurate responses to perform the intended function in the environment to which they will be exposed during accidents".

[c] Category 2 equipment must be qualified in accordance with Regulatory Guide 1.89 and the methodology described in NUREG-0588.

[d] Category 3 equipment must be of high-quality commercial grade and selected to withstand the specified service environment.

5.0 PROGRAM CONTINUATION

This chapter discusses the plans for ensuring the continued qualification, to the Regulatory Guide 1.97 requirement, of all accident monitoring instrumentation at the Trojan Nuclear Plant.

5.1 ENSURING CONTINUED COMPLIANCE TO REGULATORY GUIDE 1.97 GUIDANCE

All instrumentation classified as Category 1 or 2, after meeting Regulatory Guide 1.97 qualification guidance subject to the clarifications presented in Section 3.2.2 of this report, will be maintained under the PGE environmental qualification program. Seismic qualification records for Category 1 instrumentation will be maintained. Category 3 instrumentation will be maintained in accordance with existing PGE standards for high-quality commercial grade equipment.

6.0 REFERENCES

1. Environmental Qualification Program Manual for the Trojan Nuclear Plant, PGE-1025, Portland General Electric Company (July 1982).

2. Nuclear Quality Assurance Program, PGE-8010, Portland General Electric Company (March 1984).

7.0 APPENDICES

This chapter includes appendices which supplement and support related information provided in the main text of this report.

7.A TROJAN INSTRUMENTATION

This appendix lists the installed Trojan instrumentation used to monitor variables listed in Regulatory Guide 1.97.

I. Regulatory Guide 1.97, Category 1 Variables

Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
1. Neutron Flux	Source Range Instrument Loop	NE-31	Y1102	C02	Westinghouse	Westinghouse VX-252	Westronics
	Source Range Instrument Loop	NE-32	Y2202	C02	Westinghouse	Westinghouse VX-252	Westronics
	Intermediate Range Instrument Loop	NE-35	Y1102	C02	Westinghouse	Westinghouse VX-252	Westronics
	Intermediate Range Instrument Loop	NE-36	Y2202	C02	Westinghouse	Westinghouse VX-252	Westronics
	Power Range Instrument Loop	NE-41	Y1102	C02	Westinghouse	Westinghouse VX-252	Westronics
	Power Range Instrument Loop	NE-42	Y2202	C02	Westinghouse	Westinghouse VX-252	Westronics
	Power Range Instrument Loop	NE-43	Y1302	C02	Westinghouse	Westinghouse VX-252	Westronics
	Power Range Instrument Loop	NE-44	Y2402	C02	Westinghouse	Westinghouse VX-252	Westronics
2. T_{Hot}	RCS Loop 1 Temperature Indication Instrument Loop	TE413A	Y2203	C12	Rosemount 176KS	NA	Hagan
	RCS Loop 2 Temperature Indication Instrument Loop	TE423A	Y2203	C12	Rosemount 176KS	NA	Hagan
	RCS Loop 3 Temperature Indication Instrument Loop	TE433A	Y1103	C12	Rosemount 176KS	NA	Hagan
	RCS Loop 4 Temperature Indication Instrument Loop	TE443A	Y1103	C12	Rosemount 176KS	NA	Hagan

I. Regulatory Guide 1.97, Category 1 Variables (Cont)

Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
3. T_{Cold}	RCS Loop 1 Temperature Indication Instrument Loop	TE413B	Y1103	C12	Rosemount 176KS	NA	Hagan
	RCS Loop 2 Temperature Indication Instrument Loop	TE423B	Y1103	C12	Rosemount 176KS	NA	Hagan
	RCS Loop 3 Temperature Indication Instrument Loop	TE433B	Y2203	C12	Rosemount 176KS	NA	Hagan
	RCS Loop 4 Temperature Indication Instrument Loop	TE443B	Y2203	C12	Rosemount 176KS	NA	Hagan
4. RCS Pressure	RCS Wide-Range Pressure Indication Instrument Loop	PT-403	Y1103	C12	Barton/ Westinghouse 763 (Lot 2)	Westinghouse VX-252	NA
	RCS Wide-Range Pressure Indication Instrument Loop	PT-405	Y2203	C12	Barton/ Westinghouse 763 (Lot 2)	NA	Hagan
5. Vessel Water Level	RVLIS A Train Instrument Loop	ULIS-931	Y1106, Y1311, Y1313	C09/C60A	Westinghouse	Westinghouse	Westinghouse (on Panel C60A)
	RVLIS B Train Instrument Loop	ULIS-932	Y2411, Y2413, Y2206	C09	Westinghouse	Westinghouse	NA
6. Containment Water Level	Wide-Range Water Level Instrument Loop	LT4208A2	Y1104	C09	Barton/ Westinghouse 764	Westinghouse VX-252	NA
	Wide-Range Water Level Instrument Loop	LT4208B2	Y2204	C09	Barton/ Westinghouse 764	Westinghouse VX-252	NA

I. Regulatory Guide 1.97, Category 1 Variables (Cont)

	Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
7.	Containment Pressure	Wide-Range Pressure Instrument Loop A	PT2087A	Y1313	C09	Rosemount 1153GA8	NA	Esterline-Angus MS413C
		Wide-Range Pressure Instrument Loop B	PT2087B	Y2413	C09	Rosemount 1153GA8	NA	Esterline-Angus MS413C
		Narrow-Range Pressure Instrument Loop*	PT2080	Y2405	C19	Rosemount 1153DD6	Westinghouse VX-252	NA
		Narrow-Range Pressure Instrument Loop*	PT2081	Y1305	C19	Rosemount 1153DD6	Westinghouse VX-252	NA
		Narrow-Range Pressure Instrument Loop*	PT2082	Y2210	C19	Rosemount 1153DD6	Westinghouse VX-252	NA
		Narrow-Range Pressure Instrument Loop*	PT2083	Y1110	C19	Rosemount 1153DD6	Westinghouse VX-252	NA
8.	Containment Isolation Valve Position	Containment Isolation Valves	Varies	Varies	Varies	Varies	Varies	Varies
9.	Core Exit Temperature	65 Thermocouples	RT1-RT65	Y0401 Y0402	C09 C33Z C54	Westinghouse	Westinghouse Subcooling Margin Monitor (on Panel C09) Honeywell Electronik 15 (on Panel C33Z)	P-250 Plant Computer

* Only wide range is required for 1.97.

I. Regulatory Guide 1.97, Category 1 Variables (Cont)

	Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
10.	RCS Radioactivity	This instrument is not installed at Trojan.	NA	NA	NA	NA	NA	NA
11.	Containment H_2	H_2 Indication Instrument Loop	AE5755A	B2349 via X61	C09	Teledyne	Westinghouse VX-252 (on Panel C09)	Esterline-Angus MC411C (local)
		H_2 Indication Instrument Loop	AE5755B	B2248 via X62	C09	Teledyne	Westinghouse VX-252 (on Panel C09)	Esterline-Angus MC411C (local)
12.	Pressurizer Level	Pressurizer Level Indication Instrument Loop	LT-459	Y1103	C13/C02	Foxboro E13DH	Westinghouse VX-252 (on Panel C13)	Hagan (on Panel C02)
		Pressurizer Level Indication Instrument Loop	LT-460	Y2203	C13/C02	Foxboro E13DH	Westinghouse VX-252 (on Panel C13)	Hagan (on Panel C02)
		Pressurizer Level Indication Instrument Loop	LT-461	Y1303	C13/C02 C19	Foxboro E13DH	Westinghouse VX-252 (on Panels C13 and C19)	Hagan (on Panel C02)
13.	SG Level	SG No. 1 Wide-Range Instrument Loop	LT501	Y11/Y13	C05	Barton 384	NA	Hagan
		SG No. 2 Wide-Range Instrument Loop	LT502	Y22/Y24	C05	Barton 384	NA	Hagan
		SG No. 3 Wide-Range Instrument Loop	LT503	Y11/Y13	C05	Barton 384	NA	Hagan
		SG No. 4 Wide-Range Instrument Loop	LT504	Y22/Y24	C05	Barton 384	NA	Hagan

I. Regulatory Guide 1.97, Category 1 Variables (Cont)

Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
	SG No. 1 Narrow-Range Instrument Loop	LT517	Y2403	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 on Panel C14)	NA
	SG No. 1 Narrow-Range Instrument Loop	LT518	Y1303	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 (on Panel C14)	NA
	SG No. 1 Narrow-Range Instrument Loop	LT519	Y2203	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 (on Panel C14)	Hagan (on Panel C05)
	SG No. 2 Narrow-Range Instrument Loop	LT527	Y2403	C14/C05	Barton 764	Westinghouse VX-252 (on Panel C14)	NA
	SG No. 2 Narrow-Range Instrument Loop	LT528	Y1303	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 (on Panel C14)	NA
	SG No. 2 Narrow-Range Instrument Loop	LT529	Y1103	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 (on Panel C14)	Hagan (on Panel C05)
	SG No. 3 Narrow-Range Instrument Loop	LT537	Y2403	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 (on Panel C14)	NA
	SG No. 3 Narrow-Range Instrument Loop	LT538	Y1303	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 (on Panel C14)	NA
	SG No. 3 Narrow-Range Instrument Loop	LT539	Y1103	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 (on Panel C14)	Hagan (on Panel C05)
	SG No. 4 Narrow-Range Instrument Loop	LT547	Y2403	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 (on Panel C14)	NA

I. Regulatory Guide 1.97, Category 1 Variables (Cont)

Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
	SG No. 4 Narrow-Range Instrument Loop	LT548	Y1303	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 (on Panel C14)	NA
	SG No. 4 Narrow-Range Instrument Loop	LT549	Y2203	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 (on Panel C14)	Hagan (on Panel C05)
14. CST Level	Level Indication Instrument Loop	LT-5265	Y2414	C17	Barton 384	Westinghouse VX-252	NA
	Level Indication Instrument Loop	LT-5201	Y0207	C17	Fischer -Porter 1302493WCBK	Westinghouse VX-252	NA
15. Containment Area	Radiation Level Instrument Loop	RE 6115A	Y1313	C09	Victoreen 877-1 (Model 875)	Victoreen	Esterline Angus MS412C
	Radiation Level Instrument Loop	RE 6115B	Y2413	C09	Victoreen 877-1 (Model 875)	Victoreen	Esterline Angus MS412C
16. Degree of Subcooling	Subcooling Margin Monitor	UDIS-1013A	Y1313	C09 C12	Westinghouse	Westinghouse	NA
	Subcooling Margin Monitor	UDIS-1013B	Y2413	C09 C12	Westinghouse	Westinghouse	NA

I. Regulatory Guide 1.97, Category 1 Variables (Cont)

	Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
17.	RWST Level*	Narrow-Range Level Indication Instrument Loop	LT-1898	Y2405	C19	Barton 386	Westinghouse VX-252	NA
		Wide-Range Level Indication Instrument Loop	LT-1899	Y1305	C19	Barton 386	Westinghouse VX-252	NA
		Wide-Range Level Indication Instrument Loop	LT-1900	Y1107	C19	Barton 386	Westinghouse VX-252	NA
		Wide-Range Level Indication Instrument Loop	LT-1901	Y2210	C19	Barton 386	Westinghouse VX-252	NA
18.	SG Pressure*	SG No. 1 Pressure Indication Instrument Loop	PT-514	Y1103	C14	Rosemount 1153GD9	Westinghouse VX-252	NA
			PT-515	Y2203	C14	Rosemount 1153GD9	Westinghouse VX-252	NA
			PT-516	Y2403	C14	Rosemount 1153GD9	Westinghouse VX-252	NA
		SG No. 2 Pressure Indication Instrument Loop	PT-524	Y1103	C14	Rosemount 1153GD9	Westinghouse VX-252	NA
			PT-525	Y2203	C14	Rosemount 1153GD9	Westinghouse VX-252	NA
			PT-526	Y1303	C14	Rosemount 1153GD9	Westinghouse VX-252	NA
		SG No. 3 Pressure Indication Instrument Loop	PT-534	Y1103	C14	Rosemount 1153GD9	Westinghouse VX-252	NA
			PT-535	Y2203	C14	Rosemount 1153GD9	Westinghouse VX-252	NA
			PT-536	Y1303	C14	Rosemount 1153GD9	Westinghouse VX-252	NA

* These parameters have been included with the Category 1 list since they have been defined as Type A variables at Trojan.

I. Regulatory Guide 1.97, Category 1 Variables (Cont)

Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
	SG No. 4 Pressure Indication Instrument Loop	PT-544	Y1103	C14	Rosemount 1153GD9	Westinghouse VX-252	NA
		PT-545	Y2203	C14	Rosemount 1153GD9	Westinghouse VX-252	NA
		PT-546	Y2403	C14	Rosemount 1153GD9	Westinghouse VX-252	NA

II. Regulatory Guide 1.97, Category 2 Variables

Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
1. Containment Water Level	Narrow-Range Instrument Loop	LT4208A1	Y1104	C09	Barton 764	Westinghouse VX-252	NA
	Narrow-Range Instrument Loop	LT4208B1	Y2204	C09	Barton/ Westinghouse 764	Westinghouse VX-252	NA
2. Noble Gas Effluent/ Vent Flow Rate							
Containment Purge (PRM-1)	Particulate Channel	RE-5701A	L1420	C41	Victoreen	Victoreen Log Rateмeter	Westronics
	Iodine Channel	RE-5701B	L1420	C41	Victoreen	Victoreen Log Rateмeter	Westronics
	Gas Low Channel	RE-5701C	L1420	C41	Victoreen	Victoreen Log Rateмeter	Westronics
	Gas High Channel	RE-5701D	L1420	C41	Victoreen	Victoreen Log Rateмeter	Westronics
Auxiliary Building (PRM-2)	Particulate Channel	RE-5702A	L1406	C41	Victoreen	Victoreen Log Rateмeter	Westronics
	Iodine Channel	RE-5702B	L1406	C41	Victoreen	Victoreen Log Rateмeter	Westronics
	Gas Low Channel	RE-5702C	L1406	C41	Victoreen	Victoreen Log Rateмeter	Westronics
	Gas High Channel	RE-5702D	L1406	C41	Victoreen	Victoreen Log Rateмeter	Westronics
Main Steam Relief	Steam Line Monitor	RE-2239	Y0220	C06/C66	TEC 701	Westinghouse VX-252 (on Panel C06) TEC 704 (on Panel C66)	TIGRAPH 100 (on Panel C66)

II. Regulatory Guide 1.97, Category 2 Variables (Cont)

Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
	Steam Line Monitor	RE-2240	Y0220	C06/C66	TEC 701	Westinghouse VX-252 (on Panel C06) TEC 704 (on Panel C66)	TIGRAPH 100 (on Panel C66)
	Steam Line Monitor	RE-2241	Y0220	C06/C66	TEC 701	Westinghouse VX-252 (on Panel C06) TEC 704 (on Panel C66)	TIGRAPH 100 (on Panel C66)
	Steam Line Monitor	RE-2242	Y0220	C06/C66	TEC 701	Westinghouse VX-252 (on Panel C06) TEC 704 (on Panel C66)	TIGRAPH 100 (on Panel C66)
Condenser Air Ejector (PRM-6)	Low Gas Channel	RE-3110A	L1117	C41	Victoreen	Victoreen Log Rateneter	Westronics
	High Gas Channel	RE-3110B	L1117	C41	Victoreen	Victoreen Log Rateneter	Westronics
S/G Blowdown (PRM-10)	S/G Sample	RE-5700	Y1106	C41	Victoreen	Victoreen Log Rateneter	Westronics
3. RHR System Flow	Cold Leg Injection Wide-Range Flow Indication Instrument Loop	FT-971B	Y1304	C13	Barton 384	Westinghouse VX-252	NA
	Cold Leg Injection Wide-Range Flow Indication Instrument Loop	FT-970B	Y2404	C13	Barton 384	Westinghouse VX-252	NA
	Cold Leg Injection Narrow-Range Flow Indication Instrument Loop	FT-970A	Y2404	C13	Barton 384	Westinghouse VX-252	NA
	Cold Leg Injection Narrow-Range Flow Indication Instrument Loop	FT-971A	Y1304	C13	Barton 384	Westinghouse VX-252	NA
	Hot Leg Injection Flow Indication Instrument Loop	FT-600	Y2204	C13	Barton 384	Westinghouse VX-252	NA

II. Regulatory Guide 1.97, Category 2 Variables (Cont)

Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
4. RHR Hx Outlet Temperature	RHR Hx 1 Outlet Temperature Instrument Loop	TE-604	Y2204	C13	PYCO 122-6012-060-17.8	NA	Hagan
	RHR Hx 2 Outlet Temperature Instrument Loop	TE-605	Y1104	C13	PYCO 122-6012-060-17.8	NA	Hagan
5. Accumulator Level	No. 1 Level Indication Instrument Loop	LT-950	Y1104	C19	Barton 384	Westinghouse VX-252	NA
		LT-951	Y2204	C19	Barton 384	Westinghouse VX-252	NA
	No. 2 Level Indication Instrument Loop	LT-952	Y1104	C19	Barton 384	Westinghouse VX-252	NA
		LT-953	Y2204	C19	Barton 384	Westinghouse VX-252	NA
	No. 3 Level Indication Instrument Loop	LT-954	Y1304	C19	Barton 384	Westinghouse VX-252	NA
		LT-955	Y2404	C19	Barton 384	Westinghouse VX-252	NA
	No. 4 Level Indication Instrument Loop	LT-956	Y1304	C19	Barton 384	Westinghouse VX-252	NA
		LT-957	Y2404	C19	Barton 384	Westinghouse VX-252	NA
6. Accumulator Pressure	No. 1 Pressure Indication Instrument Loop	PT-960	Y1104	C19	Barton 393	Westinghouse VX-252	NA
		PT-961	Y2204	C19	Barton 393	Westinghouse VX-252	NA
	No. 2 Pressure Indication Instrument Loop	PT-962	Y1104	C19	Barton 393	Westinghouse VX-252	NA
		PT-963	Y2204	C19	Barton 393	Westinghouse VX-252	NA

II. Regulatory Guide 1.97, Category 2 Variables (Cont)

	Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
		No. 3 Pressure Indication Instrument Loop	PT-964	Y1304	C19	Barton 393	Westinghouse VX-252	NA
			PT-965	Y2404	C19	Barton 393	Westinghouse VX-252	NA
		No. 4 Pressure Indication Instrument Loop	PT-966	Y1304	C19	Barton 393	Westinghouse VX-252	NA
			PT-967	Y2404	C19	Barton 393	Westinghouse VX-252	NA
7.	Accumulator Isolation Valve Position	Isolation Valve Position Indication	M08808A	B2510/ Y1115	C19	Limitorque SMB-4	NA	NA
			M08808B	B2610/ Y2215	C19	Limitorque SMB-4	NA	NA
			M08808C	B2511/ Y1115	C19	Limitorque SMB-4	NA	NA
			M08808D	B2611/ Y2215	C19	Limitorque SMB-4	NA	NA
8.	Boric Acid Charging Flow	Boric Acid Charging Flow Instrument Loop	FIT-917	Y1104	C19	Barton 384	Westinghouse VX-252	NA
9.	HPI System Flow	Charging Pump Injection Flow Instrument Loop	FIT-917	Y1104	C19	Barton 384	Westinghouse VX-252	NA
10.	LPI System Flow	SI Flow Instrument Loop	FT918	Y1304	C19	Barton 384	Westinghouse VX-252	NA
		SI Flow Instrument Loop	FT922	Y2204	C19	Barton 384	Westinghouse VX-252	NA

II. Regulatory Guide 1.97, Category 2 Variables (Cont)

	Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
11.	Pressurizer PORV Valve Position	A Train PORV Valve Position Indication	ZS455A	D1016	C12	Namco EA18012302	NA	NA
		B Train PORV Valve Position Indication	ZS456	D2016	C12	Namco EA18012302	NA	NA
12.	Pressurizer Safety Valve Position	Acoustic Flow Monitoring System	SE 1189A	Y1114	C12	Endevco/Tec 2273A	TEC 914	NA
			SE 1189B	Y1114	C12	Endevco/Tec 2273A	TEC 914	NA
			SE 1189C	Y1114	C12	Endevco/Tec 2273A	TEC 914	NA
13.	Pressurizer Heater	Group A Ammeter Indication	Group A	B0922	C13	Ammeter	Westinghouse VX-252	NA
		Group B Ammeter Indication	Group B	B1022	C13	Ammeter	Westinghouse VX-252	NA
		Group C Ammeter Indication	Group C	B0912/ B1031	C13	Ammeter	Westinghouse VX-252	NA
		Group D Ammeter Indication	Group D	B1012	C13	Ammeter	Westinghouse	NA
		Group A On-Off Indication	Group A	D3021	C02	NA	NA	NA
		Group B On-Off Indication	Group B	D4021	C02	NA	NA	NA
		Group C On-Off Indication	Group C	D3021/ D4021	C02	NA	NA	NA
		Group D On-Off Indication	Group D	D4021	C02	NA	NA	NA

II. Regulatory Guide 1.97, Category 2 Variables (Cont)

	Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
14.	Safety/Relief Valve Positions (or MS Flow)	SG No. 1 Main Steam Flow Indication Instrum. Loop	FT-512	Y1103	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse (on Panel C14)	Hagan (on Panel C05)
			FT-513	Y2203	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse (on Panel C14)	Hagan (on Panel C05)
		SG No. 2 Main Steam Flow Indication Instrum. Loop	FT-522	Y1103	C14/C05	Barton 764	Westinghouse (on Panel C14)	Hagan (on Panel C05)
			FT-523	Y2203	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse (on Panel C14)	Hagan (on Panel C05)
		SG No. 3 Main Steam Flow Indication Instrum. Loop	FT-532	Y1103	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 (on Panel C14)	Hagan (on Panel C05)
			FT-533	Y2203	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 (on Panel C14)	Hagan (on Panel C05)
		SG No. 4 Main Steam Flow Indication Instrum. Loop	FT-542	Y1103	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 (on Panel C14)	Hagan (on Panel C05)
			FT-543	Y2203	C14/C05	Barton/ Westinghouse 764 (Lot 2)	Westinghouse VX-252 (on Panel C14)	Hagan (on Panel C05)
15.	AFW Flow	AFW to S/G 1 Flow Indication Instrument Loop	FT3043E	Y2204	C19	Rosemount 1153HA6	Westinghouse VX-252	NA
		AFW to S/G 2 Flow Indication Instrument Loop	FT3043B	Y2212	C19	Foxboro N-E13DM	Westinghouse VX-252	NA
		AFW to S/G 3 Flow Indication Instrument Loop	FT3043G	Y2204	C19	Rosemount 1153HA6	Westinghouse VX-252	NA

II. Regulatory Guide 1.97, Category 2 Variables (Cont)

Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
	AFW to S/G 4 Flow Indication Instrument Loop	FT3043D	Y2212	C19	Foxboro N-E13DM	Westinghouse VX-252	NA
	AFW to S/G 1 Flow Indication Instrument Loop	FT3043A	Y1112	C05	Foxboro N-E13DM	Westinghouse	NA
	AFW to S/G 2 Flow Indication Instrument Loop	FT3043F	Y1104	C05	Rosemount 1153HA6	Westinghouse VX-252	NA
	AFW to S/G 3 Flow Indication Instrument Loop	FT3043C	Y1112	C05	Foxboro N-E13DM	Westinghouse VX-252	NA
	AFW to S/G 4 Flow Indication Instrument Loop	FT3043H	Y1104	C05	Rosemount 1153HA6	Westinghouse VX-252	NA
16. Containment Spray Flow	Discharge Pressure Indication Instrument Loop	PT-2071A	Y1305	C19	Fischer - Porter 50EP1071BC5BA	Westinghouse VX-252	NA
	Discharge Pressure Indication Instrument Loop	PT-2071B	Y2405	C19	Fischer - Porter 50EP1071BC5BA	Westinghouse VX-252	NA
	NOTE: Control room containment spray flow indication is not installed.						
17. Containment Fan Cooler	Containment Air Cooler Fan 1A	VC-201A	B0113	C17/C19	NA	NA	NA
	Containment Air Cooler Fan 1B	VC-201B	B0214	C17/C19	NA	NA	NA
	Containment Air Cooler Fan 2A	VC-202A	B0122	C17/C19	NA	NA	NA

II. Regulatory Guide 1.97, Category 2 Variables

	Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
		Containment Air Cooler Fan 2B	VC-202B	B0232	C17/C19	NA	NA	NA
		Containment Air Cooler Fan 3A	VC-203A	B0323	C17/C19	NA	NA	NA
		Containment Air Cooler Fan 3B	VC-203B	B0432	C17/C19	NA	NA	NA
		Containment Air Cooler Fan 4A	VC-204A	B0313	C17/C19	NA	NA	NA
		Containment Air Cooler Fan 4B	VC-204B	B0433	C17/C19	NA	NA	NA
18.	Containment Atmospheric Temperature	Containment Temperature Indication Instrument Loops	TE-10103	Y0310	C17	Unknown	Westronics 510 Indicator MSU 160	NA
19.	Containment Sump Temperature	This instrument is not installed at Trojan.	NA	NA	NA	NA	NA	NA
20.	CVCS Makeup Flow	Charging Header Flow Indication Instrument Loop	FT-121	Y2204	C12	Barton 384	Westinghouse VX-252	NA
21.	CVCS Letdown Flow	Letdown Heat Exchanger Outlet Flow Indication Instrument Loop	FT-132	Y2404	C12	Barton 384	Westinghouse VX-252	NA
22.	VCT Level	Level Indication Instrument Loop	LT-185	Y2404	C12/C02	Barton 345	Westinghouse VX-252	NA
		Level Indication Instrument Loop	LT-112	Y1104	C12	Barton 332	Westinghouse VX-252	NA

II. Regulatory Guide 1.97, Category 2 Variables (Cont)

	Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
23.	CCW Temperature to ESF	CCW/SW Temperature Indication Train A Instrument Loop	TE 3283A2	Y0106	C18	Camco 1/2F 304	Westronics 510 Indicator MSU-S12	NA
		CCW/SW Temperature Indication Train B Instrument Loop	TE 3273A2	Y0206	C18	Camco 1/2F 304	Westronics 510 Indicator MSU-S12	NA
24.	CCW Flow to ESF	CCW Pump West Discharge Pressure Indication Loop	PT3282	Y0106	C18	Fischer & Porter 50EP107IBCSBA	Westinghouse VX-252	NA
		CCW Pump East Discharge Pressure Indication Loop	PT3272	Y0202	C18	Fischer & Porter 50EP107IBCSBA	Westinghouse VX-252	NA
		NOTE: Control room flow indication is not installed.						
25.	Emergency Ventilation Damper Position (System CV-1)	Position Lamps (Green-Open; Red-Shut)	DM10251A DM10251B	Y1113 Y2213	C17 C17	NA	NA	NA
26.	Status of Standby Power and Other Energy Sources (Hydraulic, Pneumatic)	Various	Various	-	-	-	-	-

III. Regulatory Guide 1.97, Category 3 Variables

	Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
1.	Control Rod Position	Digital Rod Position Indication	NA	Y0105 Y0223	C02 C13	Westinghouse	Westinghouse	NA
2.	RCS Boron Concentration	This instrument is not installed at Trojan.	NA	NA	NA	NA	NA	NA
3.	Analysis of Primary Coolant (Gamma Spectrum)	Postaccident Sampling System	NA	B32	NA	NA	NA	NA
4.	RCP Status	RCP A Motor Ammeter	A-H104	H104	C12	Ammeter	Westinghouse VX-252	NA
		RCP B Motor Ammeter	A-H204	H204	C12	Ammeter	Westinghouse VX-252	NA
		RCP C Motor Ammeter	A-H105	H105	C12	Ammeter	Westinghouse VX-252	NA
		RCP D Motor Ammeter	A-H205	H205	C12	Ammeter	Westinghouse VX-252	NA
5.	PRT Level	Level Indication Instrument Loop	LT-470	Y1104	C13	Barton 384	Westinghouse VX-252	NA
6.	PRT Temperature	Temperature Indication Instrument Loop	TE-468	Y2204	C13	Unknown	Westinghouse VX-252	NA

III. Regulatory Guide 1.97, Category 3 Variables (Cont)

	Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
7.	PRT Pressure	Pressure Indication Instrument Loop	PT-469	Y1104	C13	Barton 389	Westinghouse VX-252	NA
8.	Main Feedwater Flow	Loop 1 Feed Flow Indication Instrument Loop	FT-510	Y1103	C14/C05	Barton 384	Westinghouse VX-252	Hagan (on Panel C05)
			FT-511	Y2203	C14/C05	Barton 384	Westinghouse VX-252	Hagan (on Panel C05)
		Loop 2 Feed Flow Indication Instrument Loop	FT-520	Y1103	C14/C05	Barton 384	Westinghouse VX-252	Hagan (on Panel C05)
			FT-521	Y2203	C14/C05	Barton 384	Westinghouse VX-252	Hagan (on Panel C05)
		Loop 3 Feed Flow Indication Instrument Loop	FT-530	Y1103	C14/C05	Barton 384	Westinghouse (on Panel C14)	Hagan (on Panel C05)
			FT-531	Y2203	C14/C05	Barton 384	Westinghouse (on Panel C14)	Hagan (on Panel C05)
		Loop 4 Feed Flow Indication Instrument Loop	FT-540	Y1103	C14/C05	Barton 384	Westinghouse (on Panel C14)	Hagan (on Panel C05)
			FT-541	Y2203	C14/C05	Barton 384	Westinghouse (on Panel C14)	Hagan (on Panel C05)
9.	High-Level Radioactive Liquid Tank Level	Reactor Coolant Drain Tank Level	LT-4004	Y0230	C17	Barton 386	Westinghouse VX-252	NA

III. Regulatory Guide 1.97, Category 3 Variables (Cont)

	Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
10.	Radioactive Gas Holdup Tank Pressure	Waste Gas Decay Tank A Instrument Loop	PT-4338	Y0230	C16 (Plant Computer)	Fischer/ Porter 50EP107IBCSBA	Electrohome TV Monitor	NA
		Waste Gas Decay Tank B Instrument Loop	PT-4354	Y0230	C16 (Plant Computer)	Fischer/ Porter 50EP107IBCSBA	Electrohome TV Monitor	NA
		Waste Gas Decay Tank C Instrument Loop	PT-4344	Y0230	C16 (Plant Computer)	Fischer/ Porter 50EP107IBCSBA	Electrohome TV Monitor	NA
		Waste Gas Decay Tank D Instrument Loop	PT-4362	Y0230	C16 (Plant Computer)	Fischer/ Porter 50EP107IBCSBA	Electrohome TV Monitor	NA
		Waste Gas Surge Tank Instrument Loop	PT-4304	Y0230	C12	Fischer/ Porter 50PW1021BASB	Westinghouse VX-252	NA
11.	Radiation Exposure rate	Area Radiation Monitors	Various	Y1315	C20	Victoreen	Victoreen Log Ratemeter	Westronics 24 point recorder
12.	Effluent Halogen/ Particulate Sampling and Analysis	Portable Instrumentation	NA	NA	NA	NA	NA	NA
13.	Airborne Halogen/ Particulate Sampling Analysis	Portable Instrumentation	NA	NA	NA	NA	NA	NA

III. Regulatory Guide 1.97, Category 3 Variables (Concl)

	Parameters	Device (sensor, amplifier, indicator, etc)	Instrument Number	Power Supply	Indication Location	Sensor Model Number	Indicator Model Number	Recorder Model Number
14.	Plant/Environs Portable Radiation Monitor	Portable Instrumentation	NA	NA	NA	NA	NA	NA
15.	Meterological Data Wind Direction Wind Speed at Δ1	33-ft Temperature Indication	MR6392BX	Offsite Power	C34	MRI 840	NA	Esterline Angus Speed Servo II
		33-ft Wind Speed and Direction	MR6390AX	Offsite Power	C35	MRI 1074-2	NA	Esterline Angus Speed Servo II
		200 - 33-ft and 500 - 33-ft Temperature Indication	MR6393AX	Offsite Power	C34	MRI 840	NA	Esterline Angus Speed Servo II
		33-ft Wind Speed and Direction	MR6390BX	Offsite Power	C35	MRI 1074-2	NA	Esterline Angus Speed Servo II
		200 - 33-ft Temperature Indication	MR6393BX	Offsite Power	C34	MRI 840	NA	Esterline Angus Speed Servo II
		200-ft Wind Speed and Direction	MR6391AX	Offsite Power	C35	MRI 1074-2	NA	Esterline Angus Speed Servo II
		500-ft Wind Speed and Direction	MR6391BX	Offsite Power	C35	MRI 1074-2	NA	Esterline Angus Speed Servo II
16.	Postaccident Sampling and Analysis	Postaccident Sampling System	NA	B32	NA	NA	NA	NA

7.B TROJAN INSTRUMENTATION RECORDERS

This appendix lists the installed Trojan instrumentation recorders used to record variables listed in Regulatory Guide 1.97.

TROJAN INSTRUMENTATION RECORDERS

Parameter	Instrument Number	Power Supply	Indication Location	Model Type
Neutron Flux	NR-45	YO313	C02	Westronics D11E
RCS Loops 1 and 2 Hot Leg Temperature	TR-413A	YO104	C12	Hagan
RCS Loops 3 and 4 Hot Leg Temperature	TR-433A	YO104	C12	Hagan
RCS Loops 1 and 2 Cold Leg Temperature	TR-413B	YO104	C12	Hagan
RCS Loops 3 and 4 Cold Leg Temperature	TR-433B	YO104	C12	Hagan
RCS Wide Range Pressure	PR-405	YO104	C12	Hagan
RVLIS	LR-1310	Y1313	C60A	Westinghouse Optimac 100
Containment Pressure	UR2087A	Y1313	C09	Esterline Angus MS413C
Containment Pressure	UR2087B	Y2413	C09	Esterline Angus MS413C
Containment Hydrogen	AR5755A	B2349	Local	Esterline Angus MS411C
Containment Hydrogen	AR5755B	B2248	Local	Esterline Angus MS411C
Pressurizer Level	LR 459	YO313	C02	Hagan
SG No. 1 Level, Feed Flow and Steam Flow	FR510	YO313	C05	Hagan
SG No. 2 Level, Feed Flow and Steam Flow	FR520	YO313	C05	Hagan
SG No. 3 Level, Feed Flow and Steam Flow	FR530	YO313	C05	Hagan
SG No. 4 Level, Feed Flow and Steam Flow	FR540	YO313	C05	Hagan
SG No. 1 and 2 Wide Range Level	LR501	YO313	C05	Hagan

TROJAN INSTRUMENTATION RECORDERS

Parameter	Instrument Number	Power Supply	Indication Location	Model Type
SG No. 3 and 4 Wide Range Level	LR503	Y0313	C05	Hagan
Containment High Range Area Radiation	RR6115A	Y1313	C09	Esterline Angus MS412C
Containment High Range Area Radiation	RR6115B	Y2413	C09	Esterline Angus MS412C
PRM 1 through 5 (see the Instrument List for a description of these monitors)	RR4369	-	C41	Westronics 24-Point Recorder
PRM 6 through 13 (see the Instrument List for a description of these monitors)	RR4043	Y1106	C41	Westronics 24-Point Recorder
PRM 16a through 16d Main Steamline Monitors	RR2239	Y0220	C66	TIGRAPH 100
RHR HX 1 Outlet Temp	TR-612	Y0104	C13	Hagan
RHR HX 2 Outlet Temp	TR-613	Y0104	C13	Hagan
Area Radiation Monitors	RR4368	Y1315	C20	Westronics 24-Point Recorder
Meteorological Monitoring	MR6390AX	Y2412	C35	Esterline Angus Speed Servo II
Meteorological Monitoring	MR6390BX	Y2412	C35	Esterline Angus Speed Servo II
Meteorological Monitoring	MR6391AX	Y2412	C35	Esterline Angus Speed Servo II
Meteorological Monitoring	MR6391BX	Y2412	C35	Esterline Angus Speed Servo II
Meteorological Monitoring	MR6392BX	Y2412	C34	Esterline Angus Speed Servo II

TROJAN INSTRUMENTATION RECORDERS

Parameter	Instrument Number	Power Supply	Indication Location	Model Type
Meteorological Monitoring	MR6393AX	Y2412	C34	Esterline Angus Speed Servo II
Meteorological Monitoring	MR6393BX	Y2412	C34	Esterline Angus Speed Servo II

7.C DESIGN AND COMPLIANCE OF INSTRUMENTATION

This appendix contains detailed design and compliance information about each of the Regulatory Guide 1.97 variables.

A-1 RCS Hot-Leg Temperature

Required Range: 50°F-700°F

Category: 1

Existing Design: Platinum RTDs are used to measure hot-leg temperature in each RCS loop. The existing range is 0°F-700°F. The instrumentation system is treated as a Class 1E system up to the isolation device with indication obtained from the non-Class 1E side of a signal isolator. The system is seismically qualified up to the control room displays. The instrument loops are powered from battery-backed, Class 1E power sources. The system is environmentally qualified.

Display:

CR: Two dual-pen recorders provide continuous recording on Panel C12. Loops 1 and 2 are on one recorder, and Loops 3 and 4 are on the other recorder.

TSC: This parameter may be monitored in the TSC on a CRT display.

EOF: See Footnote a to Table 4-1.

Compliance: The RCS hot-leg temperature measurement system complies with Regulatory Guide 1.97 Category 1 requirements with the following exceptions:

1. The redundancy requirements are not fully met, since loss of one electrical train will result in loss of hot-leg indication for two loops. This is considered acceptable, though, since the cold-leg wide-range temperature detectors are powered such that cold-leg temperature indication will be available in these loops. This is consistent with Alternative 3 of NRC to Westinghouse Owners Group letter of November 18, 1982 (LS05-82-11-072).

   In addition, backup indication to the RCS hot-leg temperature indication will be provided by the core exit thermocouples. With the combination of hot-leg RTDs and core exit thermocouples, sufficient diversity is believed available to monitor hot-leg temperature.

2. The recorders are not seismically qualified and are powered from the same non-1E bus; thus de-energizing this bus will result in failure of control room indication.

A-1 RCS Hot-Leg Temperature

Position: The system is reliable in its present configuration; however, the recorders should be replaced with seismically qualified recorders and modified to be powered from a Class 1E, battery-backed source.

Implementation Schedule: End of 1986 refueling outage.

A-2 RCS Cold-Leg Temperature

Required Range: 50°F-700°F

Category: 1

Existing Design: Platinum RTDs are used to measure cold-leg temperature in each RCS loop. The existing range is 0°F-700°F. The instrumentation system is treated as a Class 1E system up to the isolation device with indication obtained from the non-Class 1E side of a signal isolator. The system is seismically qualified up to the control room displays. The instrument loops are powered from battery-backed, Class 1E power sources. The system is environmentally qualified.

Display:

CR — Two dual-pen recorders provide continuous recording on Panel C12. Loops 1 and 2 are on one recorder and Loops 3 and 4 are on the other recorder.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: The RCS cold-leg temperature measurement system complies with Regulatory Guide 1.97 Category 1 requirements with the following exceptions:

1. The redundancy requirements are not fully met since loss of one electrical train will result in loss of cold-leg indication for two loops. This is considered acceptable, though, since the hot-leg wide-range temperature detectors are powered such that hot-leg temperature indication will be available in these loops. This is consistent with Alternative 3 of NRC to Westinghouse Owners Group letter of November 18, 1982 (LS05-82-11-072).

   In addition, backup indication is provided by steam generator pressure indication since the cold-leg temperature approximates the saturation condition corresponding to steam generator pressure. By this method, steam tables would suffice to verify cold-leg temperature. The range of saturation temperature indication then is ~212°F-569°F, which is adequate for purposes of backup monitoring.

2. The recorders are not seismically qualified and are powered from the same non-1E bus; thus

A-2 RCS Cold-Leg Temperature

de-energizing this bus will result in failure of the control room indication.

Position: The system is reliable in its present configuration; however, the recorders should be replaced with seismically qualified recorders and modified to be powered from a Class 1E, battery-backed source.

Implementation Schedule: End of 1986 refueling outage.

A-3 RCS Pressure

Required Range: 0-3,000 psig

Category: 1

Existing Design: The RCS wide-range pressure indication is obtained from two transmitters located on the RHR suction line in the RCS. The existing range is 0-3,000 psig, and the transmitters are environmentally and seismically qualified. The two transmitters and instrumentation loops are powered from Class 1E, battery-backed power sources. The system is a Class 1E system up to the isolation device with indication obtained from the non-Class 1E side of a signal isolator.

The system meets single-failure criteria subject to the Compliance and Position sections below. Indication ambiguity due to a failed channel may be resolved by the dedicated wide-range pressure transmitters of the Reactor Vessel Level Instrumentation System (RVLIS).

Display:

CR: An indicator and a dedicated recorder are provided on Panel C12. Pressure indication from either transmitter is also available upon demand from either channel of the subcooling margin monitor.

TSC: This parameter may be monitored in the TSC on a CRT display.

EOF: See Footnote a to Table 4-1.

Compliance: The RCS wide-range pressure system complies with 1.97 Category 1 requirements with the following exception:

1. The recorder is powered from a non-1E bus and is not seismically qualified. The indicator is not seismically qualified.

Position: The system is reliable as designed. The recorder should be replaced with a qualified recorder and the power supply modified to be a Class 1E, battery-backed source. The indicator should be replaced with a seismically qualified equivalent.

Implementation Schedule: End of 1986 refueling outage.

A-4 Core Exit Temperature

Required Range: 200°F-2,300°F

Category: 1

Existing Design: As shown in Figure 4.4-19 of the Trojan Updated FSAR, 65 Chromel-Alumel in-core thermocouples are installed. The range of indication is 0°F-700°F for the control room mechanical display indicator and up to 2,300°F for the Plant computer and subcooling margin monitor (16 thermocouples).

Two reference junction boxes located in Containment are used to maintain the reference junction at 160°F. Platinum RTDs are used to monitor and control the reference junction temperature.

Display:

CR

Three methods of display are available:

1. A toggle switch indicator may be used to read out the individual CET temperature on a mechanical display indicator. The indicator can display temperatures up to 700°F and is located in the control room near the Nuclear Instrumentation System panels. Means are available to measure temperatures above 700°F if necessary through the use of a voltmeter and manual conversion of the data. The toggle switch indicator assumes that the hot junction box temperature is 160°F. Should the temperature vary from 160°F, temperature correction factors can be applied to the thermocouple readings based on platinum RTDs located in the reference junction box. No alarm features are associated with the toggle indicator.

2. Core exit thermocouple readings can also be displayed via the Plant computer on high-speed printer and CRT display devices. A spatially oriented core map printout which is available upon demand from the typewriter provides the incore thermocouple temperatures, assembly temperature rises, and relative fuel assembly powers at each core exit thermocouple location. The average incore thermocouple temperature and location of the hottest thermocouple are also listed on the map. In addition, a summary map printout is available that lists the individual incore thermocouple temperatures in ascending order.

A-4 Core Exit Temperature

Storage and trending capability exists which provides the capability to obtain, upon demand, a 1 min-old core map, the current core map, or one of the hourly core maps (total of 24) that can be stored in the computer.

3. The two SMMs together have the capability to selectively read any of 16 thermocouples, four from each core quadrant, all within a short time interval. Data from individual thermocouples can be displayed by using a thumbwheel selector switch and pressing the individual sensor button on the SMM. If the indicated data shows that the CET input is disabled or out of range, then the sensor input to the SMM can be manually disabled. The appropriate temperature status lights are de-energized when the sensors are disabled or out of range. The SMMs can indicate CET temperatures from less than 200°F up to 2,300°F.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: The Incore Thermocouple System is not environmentally or seismically qualified and is powered from a non-Class 1E power source. The system is a non-Class 1E system.

Position: The extent to which the CETs will be upgraded is being resolved as a NUREG-0737, Item II.F.2, Inadequate Core Cooling, issue. The PGE to NRC commitment regarding a CET upgrade is scheduled for transmittal to the NRC by the end of 1984.

Implementation Schedule: End of 1987 refueling outage.

A-5 Containment Pressure

Required Range: Total range of 0-3X design pressure

Category: 1

Existing Design: Two Class 1E environmentally and seismically qualified pressure transmitters are provided for wide-range pressure measurement. The transmitters are powered from separate Class 1E, battery-backed sources and are routed in a Class 1E manner. The range of indication is -10 to 190 psig. This range meets Regulatory Guide 1.97 requirements since Containment design pressure is 60 psig.

For added reliability the two transmitters are located outside of Containment as shown on Updated FSAR Figure 6.5-1.

The system meets single-failure criteria. Failure of one channel will not result in indication uncertainty since four narrow-range Containment pressure monitors are available. The narrow-range indication is 0 to 75 psig, which is considered suitable for backup monitoring capability.

Display:

CR — Each channel of wide-range indication is recorded on its respective dedicated recorder on the post-accident monitoring Panel C09. Narrow-range indication is available on control room Panel C19.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: The Containment pressure monitoring system complies with Category 1 criteria of Regulatory Guide 1.97. The classification as Category 1 is considered appropriate. In addition, this parameter is designated as a Type A variable since it is relied upon for evaluating Containment conditions in the Emergency Instructions.

The control room indicators for the narrow-range Containment pressure monitors are not seismically qualified. In order to serve as backup indicators for single-failure criteria, they should be replaced with seismically qualified indicators.

A-5 Containment Pressure

This system has been previously reviewed and approved under NUREG-0737, Item II.F.1.4, as stated in the NRC Safety Evaluation Report dated May 24, 1983.

Position: The Containment pressure monitoring system design is acceptable. The narrow-range pressure indicators should be replaced with seismically qualified indicators.

Implementation Schedule: End of 1987 refueling outage.

A-6 Refueling Water Storage Tank Level

Required Range: Top to bottom

Category: 2 - Regulatory Guide 1.97
1 - Trojan Type A

Existing Design: Four level transmitters are used for refueling water storage tank (RWST) level indication. The transmitters and instrument loops are routed in a Class 1E manner up to the isolation device in the control room panel and are powered from Class 1E, battery-backed sources. The system is seismically qualified and is designated as a safety-related system. The level transmitters are located in an accident/post-accident mild environment by the RWST; hence, a review per 10 CFR 50.49 for environmental qualification is not required. Three wide-range level transmitters are available so that indication ambiguity due to a failed channel may be resolved.

The RWST is capable of storing 438,000 gal of water. This volume corresponds to the level of an overflow connection at 37 ft 1 in. RWST outlet is located at 2 ft 4 in. The level transmitter taps have been placed at 38 ft 7 in. and 2 ft 4 in., which covers more than the total usable volume of the tank.

Display:

CR: Four dedicated indicators, one for each level transmitter, are available on control room Panel C19. Three of the indicators provide wide-range indication of 0 percent to 100 percent of span where the span is as described above, and the fourth indicator provides narrow range indication of 75 percent to 100 percent. Recording is not provided.

TSC: This parameter may be monitored in the TSC on a CRT display.

EOF: See Footnote a to Table 4-1.

Compliance: RWST level indication complies with Regulatory Guide 1.97 Category 2 requirements. RWST level indication is considered a Type A variable for Trojan and is also qualified to Category 1 requirements with the exception of the control room indicators, which are not seismically qualified. Recording is not considered necessary in this case since indicators alone are sufficient to show availability of this water source.

A-6 Refueling Water Storage Tank Level

Position: The control room indicators should be replaced with seismically qualified equivalents. No other modifications are necessary.

Implementation Schedule: End of 1987 refueling outage.

A-7 Pressurizer Level

Required Range: Top to bottom

Category: 1

Existing Design: Three environmentally and seismically qualified level transmitters are used to monitor pressurizer water level. The transmitters and instrument loops are powered from Class 1E, battery-backed buses. The instrumentation loops are routed in a Class 1E manner up to the isolator devices in the control room process instrumentation racks and are routed in a non-Class 1E manner beyond the racks to the display. The system meets single-failure criteria with the exceptions identified below. The range of indication is 0 to 100 percent, which covers an actual span of 3.7 to 96.3 percent actual level.

Display:

CR — Dedicated indicators for each level transmitter are available on control room Panel C13. In addition, one channel is located on control room Panel C19. Any channel may be selected for recording on control room Panel C02.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: The pressurizer level instrument loops comply with Regulatory Guide 1.97 Category 1 requirements with the following exceptions:

1. The recorder is not seismically qualified and is powered from a non-Class 1E source. In addition, all three channels of pressurizer level indication are connected to a single recorder via a common switch. A fault with this switch could conceivably result in loss of all pressurizer level indication.

2. All indication is located in series on instrument loops with several non-Class 1E loads. Thus, failure of any load could result in indication failure of the affected channel. The indicators in the control room are not seismically qualified.

The range of available level indication from 3.7 to 96.3 percent meets the Regulatory Guide 1.97 goal of measuring from bottom to top. According to Updated FSAR Section 5.4.8.3.2, the normal operating water

A-7 Pressurizer Level

volume in the pressurizer varies from 30 percent to 61.5 percent of free internal vessel volume. Trojan Emergency Instructions require operators to take actions to restore or keep the water level in the pressurizer at greater than 17 percent and less than 92 percent of tank volume.

Position: The system is reliable as designed; however, the recorder should be replaced with a seismically qualified recorder and powered from a Class 1E, battery-backed source. The control room indicators should be replaced with seismically qualified equivalents. The recorder and indicators should be isolated from non-Class 1E equipment. Single-failure criteria may be met as long as the recorder signal is isolated from the indicator signal.

Implementation Schedule: End of 1987 refueling outage.

A-8 Steam Generator Level

Required Range: From tube sheet to separators

Category: 1

Existing Design: Each steam generator has four level transmitters. Three of the transmitters for each steam generator are used for protective functions and provide narrow-range indication of +7 to -5 ft of nominal full-load water level. These three transmitters are environmentally and seismically qualified and are powered from Class 1E, battery-backed buses. The narrow-range transmitters meet single-failure criteria up to the control room panels.

The fourth level transmitter for each steam generator provides wide-range level indication of +7 ft to -41 ft of nominal full-load water level. This transmitter and instrument loop are a non-1E system but are powered from a Class 1E, battery-backed bus. The transmitter is not environmentally qualified and the instrument loop is not seismically qualified by virtue of its non-Class 1E designation. The wide-range level transmitter signal is routed first to C160 then isolated and transmitted to the control room.

Display:

CR — The three narrow-range channels are indicated on dedicated indicators on Panel C14. One narrow-range channel for each steam generator is also recorded on Panel C05. The wide-range channel for each steam generator is recorded on Panel C05.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: The narrow-range level instrumentation systems generally comply with Regulatory Guide 1.97 requirements with the exception of range and indication qualification. The narrow-range level recorders and indicators are not seismically qualified and the recorders are powered from a non-Class 1E bus. The approximately 12-ft range provided by the narrow-range transmitters is only one-fourth the required range.

The wide-range level instrumentation system does not comply with Regulatory Guide 1.97 Category 1 requirements. The system is non-Class 1E, and the transmitters are not environmentally qualified. There is one wide-range transmitter per steam generator.

A-8 Steam Generator Level

The wide-range recorders in the control room are all powered from the same non-Class 1E source and as such cannot be considered reliable or even necessarily available during the post-accident phase.

Position:

Each channel of wide-range level should be upgraded in accordance with Category 1 requirements. The narrow-range indicators should be replaced with seismically qualified equivalents.

Two wide-range level transmitters per steam generator are considered excessive. Only one narrow and one wide-range level indicator are necessary for each steam generator. Since no more than two steam generators are necessary for Plant shutdown heat sink purposes, redundancy requirements for two wide-range channels per steam generator are met on a system basis by having similar instruments in other unaffected steam generators. The Emergency Instructions are based on narrow-range level indication and wide-range level is backup indication should level fall below the narrow-range span.

The wide-range level range of -41 ft to +7 ft is considered adequate as -41 ft is 14 in. above the tube sheet, and +7 ft extends to the level of the separators.

Implementation Schedule:

End of 1987 refueling outage.

A-9 Steam Generator Pressure

Required Range: From atmospheric pressure to 20 percent above the lowest safety valve setting

Category : 2 - Regulatory Guide 1.97
1 - Trojan Type A

Existing Design: Three qualified pressure transmitters are provided on each of the four main steam lines upstream of the main steam isolation valves. These transmitters are used in the Solid-State Protection System to generate reactor trip and safeguards actuation signals. The associated instrumentation is routed in a Class 1E manner up to the isolation device with indication obtained from the non-Class 1E side of a signal isolator. These transmitters and instrument loops are powered from Class 1E, battery-backed sources, and the system is environmentally and seismically qualified subject to the clarifications listed below. The range of indication is 0 to 1,200 psig. A fourth unqualified pressure transmitter is provided on each of the four main steam lines and has a range of indication of 0 to 1,500 psig.

Display:

CR A dedicated indicator for each pressure transmitter is located on control room Panel C14. The indicators are grouped so that the three pressure indicators for each steam generator are placed side by side.

TSC This parameter may be monitored in the TSC on a CRT display.

EOF See Footnote a to Table 4-1.

Compliance: The steam generator pressure indication system complies with Regulatory Guide 1.97 Category 2 requirements with the exception of range. The required range is "from atmospheric pressure to 20 percent above the lowest safety valve setting".

Each main steam line has five spring-loaded safety valves and one power-operated relief valve (PORV) located between the Containment penetration and the corresponding main steam isolation valve. The nominal set points of these valves are listed below:

PORV - 1,125 psig or manually operated from C14 or C160
Safety 1 - 1,170 psig
Safety 2 - 1,200 psig
Safety 3 - 1,210 psig
Safety 4 - 1,220 psig
Safety 5 - 1,230 psig

A-9 Steam Generator Pressure

The total capacity of the safety valves is equivalent to 100 percent of the steam flow generated with the turbine throttle valves in the wide-open position. The PORVs' combined capacity is 10 percent of full steam flow.

To fully comply with Regulatory Guide 1.97, the range of qualified pressure indication should extend to 120 percent of 1,125 psig, or 1,350 psig. Although the existing qualified range of 0 to 1,200 psig is well below this value, it is still almost 7 percent above the lowest relief valve setting. By the time the indication reaches the peak range of 1,200 psig, one PORV and two safety valves per main steam line are open to reduce pressure. Should steam generator pressure exceed the qualified range of 1,200 psig, additional information has been provided to allow the operators to deduce the actual conditions in the steam generator. This is accomplished by providing an additional independent channel of steam generator pressure with a range of 0 to 1,500 psig. This additional information provided to the operator is needed only in the event that pressure has exceeded the qualified range. Therefore, it is considered acceptable to use installed instrumentation of a lesser design and qualification category to allow the operators to deduce the actual condition in the steam generator.

Position:

The system is acceptable as designed and meets or exceeds all Category 2 qualification requirements. The range of indication is considered sufficient for post-accident pressure monitoring.

In addition, as a Trojan Type A variable, the system meets Category 1 requirements with the following exceptions listed below. Correction of No. 2 below will enable the system to meet single-failure criteria.

1. Recording has not been provided; however, in this case, recording is not considered an important function since trend monitoring will not provide useful information.

2. One channel of indication per steam generator shares circuits with non-Class 1E components in addition to the Plant computer. This discrepancy is considered acceptable for indication purposes since any failure due to electrical independence problems will be readily distinguishable by comparison to the other pressure indicators. The indicators are not seismically qualified and

A-9 Steam Generator Pressure

should be replaced with seismically qualified equivalents.

Implementation Schedule: End of 1987 refueling outage.

A-10 Condensate Storage Tank Water Level

Required Range: Plant specific

Category: 1

Existing Design: The condensate storage tank (CST) water level is measured by two level transmitters. The CST serves as the suction source for AFW and as such is an indicator of the ability to use AFW as a heat removal system.

Display:

CR — CST level is indicated on control room Panel C17. Redundant indicators are available. Recording capability has not been provided.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: The CST level indication system does not comply with Regulatory Guide 1.97 Category 1 requirements. Both transmitters and associated instrument loops are designed as non-Class 1E systems and as such are not seismically qualified. Isolation from other non-1E instruments or equipment has not been provided. One transmitter is powered from a Class 1E, battery-backed bus and the other is powered from a non-Class 1E bus. The level transmitters are located in an accident/post-accident mild environment by the CST; hence, a review per 10 CFR 50.49 for environmental qualification is not required. The control room indicators are not seismically qualified.

Position: The CST itself is not seismically qualified, therefore, the seismic qualification of the level instrumentation will not be upgraded. The system will be upgraded to provide as reliable a system as possible by providing Class 1E, battery-backed power supplies.

The purpose of the CST water level system is to ensure an adequate water supply for AFW. The CST level is normally maintained between 435,000 and 450,000 gal. The CST low-level alarm actuates at 345,000 gal (60 percent of indicated tank level), and the CST low-low level alarm annunciates at 6 percent of indicated tank level. The Trojan operators, by written guidance, are required to control makeup and check the level indication for a low-level alarm. The required action for a CST low-low level alarm is to monitor CST level and shift AFW pump suction to service water before the

A-10 Condensate Storage Tank Water Level

low suction trip occurs. Additionally, the AFW pump suction pressure may be monitored during an accident to ensure an adequate supply of water for AFW.

The power supply for the system should be upgraded so that power is from a Class 1E, battery-backed bus to increase system reliability.

Implementation Schedule: End of 1987 refueling outage.

B-1 Neutron Flux

Required Range: 10^{-6} percent to 100 percent full power

Category: 1

Existing Design: Two source range monitors have a range of 1 to 10^{6} counts per second. Two intermediate range monitors have a range of 10^{-11} to 10^{-3} amps and overlap both source range and power range indication. Four power range monitors have a range of 0 to 200 percent. These monitors provide an equivalent range of 10^{-9} percent to 200 percent full power. All ranges are indicated and any channel may be recorded.

The three systems are powered from Class 1E battery-backed buses.

Display:

CR — Indicators for all channels of all three ranges are available on Panel C02. Any channel may be selected on a dual-pen recorder on Panel C02 also. All power range channels are continuously recorded on Panel C13.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: The Nuclear Instrumentation System is not environmentally qualified. Continuous recording is provided, but the recorders are powered from a non-1E power source. The control room indication is not seismically qualified.

Position: Neutron flux level indication is a fundamental requirement for all modes of reactor operation per the Technical Specifications. Flux levels are used to verify reactor trip (in all cases), diagnose an ATWS condition, diagnose an unwanted return to criticality due to overcooling or boron dilution, and generally to determine whether the startup rate is positive, negative, or zero.

Because of the importance of neutron flux indication, the classification as Category 1 is believed appropriate. Neutron flux may be indicated by both direct and indirect methods. Direct methods include neutron flux monitors, while indirect methods include monitoring of control rod position and RCS boron concentration. The indirect methods constitute a determination that the reactor is shut down.

B-1 Neutron Flux

Neutron flux is monitored to control reactivity in the reactor. Following an accident, reactivity control is automatically achieved and maintained by reactor trip and the injection of boric acid into the RCS by the safety injection system following a postulated LOCA/HELB. The control rod positions are verified as an immediate action by the operator in the control room before the harsh environment could significantly degrade the rod position indication signals. The proper operation of the safety injection system is monitored and verified through the use of environmentally and seismically qualified instrumentation. The reactor trip and boration by the Safety Injection System ensures reactor core shutdown with significant margin under all postulated conditions. The RCS soluble boron content can be verified by analysis of RCS grab samples, which are taken using environmentally and seismically qualified valves. The RCS soluble boron content is not expected to change rapidly, if at all, following the initial boration during the ECCS injection phase of an accident. Therefore, periodic analysis of RCS samples would detect any significant changes in boron concentration.

A single, fully qualified, neutron monitoring channel, coupled with fully qualified control rod position indication and RCS soluble boron concentration monitoring, will provide sufficiently diverse means to monitor neutron flux for all types of accidents. One channel that meets applicable design criteria will be installed. A single channel is acceptable since the existing system is considered adequate to ensure that the safety function of reactor shutdown is accomplished. Although the existing neutron flux monitors are not environmentally qualified for post-accident monitoring, they are qualified to perform their immediate safety function of reactor protection. For long-term monitoring, a single qualified channel is considered adequate.

Implementation Schedule: End of 1986 refueling outage.

B-2 Control Rod Position

Required Range: Full in or not full in

Category: 3

Existing Design: A digital rod position indication system is used to measure the actual position of each rod using a detector which consists of 42 discrete coils mounted concentric with the rod drive pressure housing. The coils are located axially along the pressure housing on 3.75-in. spacing and magnetically sense the entry and presence of the rod drive shaft through its center line.

The coils are connected to two rod position indication cabinets located inside Containment. Multiplexing is used to transmit the digital position signals from these in-Containment cabinets to the control board display unit.

The system is powered from non-Class 1E power sources; however, these sources can also be supplied from the emergency diesel generators.

The range of indication is actual position indication from bottom to top.

Display:

CR — Rod position is displayed on control Panel C13 on a display unit which contains light-emitting diodes (LED) for each control rod. Included in this system design is a rod at bottom signal that actuates a control room annunciator.

TSC — Control rod position indication has not been included with the TSC design. This parameter is not one considered particularly useful for performing TSC functions.

EOF — See Footnote a to Table 4-1.

Compliance: The rod position indication system complies with Category 3 requirements for the control room; however, it has not been provided for the TSC as discussed above.

Position: No modifications are necessary.

Implementation Schedule: Complete.

B-3 RCS Soluble Boron Concentration

Required Range: 0 to 6,000 ppm

Category: 3

Existing Design: RCS soluble online boron concentration indication that meets Regulatory Guide 1.97 requirements is not installed at Trojan.

Compliance: The capability for determining post-accident soluble boron concentration in the reactor coolant exists in the Trojan Post-Accident Sampling System (PASS). PASS has previously been reviewed and approved under NUREG-0737, Item II.B.3, as stated in the NRC Safety Evaluation Report dated August 15, 1984.

Position: There is no need to install online capability to monitor this parameter. Direct indication of reactivity control is provided by neutron flux status. Sampling capability provides a means of determining this parameter. For post-accident monitoring purposes, RCS soluble boron concentration can be determined once a day by analysis of a grab sample, in accordance with NUREG-0737. Measurement of post-accident reactor coolant soluble boron concentration is not critical. For Category 3 variables, intermittent determinations or indications should be acceptable.

Soon after the onset of an accident, 1,200 gpm of water at 2,000 ppm boron concentration is automatically injected from the RWST into the RCS. The accumulators automatically discharge 2,700 ft^3 of water at 2,000 ppm boron concentration into the RCS. The RHR pumps eventually inject at least 3,000 gpm of 2,000 ppm borated water from the RWST. Therefore, the post-accident reactor coolant boron concentration must be greater than the pre-accident concentration. The post-accident flow rates and concentrations are designed to automatically provide a boron concentration for the accident situation, whether or not the boron concentration is ever measured.

The PASS grab sample chemical analysis is considered to be acceptable for determination of soluble boron concentration in the reactor coolant. No modifications are necessary.

Implementation Schedule: Complete.

B-4 RCS Cold-Leg Temperature

Required Range: 50°F-400°F

Category: 3

See A-2 for design information and compliance.

B-5 RCS Hot-Leg Temperature

Required Range: 50°F-400°F

Category: 3

See A-1 for design information and compliance.

B-6 RCS Cold-Leg Temperature

Required Range: 50°F-400°F

Category: 3

See A-2 for design information and compliance.

B-7 RCS Pressure

Required Range: 0-3000 psig

Category: 1

See A-3 for design information and compliance.

B-8 Core Exit Temperature

Required Range: 200°F-2300°F

Category: 3

See A-4 for design information and compliance.

B-9 Vessel Water Level

Required Range:	Bottom of hot-leg to top of vessel
Category:	1
Existing Design:	Due to the many PGE to NRC letters describing this system under NUREG-0737 requirements, another detailed description is not provided here. PGE to NRC letter of March 18, 1983 provides a detailed description of the system and its qualification level.
Display:	
CR	RVLIS is indicated on both trains of the post-accident monitoring Panel C09. Recording of one train is also available on C60A located in the back area of the control room.
TSC	This parameter may be monitored in the TSC on a CRT display.
EOF	See Footnote a to Table 4-1.
Compliance:	See PGE to NRC letter of March 18, 1983 and NRC Safety Evaluation Report of February 2, 1984.
Position:	RVLIS meets the Category 1 requirements of Regulatory Guide 1.97. The system is operational for testing only. An implementation letter report will be submitted within 60 days after system acceptance, but not later than September 1, 1985. See PGE to NRC letter of March 12, 1984.
Implementation Schedule:	Complete.

B-10 Degrees of Subcooling

Required Range: 200°F subcooling to 35°F superheat

Category: 2

Existing Design: Two Westinghouse subcooling margin monitors (SMMs) are located in the control room post-accident monitoring Panel C09. They are totally independent in their operation except that the same sensor may be input into each channel. Each SMM has the capability to selectively read any of eight incore thermocouples, two from each core quadrant. The SMMs together can monitor a total of 16 thermocouples. In addition, four wide-range RTDs (two hot-leg and two cold-leg) can be monitored per SMM. Pressure indication is obtained from the wide-range RCS pressure transmitters.

For determination of margin to saturation, either RTDs or thermocouples may be selected. The temperature input is auctioneered from the highest RTD or thermocouple temperature. The pressure signal is auctioneered from the lowest indicating of the two pressure transmitters.

The RTDs and pressure transmitters are environmentally qualified. The incore thermocouples are scheduled to be qualified. The SMMs, RTDs, and pressure transmitters are powered from Class 1E, battery-backed sources, and the incore thermocouples will be powered from a 1E source. The SMMs do not meet single-failure criteria. There is no seismic qualification data for the SMMs.

Display:

CR

A margin-to-saturation meter for each SMM is located on Panel C12 and gives a continuous analog indication of margin to saturation. The meter indicates 200°F subcooled to saturation (0°F). Margins greater than 200°F will indicate to the left of the 200°F mark but are compressed. The region to the right of the saturation point (0°F margin) is degrees superheat. The superheat region is linear from saturation up to 50°F superheat. Beyond this, the scale is logarithmic up to 2,000°F superheat.

The local SMMs on Panel C09 have digital displays that indicate saturation margin. The displays are kept up to date with the most recent pressure and temperature values. Below saturation, the margin is indicated as degrees Fahrenheit subcooled, and above saturation it is indicated as degrees Fahrenheit of superheat.

B-10 Degrees of Subcooling

TSC	Subcooling margin is calculated by the TSC computer. The subcooling margin may be monitored in the TSC on a CRT display.
EOF	See Footnote a to Table 4-1.
Compliance:	The SMMs do not comply with 1.97 Category 1 requirements. This issue is being resolved as part of NUREG-0737, Item II.F.2, Inadequate Core Cooling Instrumentation.
Position:	The acceptability of the SMMs is being resolved via NUREG-0737. The PGE to NRC commitment regarding this variable is scheduled for transmittal to the NRC by the end of 1984.
Implementation Schedule:	Complete.

B-11 RCS Pressure

Required Range: 0 to 3,000 psig

Category: 1

See A-3 for design information and compliance.

B-12 Containment Water Level

Required Range: Wide range - Plant specific
Narrow range - sump level

Category: 1 - wide range
2 - narrow range

Existing Design: A total of four level transmitters are used to provide redundant wide-range and narrow-range level indication. The transmitters are environmentally and seismically qualified and are powered from Class 1E, battery-backed power sources. The system meets single-failure criteria subject to the "Compliance" and "Position" sections below since failure of any one channel can be resolved by comparison with the other three channels. Narrow range measures sump level from 0-32 in. and wide range measures 0-188 in. (0-799,000 gal).

Display:

CR — Indicators for all four transmitters are located on Panel C09. Separate indicators are available for narrow-range and wide-range indication and are continuously available.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: The Containment Water Level Instrumentation System complies with Regulatory Guide 1.97 Category 1 requirements with one exception. The control room indicators are not seismically qualified.

Recording for this system is not by means of a dedicated recorder. Instead, the Plant computer (P-250) is used as the method of recording. This has previously been identified to the NRC in the PGE to NRC letter of December 17, 1982.

This system has been previously reviewed and approved under NUREG-0737, Item II.F.1.5, as stated in the NRC Safety Evaluation Report dated May 24, 1983.

Position: The Containment Water Level Instrumentation System design is considered acceptable. The control room indicators should be replaced with seismically qualified equivalents.

Implementation Schedule: End of 1987 outage.

B-13 Containment Pressure

Required Range: Total range of 0-3X design pressure.

Category: 1

See A-5 for design information and compliance.

B-14 Containment Isolation Valve Position

Required Range: Closed - not closed

Category: 1

Existing Design: Containment isolation valve position indication is installed for all power-operated Containment isolation valves at Trojan. The indication is powered from Class 1E, battery-backed or emergency diesel generator-backed buses unless noted otherwise. The limit switch assemblies used for position indication are seismically and environmentally qualified with the exceptions listed below. This review considered all valves presently classified by the Trojan Technical Specifications as Containment isolation valves (comprising all valves listed in B-14, Tables 1 and 2). Another review currently in progress, and intending to correct or justify any discrepancies or inconsistencies between the Updated FSAR, the Technical Specifications, and 10 CFR 50, Appendix J, has determined that the valves listed in B-14, Table 1 are valves required as Containment isolation barriers, and the valves listed in B-14, Table 2 are valves not required as Containment isolation barriers. When the above review is complete, a change to the Technical Specifications will be sought to delete the B-14, Table 2 valves from the list of Containment isolation valves. Upgrades to the B-14, Table 2 valves will not be made.

Display:

CR — Indication is available on various control room panels by means of open/closed indicating lights. In addition, many valves are also indicated on the Containment isolation valve status panels and the safety injection valve status panel.

TSC — This parameter may be monitored in the TSC on a CRT display with exceptions as discussed below.

EOF — See Footnote a to Table 4-1.

Compliance and Position: Regulatory Guide 1.97 Category 1 requirements are intended to apply to instrumentation systems and, as such, have little meaning in some areas when applied to Containment isolation valve indication. For example, the following deviations from Category 1 requirements have been identified:

1. Recording has not been provided.

2. Redundancy of indication generally has been met on a per line basis rather than a per valve basis.

3. Indication is not continuous for certain valves that are required to be de-energized with power removed to ensure the correct position is maintained. Resolution of this deviation is discussed below.

4. Indication is not provided for manually operated valves, safety relief valves, or check valves used as Containment isolation valves.

In addition, the following valves do not have environmentally qualified limit switch assemblies for indication:

CV4000	CV5657
CV4006	CV5659
CV4470	CV5661
CV4471	CV8025
CV4181	CV8033
CV4301	CV10001
CV5652	CV10004
CV5655	

It is agreed that all nonqualified limit switch assemblies should be replaced with environmentally qualified substitutes, and the nonchannelized indication circuits should be upgraded to Class 1E. However, the other deviations are not considered significant. Recording of Containment isolation valve position would provide no useful function and is considered unnecessary.

Redundancy of indication is believed to be more appropriate when applied to each Containment penetration rather than on a per valve basis. The purpose of this indication is to ensure each Containment penetration is isolated. By having valve position indication for the valves on each side of the Containment penetration, the redundancy requirements are considered to be adequately met. This discussion is only applicable when two power-operated valves are used for a given penetration.

It is not considered necessary to provide valve position indication for manually-operated valves and check valves. These valves are maintained in the appropriate position to ensure Containment isolation. Only those valves whose position can be changed from the control room (ie, power-operated Containment isolation valves) are considered important for monitoring purposes.

B-14 Containment Isolation Valve Position

Certain Containment isolation valves are closed with power removed to ensure the valves cannot be opened. Valve power removal in these cases also results in loss of valve position indication. This is considered acceptable for two reasons:

1. These Containment isolation valves are positioned in the desired position and cannot be inadvertently repositioned since power is removed.

2. Each valve control switch on the control room panels has an associated tag-out tag to unambiguously inform the operators of this position.

Position indication for the following Containment isolation valves is not available in the TSC:

SV5642
SV5643
SV5679
SV6991
SV6992
CV8843

Position indication for these valves should be provided in the TSC.

The unqualified limit switch assemblies should be upgraded to comply with environmental qualification requirements and the nonchannelized indication circuits should be upgraded to Class 1E criteria. The other deviations identified above are considered acceptable and no modifications are planned.

Implementation Schedule: End of 1987 refueling outage.

B-14 TABLE 1: Containment Isolation Valves

Valve	Tag Number	Indication Power Supply	Indication Locations	Electrical Schematic	P&ID
Containment Spray Pump Discharge	MO2053A	B2108	C19, C19	E-416	M-207
Containment Spray Pump Discharge	MO2053B	B2208	C19, C19	E-416	M-207
Recirculation Sump Valve	MO2069A	B2528	C19	E-362	M-207
Recirculation Sump Valve	MO2069B	B2627	C19	E-362	M-207
Component Cooling Water Supply	MO3290	B2437	C18	E-413	M-215
Component Cooling Water Supply	MO3291	B2308	C18	E-413	M-215
Component Cooling Water Return	MO3292	B2136	C18	E-413	M-215
Component Cooling Water Return	MO3346	B2238	C18	E-413	M-215
Nitrogen to Reactor Coolant Drain Tank	CV4000	D2016	C19B, C19	E-397A	M-220
Reactor Coolant Drain Tank Outlet	MO4005	B2142	C19A, C19	E-485A	M-220
Reactor Coolant Drain Tank Outlet	CV4006	D2016	C19B, C19	E-397A	M-220
Containment Sump Discharge	MO4180	B2354	C19A, C19	E-445	M-221
Containment Sump Pump Discharge	CV4181	Y2214	C19B, C19	E-550	M-221
Gas Collection Header Isolation	MO4300	B2243	C19B, C17	E-485	M-222
Gas Collection Header Isolation	CV4301	D1016	C19A, C17	E-397	M-222
Service Air to Containment	CV4470	D1016	C19A, C17	E-397	M-223
Instrument Air to Containment	CV4471	D2016	C19B, C19	E-397	M-223

B-14 TABLE 1: Containment Isolation Valves

Valve	Tag Number	Indication Power Supply	Indication Locations	Electrical Schematic	P&ID
Post-Accident Sampling System Isolation	SV5642	D3011	C19A, C41	E-2201	M-243
Post-Accident Sampling System Isolation	SV5643	D3011	C19A, C41	E-2201	M-243
Accumulator A Sample Isolation	MO5651A	B2146	C19A, C19	E-486	M-231
Accumulator B Sample Isolation	MO5651B	B2147	C19A, C19	E-486	M-231
Accumulator C Sample Isolation	MO5651C	B2352	C19A, C19	E-486	M-231
Accumulator D Sample Isolation	MO5651D	B2543	C19A, C19	E-486	M-231
Accumulator Common Sample	CV5652	D4012	C19B, C19	E-448	M-231
RCS Hot-Leg Sample Isolation	MO5653	B2148	C19A, C12	E-486	M-231
RCS Hot-Leg Sample Isolation	MO5654	B2549	C19A, C12	E-486	M-231
RCS Hot-Leg Sample Isolation	CV5655	D4012	C19B, C19	E-448	M-231
Pressurizer Liquid Sample Isolation	MO5656	B2353	C19A, C13	E-486	M-231
Pressurizer Liquid Sample Isolation	CV5657	D4012	C19B, C19	E-448	M-231
Pressurizer Vapor Space Sample Isolation	MO5658	B2551	C19A, C13	E-486	M-231
Pressurizer Vapor Space Sample Isolation	CV5659	D4012	C19B, C19	E-448	M-231
Reactor Coolant Drain Tank Sample Auto Gas	MO5660	B2149	C19A, C17	E-486	M-231
Reactor Coolant Drain Tank Sample Auto Gas	CV5661	D2017	C19B, C17	E-449	M-231
Containment Radiation Sample	MO5663	B2441	C19B, C41	E-483	M-243

B-14 TABLE 1: Containment Isolation Valves

Valve	Tag Number	Indication Power Supply	Indication Locations	Electrical Schematic	P&ID
Containment Radiation Sample	MO5671	B2442	C19B, C41	E-483	M-243
Containment Sample	MO5672	B2115	C19A, C41	E-485	M-243
Containment Radiation Sample	MO5673	B2540	C19A, C41	E-485	M-243
Containment Hydrogen Sample	MO5674	B2541	C19A, C41	E-485	M-243
Containment Hydrogen Sample	MO5675	B2646	C19B, C41	E-483	M-243
Containment Hydrogen Sample	MO5676	B2647	C19B, C41	E-483	M-243
Containment Hydrogen Sample	MO5677	B2232	C19B, C41	E-483	M-243
Containment Hydrogen Sample	MO5678	B2636	C19B, C41	E-483	M-243
Post-Accident Sampling System Isolation	SV5679	D3011	C19A, C41	E-2201	M-243
Personnel Air Lock Seal Test Line	SV6991	D1019	C19A, C19	E-2017	M-5008
Personnel Air Lock Seal Test Line	SV6992	D2017	C19B, C19	E-2017	M-5008
Pressurizer Relief Tank to Gas Sample	CV8025	D2016	C19B, C13	E-548	M-201
Pressurizer Relief Tank to Gas Sample	CV8026	D1016	C19A, C13	E-546	M-201
Primary Makeup Water to Pressurizer Relief Tank	CV8028	D2016	C19B, C13	E-548	M-201
Nitrogen to Pressurizer Relief Tank	CV8033	D2016	C19B, C13	E-548	M-201
Reactor Coolant Pump Seal Water Return	MO8100	B2203	C19B, C13	E-534	M-203
Charging Line Isolation	MO8105	B2205	C19, C12	E-534	M-202

B-14 TABLE I: Containment Isolation Valves

Valve	Tag Number	Indication Power Supply	Indication Locations	Electrical Schematic	P&ID
Reactor Coolant Pump Seal Water Isolation	MO8112	B2105	C19A, C12	E-535	M-203
Letdown Orifice Isolation	CV8149A	D1023/D3011	C19A, C12	E-543	M-202
Letdown Orifice Isolation	CV8149B	D1023/D3011	C19A, C12	E-543	M-202
Letdown Orifice Isolation	CV8149C	D1023/D3011	C19A, C12	E-543	M-202
Letdown Line Isolation	CV8152	D2016	C19B, C12	E-539	M-202
RHR Loop Inlet Isolation	MO8701	B2110	C19, C13	E-576	M-205
RHR Loop Outlet Isolation	MO8703	B2340	C13	E-598	M-205
Safety Injection Pump Discharge Isolation	MO8802A	B2512	C19	E-580	M-206
Safety Injection Pump Discharge Isolation	MO8802B	B2640	C19	E-580	M-206
RHR Discharge Train A	MO8809A	Y1115	C19	E-1835	M-205
RHR Discharge Train B	MO8809B	Y2215	C19	E-1836	M-205
Injection Line Isolation	MO8835	Y1115	C19	E-1835	M-206
Safety Injection System Test Line	CV8843	D1019	C19	E-551	M-206
Safety Injection System Test Line	CV8871	D3006	C19A, C19	E-586	M-206
Nitrogen to Accumulator Tanks	CV8880	D3006	C19A, C19	E-586	M-206
Safety Injection Pump Accumulator Test Isolation	CV8888	D4012	C19B, C19	E-584	M-206
Accumulator to Holdup Tank	CV8964	D4012	C19B, C19	E-584	M-206

B-14 TABLE 1: Containment Isolation Valves

Valve	Tag Number	Indication Power Supply	Indication Locations	Electrical Schematic	P&ID
Containment Purge Supply	CV10001	Y2206	C19B, C19	E-463	M-243
Containment Purge Supply	MO10002	B2106	C19A, C17	E-484	M-243
Containment Purge Exhaust	MO10003	B2305	C19A, C17	E-484	M-243
Containment Purge Exhaust	CV10004	Y2206	C19B, C19	E-463	M-243
Hydrogen Vent In	MO10005	B2405	C19B, C17	E-484	M-243
Hydrogen Vent In	MO10006	B2408	C19B, C17	E-484	M-243
Hydrogen Vent In	MO10007	B2344	C19A, C17	E-484	M-243
Hydrogen Vent In	MO10008	B2347	C19A, C17	E-484	M-243
Hydrogen Vent Out	MO10009	B2544	C19A, C17	E-484	M-243
Hydrogen Vent Out	MO10010	B2545	C19A, C17	E-484	M-243
Hydrogen Vent Out	MO10011	B2245	C19B, C17	E-484	M-243
Hydrogen Vent Out	MO10012	B2246	C19B, C17	E-484	M-243
Chilled Water Out	MO10013	B2350	C19A, C17	E-484	M-248
Chilled Water Out	CV10014	Y2206	C19B, C19	E-463	M-248
Chilled Water In	CV10015	Y2206	C19B, C19	E-463	M-248
Chilled Water In	MO10016	B2505	C19A, C17	E-484	M-248

B-14 TABLE 2: Valves Not Required as Containment Isolation Barriers (To be Removed From Trojan Technical Specification's List of Containment Isolation Valves)

Valve	Tag Number
Steam Generator A Steam Supply to AFW	CV1451
Steam Generator B Steam Supply to AFW	CV1452
Steam Generator C Steam Supply to AFW	CV1453
Steam Generator D Steam Supply to AFW	CV1454
Containment Spray Pump Suction	MO2052A
Containment Spray Pump Suction	MO2052B
Main Steam Power Operated Relief	CV2210
Main Steam Isolation Valve	CV2216
Main Steam Power Operated Relief	CV2230
Main Steam Isolation Valve	CV2236
Main Steam Power Operated Relief	CV2250
Main Steam Isolation Valve	CV2256
Main Steam Power Operated Relief	CV2270
Main Steam Isolation Valve	CV2276
Steam Generator A MSIV Bypass	CV2277
Steam Generator B MSIV Bypass	CV2278
Steam Generator C MSIV Bypass	CV2279
Steam Generator D MSIV Bypass	CV2280
Steam Generator B Main Steam Line Drain	CV2294
Steam Generator C Main Steam Line Drain	CV2295
Steam Generator D Main Steam Line Drain	CV2296
Steam Generator A Main Steam Line Drain	CV2297
Steam Generator Blowdown	MO2808
Steam Generator Blowdown Sample	CV2809
Steam Generator Blowdown	MO2810
Steam Generator Blowdown Sample	CV2811
Steam Generator Blowdown	MO2812
Steam Generator Blowdown	MO2813
Steam Generator Blowdown Sample	CV2814
Steam Generator Blowdown Sample	CV2880
Component Cooling Water Isolation SCI/SCII	MO3294
Component Cooling Water Isolation SCI/SCII	MO3296
Component Cooling Water From RCPs/Excess Letdown HX	MO3300
Component Cooling Water Return	MO3320
Steam Generator A Blowdown Isolation	MO6716
Steam Generator B Blowdown Isolation	MO6717
Steam Generator C Blowdown Isolation	MO6718
Steam Generator D Blowdown Isolation	MO6719
Charging Line Isolation	MO8106
RHR Pump Suction Isolation	MO8700A
RHR Pump Suction Isolation	MO8700B
RHR Loop Inlet Isolation	MO8702
Safety Injection Test Line	MO8811A
Safety Injection Test Line	MO8811B
Safety Injection Test Line	CV8823
Safety Injection Test Line	CV8824

B-14 TABLE 2: Valves Not Required as Containment Isolation Barriers (To be Removed From Trojan Technical Specification's List of Containment Isolation Valves)

Valve	Tag Number
Safety Injection Test Line	CV8825
Safety Injection System Test Line	CV8881
Recirculation Test Line Isolation	CV8890A
Recirculation Test Line Isolation	CV8890B

B-15 Containment Pressure

Range: -5 psig to design pressure

Category: 1

See A-5 for design information and compliance.

C-1 Core Exit Temperature

Range: 200°F-2,300°F

Category: 1

See A-4 for design information and compliance.

C-2 Radioactivity Concentration or Radiation Level in Circulating Primary Coolant

Required Range: One-half Technical Specifications limit to 100 times Technical Specifications limit, R/hr

Category: 1

Existing Design: An instrument that meets Category 1 criteria is not installed; however, such an instrument is considered unnecessary due to other available monitoring methods.

Display: N/A

Compliance: Regulatory Guide 1.97 specifies that the status of the fuel cladding be monitored during and after an accident, and measurement of the radioactivity of the circulating primary coolant is stated as a key parameter. The installation of such an additional radioactivity monitor is not considered necessary, since other monitoring methods are available.

During normal operation, the gross failed-fuel monitor (PRM-13) is used to continuously measure the concentration of gamma-emitting fission products in the primary coolant. PRM-13 is not environmentally or seismically qualified and is powered from a non-1E bus, and as such is intended only for normal operation. The detector is located adjacent to the CVCS letdown line between the letdown heat exchangers and the mixed-bed demineralizers. The analyzer discriminator is set to measure primarily Kr-87, Kr-88, I-135, Xe-138, and Cs-138. These nuclides are selected due to their short half-lives, high fission yields, and high escape-rate coefficients from the fuel; ie, levels of these nuclides in reactor coolant give a rapid indication of changes in fuel cladding integrity.

In addition, routine primary coolant sampling will verify fuel cladding integrity during normal operation. For post-accident monitoring, PRM-13 may not be used since it is located on the RCS letdown line and is isolated by a Containment isolation signal; however, the Post-Accident Sampling System (PASS) has been installed in accordance with NUREG-0737, Item II.B.3 criteria for this purpose. Using the PASS, undiluted or diluted degassed samples of the reactor coolant liquid can be obtained. The extent of any core damage could then be assessed using measured concentrations of key radionuclides.

C-2 Radioactivity Concentration or Radiation Level in Circulating Primary Coolant

A detailed description of the PASS is provided in the PGE to NRC letters of December 17, 1982 and November 11, 1983. On August 15, 1983, the NRC issued a Safety Evaluation Report approving the PASS design. It is believed that the PASS will provide a much more specific and unambiguous indication of the problem by identifying isotopes and concentrations.

In addition to the PASS, other Plant instrumentation can be used to detect fuel cladding failures during accident conditions. These instruments include the Containment high-range radiation monitors (ARM-15A and ARM-15B); and process and effluent radiation monitors which monitor the Containment (PRM-1), the reactor coolant drain tank discharge (PRM-15), and the Containment sump discharge (PRM-14). Furthermore, process radiation monitors on the PASS sampling lines can also be used to give an indication of fuel cladding failures.

Position: This variable should not be included in the list of required 1.97 instrumentation. Existing monitoring methods are considered sufficient for evaluating fuel cladding breaches. No modifications to install additional monitoring equipment are required.

Implementation Schedule: Complete.

C-3 Analysis of Primary Coolant (Gamma Spectrum)

Required Range:	10 µCi/ml to 10 Ci/ml or TID-14844 source term in coolant volume
Category:	3
Compliance:	See E-10 for discussion of the Post-Accident Sampling System (PASS). The design basis for the PASS gamma spectroscopy is 10^{-7} µCi/cc up to a level corresponding to the TID-14844 source term in coolant volume. The NRC approved the design of the PASS in their Safety Evaluation Report dated August 15, 1983.
Position:	The existing system is acceptable as designed. No further modifications are necessary.
Implementation Schedule:	Complete.

C-4 RCS Pressure

Required Range: 0 to 3,000 psig

Category: 1

See A-3 for design information and compliance.

C-5 Containment Pressure

Required Range: -5 psig to design pressure

Category: 1

See A-5 for design information and compliance.

C-6 Containment Sump Water Level

Required Range:	Narrow range - sump Wide range - Plant specific
Category:	Narrow range - 2 Wide range - 1

See B-12 for design information and compliance.

C-7 Containment Area Radiation

Required Range: 1 to 10^4 R/hr

Category: 3

See E-1 for design information and compliance.

C-8 Effluent Radioactivity - Noble Gas Effluent From Condenser Air Removal System Exhaust

Required Range: 10^{-6} to 10^{-2} µCi/cc

Category: 3

Effluent radioactivity monitoring of noble gases, particulates, and halogens has previously been addressed in NUREG-0737, Item II.F.1.1, Noble Gas Effluent Monitor, and Item II.F.1.2, Sampling and Analysis of Plant Effluents.

Since this item has received extensive review per NUREG-0737, it is not addressed in detail in this report. Any additional review will be completed in accordance with NUREG-0737.

C-9 RCS Pressure

Required Range: 0 to 3,000 psig

Category: 1

See A-3 for design information and compliance.

C-10 Containment Hydrogen Concentration

Required Range: 0-10 volume percent

Category: 1

Existing Design: Two hydrogen analyzers are provided for sampling of the Containment atmosphere following a Design Basis Accident event. The analyzers are powered from Class 1E, diesel generator-backed buses and are routed in a Class 1E manner. The system is seismically and environmentally qualified. The system is normally de-energized in a standby condition and would be energized after an accident has occurred. The range of display is 0-10 percent for low range and 0-30 percent for high range.

The Hydrogen Monitoring System is considered to meet single-failure criteria subject to the "Compliance" and "Position" sections below. Indication uncertainty due to a failed channel may be resolved by use of the Post-Accident Sampling System, which can sample also for Containment hydrogen concentration.

Display:

CR — Redundant low-range and high-range indicators are located on the post-accident monitoring Panel C09. Indication is not continuously available, but the system is available upon demand. Recorders are locally available for trend analysis.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: The hydrogen analysis system does not meet all Regulatory Guide 1.97 requirements. The system is powered from a Class 1E source; however, it is not battery-backed. Since the system is normally maintained in a standby condition, this is considered acceptable since momentary interruption is clearly tolerable as allowed by Regulatory Guide 1.97.

Recording has not been provided in the control room but is locally available for later trend analysis. Indicators alone are considered adequate for the control room, which meets Regulatory Guide 1.97 minimum requirements; however, the indicators are not seismically qualified.

C-10 Containment Hydrogen Concentration

As discussed in the PGE to NRC letter dated May 4, 1981, the power supplies to all Containment isolation valves are channelized by providing Train A power and Channel A Containment isolation signal to the isolation valves inside Containment, and Train B power and Channel B Containment isolation signal to the outside isolation valves. This design is based on accepted NRC design criteria for redundancy in Containment isolation. Because of this design criteria for Containment isolation, the Trojan hydrogen analysis system does not entirely meet the design requirements of NUREG-0737 for redundancy. A single Channel A or B failure could isolate both Containment hydrogen analysis loops; however, a single failure of this type could be corrected without major difficulty following an accident. Containment isolation, due to its importance, should take design precedence over the Containment hydrogen analysis system redundancy.

Not all sample valves in Containment are environmentally qualified; however, two environmentally qualified sample points are available for use.

This system has been previously reviewed and approved under NUREG-0737, Item II.F.1.6, as stated in the NRC Safety Evaluation Report dated May 24, 1983.

Position: The differences identified above do not have a significant impact on system reliability. The control room indicators should be replaced with seismically qualified equivalents.

Implementation Schedule: End of 1987 refueling outage.

C-11 Containment Pressure

Required Range: -5 psig to 3 times design pressure

Category: 1

See A-5 for design information and compliance.

C-12 Containment Effluent Radioactivity - Noble Gases From Identified Release Points

Required Range: 10^{-6} to 10^{-2} µCi/cc

Category: 2

Effluent radioactivity monitoring of noble gases, particulates, and halogens has previously been addressed in NUREG-0737, Item II.F.1.1, Noble Gas Effluent Monitor, and Item II.F.1.2, Sampling and Analysis of Plant Effluents.

Since this item has received extensive review per NUREG-0737, it is not addressed in detail in this report. Any additional review will be completed in accordance with NUREG-0737.

C-13 Effluent Radioactivity - Noble Gases

Required Range: 10^{-6} to 10^{3} µCi/cc

Category: 2

Effluent radioactivity monitoring of noble gases, particulates, and halogens has previously been addressed in NUREG-0737, Item II.F.1.1, Noble Gas Effluent Monitor, and Item II.F.1.2, Sampling and Analysis of Plant Effluents.

Since this item has received extensive review per NUREG-0737, it is not addressed in detail in this report. Any additional review will be completed in accordance with NUREG-0737.

D-1 RHR System Flow

Required Range: 0 to 110 percent design flow

Category: 2

Existing Design: Four flow transmitters are used for RHR system flow indication of cold-leg RCS injection. One additional transmitter is used for indication of hot-leg RCS injection. The instrumentation system is powered from Class 1E, battery-backed buses. The transmitters are located in an accident/post-accident mild environment in the 5-ft and the 45-ft elevations of the Auxiliary Building; hence, a review per 10 CFR 50.49 for environmental qualification is not required.

Two transmitters are used per train of RHR for cold-leg RCS injection. One transmitter for each train provides narrow-range indication of 0 to 1,500 gpm, and the other transmitter per train provides wide-range indication of 0 to 5,000 gpm. The transmitter used for hot-leg RCS injection provides an indication range of 7,000 gpm.

Display:

CR: Flow indicators for each transmitter are provided on control room Panel C13.

TSC: This parameter may be monitored in the TSC on a CRT display.

EOF: See Footnote a to Table 4-1.

Compliance: RHR System flow indication complies with Regulatory Guide 1.97 Category 2 requirements. The required range of indication is 0 to 110 percent design flow. Updated FSAR Table 5.4-13 notes that RHR pump design flow is 3,000 gpm at 375 ft of head. The wide range indication of 0-5000 gpm covers 0 to 167 percent per pump and thus complies with the required range. The indication range of 0 to 7,000 gpm covers 0 to 116 percent of range for both pumps.

Position: No modifications are necessary.

Implementation Schedule: Complete.

D-2 RHR Heat Exchanger Outlet Temperature

Required Range: 40°F-350°F

Category: 2

Existing Design: Two platinum RTDs are located in the 5-ft elevation of the Auxiliary Building in a post-accident harsh environment for RHR heat exchanger outlet temperature. The RTDs are located near the RHR heat exchangers such that the RTD powered from Train A measures the Train A heat exchanger outlet, and the Train B RTD measures the Train B heat exchanger outlet.

The RTDs are environmentally qualified and are powered from Class 1E, battery-backed buses. The range of control room indication is 50°F to 400°F.

Display:

CR — Dedicated recorders for each RTD are located on control room Panel C13. The recorders are each dual-pen type with the second pen indicating RHR heat exchanger inlet temperature. By this scheme, the differential temperature across the heat exchanger is readily available.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: RHR heat exchanger outlet temperature complies with Regulatory Guide 1.97 Category 2 requirements with the exception of indication range.

Position: The existing range of 50°F to 400°F meets the intent of the Regulatory Guide 1.97 specified range of 40°F to 350°F. Operators are required by written procedures to maintain reactor coolant temperature above 100°F when using the RHR system. In addition, the minimum temperature that the reactor vessel may be at with head bolts tensioned is 60°F, as limited by written procedures. These written procedures ensure that the minimum temperature range of 50°F is more than adequate to serve the purpose of monitoring RHR system operation and for analysis. Finally, all Updated FSAR Chapter 15 Condition III and IV accidents will cause RHR outlet temperatures to rise, showing again that the current temperature range is adequate.

No modifications are necessary.

Implementation Schedule: Complete.

D-3 Accumulator Tank Level and Pressure Indication and Accumulator
D-4 Isolation Valve Position

Required Range: Level - 10 to 90 percent volume
Pressure - 0 to 750 psig
Valve Position - Closed or open

Category: 2

Existing Design: Four accumulators are located inside Containment. One accumulator is attached to each of the RCS cold-legs. The accumulators are pressure vessels filled with borated water and pressurized with nitrogen gas. During normal operation, each accumulator is isolated from the RCS by two check valves in series. Should the RCS pressure fall below the accumulator pressure, the check valves open and borated water is forced into the RCS from the accumulators.

Two level transmitters and two pressure transmitters are provided for each accumulator. All transmitters and their associated instrumentation loops are powered from Class 1E, battery-backed sources. The pressure and level transmitters are not environmentally qualified.

The range of indication for the pressure indicators is 0 to 700 psig, and the level indicators have a range of 0 to 100 percent, which covers an actual accumulator level of about 53 to 70.9 percent.

The indication for accumulator isolation valve position is obtained from stem-mounted position switches located on the motor-operated accumulator discharge valve. The indication is either closed or open and is energized from a Class 1E, battery-backed bus. The isolation valves are not environmentally qualified in their existing configuration.

Display:

CR A dedicated indicator is available for each pressure and level transmitter on control room Panel C19. The indicators are grouped together by accumulator number such that all four pressure and level indicators for a given accumulator are in the same location. The indicators for isolation valve position are also located on control room Panel C19 on the safety injection status panel.

TSC This parameter may be monitored in the TSC on a CRT display.

D-3 Accumulator Tank Level and Pressure Indication and Accumulator
D-4 Isolation Valve Position

EOF — See Footnote a to Table 4-1.

Compliance: The accumulator instrumentation complies with 1.97 Category 2 requirements with the following exceptions:

1. The pressure and level transmitters and isolation valves are not environmentally qualified.

2. The range of pressure indication is 0 to 700 psig instead of 0 to 750 psig.

3. The actual range of level indication is about 53 to 70.9 percent instead of 10 to 90 percent.

Position: As discussed in Section 6.3 of the Updated FSAR, the accumulators are passive devices that discharge immediately when RCS pressure drops below accumulator pressure. The isolation valve for each accumulator is required to be open for Modes 1, 2, and 3 if pressurizer pressure is greater than 1,000 psig.

Level indication is useful during normal operation to ensure adequate water is available for injection. Similarly, pressure indication ensures adequate pressure is available for injection and yet is less than the accumulator design pressure. During normal operation, operators are required by Technical Specifications to manually control each accumulator level between 870 (64 percent of tank volume) and 930 (69 percent of tank volume) cubic feet, and each accumulator pressure between 600 (86 percent of tank design pressure) and 673 (96 percent of tank design pressure) psig. The pressure in each accumulator is limited to 700 psig by relief valves. In addition, no accident conditions will cause accumulator pressure to increase. For these reasons, the existing level and pressure instrument ranges are more than adequate to perform the primary function of monitoring pre-accident system conditions to assure that the system is operational.

The accumulator instrumentation is also needed during and after all accidents, except a large break LOCA, to assure isolation valve closure and/or nitrogen venting during RCS cooldown. Discharge of the accumulator tanks is automatic and inevitable when RCS pressure drops below 600 psig. Coolant injection from the accumulators (approximately 28,500 gal) may be verified by core exit thermocouple readings and Category 1 wide-range pressure and reactor vessel level indicators.

D-3 Accumulator Tank Level and Pressure Indication and Accumulator
D-4 Isolation Valve Position

Accumulator status indication is also necessary in the long-term accident phase and post-accident phase. Section 15.6 of the Updated FSAR notes that accumulator injection may not begin until 40 min into a small-break LOCA. If the accumulators have not injected and operators are attempting to enter post-LOCA cooldown and RCS depressurization, the emergency instructions require that the accumulators be prevented from injecting by closing the isolation valves or venting the nitrogen. Since none of these valves are environmentally qualified and thus may prevent isolation of the accumulators, pressure indication is doubly important. If left unisolated, the accumulators could conceivably inject nitrogen into the RCS as RCS pressure is reduced. Nitrogen injection into the RCS during the cooldown phase could result in loss of core cooling and core uncovery until the operators recovered from this inadvertent injection.

For these reasons, the pressure indication should be upgraded and environmentally qualified in accordance with Category 2 requirements. The isolation valve and valve position indication should also be environmentally qualified.

Environmental qualification upgrading of level indication is not believed necessary. The level is maintained between 64 and 69 percent during normal operation. After a harsh environment exists, during an accident which may disable these level transmitters, accumulator status may be inferred solely by pressure indication.

Implementation Schedule: End of 1987 refueling outage.

D-5 Boric Acid Charging Flow

Required Range: 0 to 110 percent design flow

Category: 2

The flow transmitter used for boric acid charging flow indication is the same transmitter used for high pressure injection flow into the reactor coolant system indication. See Section D-6 for design details and system compliance.

D-6 Flow in HPI System

Required Range:	0 to 110 percent design flow
Category:	2
Existing Design:	The centrifugal charging pumps are the source for high pressure injection into the Reactor Coolant System. A flow transmitter, located at the 25-ft elevation of the Auxiliary Building, is used for flow indication. The flow transmitter and associated instrumentation loop are powered from a Class 1E, battery-backed bus. The flow transmitter is located in an accident/post-accident mild environment; hence, a review per 10 CFR 50.49 for environmental qualification is not required.
Display:	
CR	A dedicated indicator is available on control room Panel C19.
TSC	This parameter may be monitored in the TSC on a CRT display.
EOF	See Footnote a to Table 4-1.
Compliance:	The centrifugal charging pump flow indication complies with Category 2 requirements. The range of flow indication is 0 to 800 gpm. Each centrifugal charging pump is designed to deliver 150 gpm at the design head of 5,800 ft. This provides a range of 0 to 267 percent design flow for the combined pumps' capacity.
Position:	No modifications are necessary.
Implementation Schedule:	Complete.

D-7 Flow in LPI System

Required Range: 0 to 110 percent design flow

Category: 2

Existing Design: Two safety injection pumps are the source for the low pressure injection into the Reactor Coolant System. A flow transmitter is provided on the discharge of each pump for flow measurement. The flow transmitters and associated instrumentation loops are powered from Class 1E battery-backed buses. The flow transmitters are located in an accident/post-accident mild environment in the 5-ft elevation of the Auxiliary Building; hence, a review per 10 CFR 50.49 for environmental qualification is not required.

Display:

CR	A dedicated indicator for each flow transmitter is available on control room Panel C19.
TSC	This parameter may be monitored in the TSC on a CRT display.
EOF	See Footnote a to Table 4-1.

Compliance: The safety injection pump flow indication complies with Category 2 requirements. The range of flow indication is 0 to 800 gpm. Each safety injection pump is designed to provide a maximum operating flow rate of 650 gpm as shown on Updated FSAR Table 6.3-5. This provides a range of 0 to 123 percent design flow.

Position: No modifications are necessary.

Implementation Schedule: Complete.

D-8 Refueling Water Storage Tank Level

Required Range: Top to Bottom

Category: 2 - Regulatory Guide 1.97
1 - Trojan Type A

See A-6 for design information and compliance.

D-9 Reactor Coolant Pump Status

Required Range: Motor current

Category: 3

Existing Design: The four reactor coolant pumps are each powered from a separate breaker on the 12.47-kV buses. Indication of reactor coolant pump status is obtained from ammeters installed at the local motor control centers. These ammeters provide indication of actual current to each reactor coolant pump.

Display:

CR — A dedicated ammeter indicator for each reactor coolant pump is located on control room Panel C12. The range of indication is a 0-400 amps.

TSC — Reactor coolant pump run indication is available in the TSC on a CRT display. This indication is on-off indication instead of motor current indication, which is considered acceptable for TSC functions.

EOF — See Footnote a to Table 4-1.

Compliance: Reactor coolant pump status indication complies with Regulatory Guide 1.97 Category 3 requirements.

Position: No modifications are necessary.

Implementation Schedule: Complete.

D-10 Primary System Safety Relief Valve Positions or Flow-Through or Pressure in Relief Valve Lines

Required Range: Closed - not closed

Category: 2

Existing Design: The pressurizer has three safety valves and two power-operated relief valves (PORVs) for high primary system pressure relief. The safety valves are totally enclosed pop-type, spring-loaded, self-actuated valves. The PORVs are quick-opening valves that are operated automatically or by remote control.

Safety valve position indication is derived from an acoustic flow monitoring system that indicates flow in each individual safety valve discharge line. The Acoustic Flow Monitoring System is composed of three channels, one for each safety valve, that consists of: (a) an accelerometer mounted downstream from the valve; (b) a charge converter, which translates the charge to a voltage signal; and (c) an instrument rack module, located in the control room, which translates the voltage signal into a discrete indication of valve position via light-emitting diodes. The acoustic flow monitoring system is environmentally qualified and is powered from a Class 1E, battery-backed source. This indication system was installed in response to NUREG-0578, Section 2.1.3.a requirements (later covered in NUREG-0737, Item II.D.3).

PORV position indication is obtained from environmentally qualified limit switches mounted on each PORV. These limit switches are used to provide open/closed indication at the remote valve controller in the control room on Panel C12. The PORVs and limit switches receive power from Class 1E, 125-V d-c buses.

Display:

CR: Safety valve and PORV position indication are provided on control room Panel C12. The safety valve display is in the form of vertical light-emitting diodes that light to display valve flow from <1 percent to 100 percent. Open/closed indication for the PORVs is provided on the control room Panel C12 directly above the control switches for these valves.

TSC: This parameter is not available for monitoring at the TSC, although the capability for monitoring was included in the TSC design.

D-10 Primary System Safety Relief Valve Positions or Flow-Through or Pressure in Relief Valve Lines

EOF	See Footnote a to Table 4-1.
Compliance:	The ability to quickly and accurately identify leaking or failed PORVs or safety valves is important. RCS pressure reduction without forced circulation is likely to be accomplished by manual action of the PORVs, and indentification that a PORV has failed to reseat is critical. This system complies with Category 2 requirements, with the exception of the TSC, and the classification as Category 2 is believed appropriate.
Position:	This parameter should be available in the TSC. The software is in place to support its installation.
Implementation Schedule:	End of 1987 refueling outage.

D-11 Pressurizer Level

Required Range: Top to bottom

Category: 1

See A-7 for design information and compliance.

D-12 Pressurizer Heater Status

Required Range: Electric current

Category: 2

Existing Design: The pressurizer is equipped with four pressurizer heater groups labelled A, B, C, and D. Groups A, B, and D are designated the backup heaters, and Group C is the proportional (or control) heaters.

Indication of pressurizer heater status is obtained from ammeter current coils installed at the local motor control centers. The motor control centers are located in an accident/post-accident mild environment in the Plant facade area at the 45-ft elevation; hence, a review per 10 CFR 50.49 for environmental qualification is not required. The power supply is non-1E 480 V a-c to the pressurizer heaters; however, the heaters can also be supplied from the emergency diesel generators. The ammeters indicate which heaters are being supplied with power and also can confirm that the current is within expected limits.

Display:

CR — A dedicated ammeter indicator for each pressurizer heater group is located on control room Panel C13. The range of indication is 0-800 amps.

TSC — Pressurizer heater status indication is not available in the TSC. This parameter was reviewed during the TSC early design stages and it was concluded that it is not critical for performing TSC functions.

EOF — See Footnote a to Table 4-1.

Compliance: Pressurizer heater status indication complies with the intent of Regulatory Guide 1.97 Category 2 requirements. Although the ammeters do not directly measure pressurizer heater status, they do provide assurance that the system is operating normally. This appears to be the intent of Regulatory Guide 1.97 since it allows electric current to be the monitored parameter.

Position: No modifications are necessary.

Implementation Schedule: Complete.

D-13 Quench Tank Level

Required Range:	Top to bottom
Category:	3
Existing Design:	The pressurizer relief tank has one level transmitter located in Containment. The level transmitter and associated instrument loop are powered from a Class 1E, battery-backed source. The level indication covers a range of approximately 6 to 94 percent level. This meets the intent of the Regulatory Guide 1.97 goal of top to bottom.
Display:	
CR	A dedicated indicator is available on control room Panel C13. The indicator displays 0 to 100 percent, which covers the span of 6 to 94 percent level. Recording is not provided or necessary.
TSC	This parameter may be monitored in the TSC on a CRT display.
EOF	See Footnote a to Table 4-1.
Compliance:	The pressurizer relief tank level indication meets Category 3 requirements.
Implementation Schedule:	Complete.

D-14
D-15 Quench Tank Temperature and Pressure

Required Range: 50°F to 750°F and 0 to design pressure

Category: 3

Existing Design: Temperature and pressure indication for the pressurizer relief tank is provided. The temperature RTD and pressure transmitter are located in Containment and are powered from Class 1E, battery-backed sources.

The range of indication is 0°F to 300°F and 0 to 100 psig. The pressurizer relief tank design temperature and pressure are 340°F and 100 psig, respectively. The tank design pressure is conservative as described in Section 5.4 of the Updated FSAR, which states that the tank design pressure is twice the calculated pressure resulting from the maximum design safety valve discharge for a step load decrease of 10 percent.

Pressurizer relief tank pressure indication meets the specified Regulatory Guide 1.97 range of 0 to design pressure, and its classification as a Category 3 parameter is believed appropriate. The temperature indication range of 0°F to 300°F does not meet the specified range of 50°F to 750°F. This required range is not suitable for Trojan due to the pressurizer relief tank design. Rupture disks are installed on the tank and are designed to release pressure at 85 to 100 psig. They have a relief capacity equal to the combined capacity of the pressurizer safety valves. Because of this, tank pressure will not exceed 100 psig.

Should saturation conditions exist in the pressurizer relief tank at design pressure, the maximum temperature would be about 338°F. Per the design basis of this relief tank as described in the FSAR, the maximum expected temperature for the design discharge is only 200°F. Based on this, a range of 50°F to 750°F is excessive and the range of 0°F to 300°F is considered adequate.

Tank level and pressure indication are available and are considered post-accident monitors. Tank temperature indication is available as described above; however, this is not considered a post-accident monitor for Trojan. It is believed that the level and pressure instruments provide sufficient indication of tank status.

D-14 Quench Tank Temperature and Pressure
D-15

Display:

CR	Dedicated indicators are provided on control room Panel C13. Recording is not provided or necessary.
TSC	This parameter may be monitored in the TSC on a CRT display.
EOF	See Footnote a to Table 4-1.

Compliance: Pressurizer relief tank pressure indication complies with Category 3 requirements of Regulatory Guide 1.97. Temperature indication complies with Category 3 requirements with the exception of range; however, as described above, the existing range is considered acceptable since it extends 50 percent beyond the FSAR maximum expected. In addition, tank temperature indication is not considered an important post-accident monitoring parameter since level and pressure indication which meets Regulatory Guide 1.97 is available.

Implementation Schedule: Complete.

D-16 Steam Generator Level

Required Range: From tube sheet to separators

Category: 1

See A-8 for design information and compliance.

D-17 Steam Generator Pressure

Required Range: From atmospheric pressure to 20 percent above the lowest safety valve setting.

Category: 2 - Regulatory Guide 1.97
1 - Trojan Type A

See A-9 for design information and compliance.

D-18 Safety/Relief Valve Positions or Main Steam Flow

Required Range: Closed - not closed

Category: 2

Existing Design: Five safety valves and one air-operated relief valve are installed per main steam line. Two flow transmitters are installed per main steam line for steam flow indication. These main steam flow transmitters are also used in the solid-state protection system to generate protective actuation signals. The main steam flow instrumentation systems are routed in a Class 1E manner up to the isolation device, with indication obtained from the non-Class 1E side of a signal isolator. The main steam flow instrumentation loops are powered from Class 1E, battery-backed buses.

The main steam flow transmitters are located inside Containment and are environmentally qualified. The range of indication is 0 to 4.8×10^6 lb/hr.

Display:

CR: Dedicated indicators for each of the eight transmitters are located on control room Panel C14. In addition, the signal from one transmitter per steam line is recorded on dedicated recorders on control room Panel C05. These recorders are powered from a non-Class 1E source.

TSC: This parameter may be monitored in the TSC on a CRT display.

EOF: See Footnote a to Table 4-1.

Compliance: The system complies with Category 2 requirements.

Position: No modifications are necessary.

Implementation Schedule: Complete.

D-19 Main Feedwater Flow

Required Range:	0 to 110 percent design flow
Category:	3
Existing Design:	Four flow elements, one on each steam generator feed line, are used to monitor main feedwater flow. Each flow element provides signals to two flow transmitters for indication. The instrumentation systems are routed in a Class 1E manner up to the isolation device with indication obtained from the non-Class 1E side of a signal isolator. The instrument loops are powered from Class 1E, battery-backed buses.
Display:	
CR	Dedicated indicators for each flow transmitter are located on control room Panel C14. In addition, flow recorders are available on control room Panel C05. These recorders are powered from a non-Class 1E source.
TSC	This parameter may be monitored in the TSC on a CRT display.
EOF	See Footnote a to Table 4-1.
Compliance:	Main feedwater flow indication complies with Regulatory Guide 1.97 Category 3 requirements. The range of indication is 0 to 4.8×10^6 lb/hr per feed line. For a four-loop system, the design flow rate is consistent with the design steam flow rate of 3.794×10^6 lb/hr per steam line. This provides a range of 0 to 126 percent design flow.
Position:	No modifications are necessary.
Implementation Schedule:	Complete.

D-20 Auxiliary Feedwater Flow

Required Range:	0 to 110 percent design flow
Category:	2
Existing Design:	Four flow elements are used to monitor AFW flow. The four elements provide signals to eight flow transmitters for indication. The existing range is 0-450 gpm per indicator, and the transmitters are environmentally qualified.
Display:	
CR	Indicators for flow to each steam generator are located on control room Panels C05 and C19.
TSC	This parameter may be monitored in the TSC on a CRT display.
EOF	See Footnote a to Table 4-1.
Compliance:	The AFW flow indication complies with Regulatory Guide 1.97 Category 2 requirements. The range of indication is 0 to 450 gpm per steam generator. In the event of loss of offsite power, a total of 440 gpm of AFW flow into two of the four steam generators is required. With a total range of indication of 0 to 900 gpm for two steam generators, this provides a range of 0 to 205 percent design flow.
Position:	AFW flow indication is considered acceptable as is. Flow indication for AFW has been reviewed and resolved by the NRC in accordance with NUREG-0737 Item II.E.1.2, Auxiliary Feedwater System Automatic Initiation and Flow Indication in the NRC Safety Evaluation Report (SER), dated April 8, 1982. This SER concluded that the Trojan AFW flow indication complies with the NRC's long-term safety grade requirements and therefore, is acceptable. Based on the above, the system is reliable as built, and no modifications are necessary.
Implementation Schedule:	Complete.

D-21 Condensate Storage Tank Water Level

Required Range: Plant specific

Category: 1

See A-10 for design information and compliance.

D-22 Contai. ent Spray Flow

Required Range: 0 to 110 percent design flow

Category: 2

Existing Design: Flow transmitters are not installed to monitor spray flow. System operability is verified periodically in accordance with Technical Specification requirements. This periodic surveillance testing verifies that the flow path and the pumps are operable per design requirements.

If Containment spray is necessary, proper system operation can be confirmed by various means. The discharge line of each pump has a pressure transmitter installed. These transmitters are powered from Class 1E, battery-backed sources and are designated as the post-accident monitoring instruments for the Containment spray system. The transmitters are located in an accident/post-accident mild environment; hence, a review per 10 CFR 50.49 for environmental qualification is not required.

Approximately 5 percent of each Containment spray pump discharge is bypassed through a spray additive eductor, where it is used as the motive flow to draw a 30-wt% sodium hydroxide solution from the sodium hydroxide tank. This solution is directed to the spray pump suction and on to Containment to remove any fission-product iodine in the atmosphere. The sodium hydroxide tank has two level transmitters installed, and normal operation of the Containment Spray System can also be inferred from a gradually decreasing tank level. This parameter would be useful during the initial operating phase of the Containment Spray System. Later, when spray pump suction is manually shifted to the Containment recirculation sump, pump discharge pressure indication will be sufficient to verify system operation.

Display:

CR — Dedicated pressure indicators are available on control room Panel C19. The range of indication is 0 to 300 psig. The upper range of indication corresponds to system design pressure. The sodium hydroxide tank levels are available on dedicated indicators located next to the Containment spray pump pressure indicators on control room Panel C19.

TSC — Discharge pressure may be monitored in the TSC on a CRT display.

D-22 Containment Spray Flow

EOF	See Footnote a to Table 4-1.
Compliance:	Since flow transmitters are not installed, this system does not comply with 1.97 requirements; however, the equivalent spray pressure indication is considered adequate to ensure that the spray system is functioning as designed. The pressure transmitters meet Regulatory Guide 1.97 Category 2 qualification requirements.
Position:	It is unnecessary to install flow transmitters when other suitable indication is already available. No modifications are planned.
Implementation Schedule:	Complete.

D-23 Heat Removal by the Containment Fan Heat Removal System

Required Range: Plant specific

Category: 2

Existing Design: The Containment air coolers are divided into two groups of four units each, designated Train A and Train B. Each of the four Train A cooler coils is supplied with component cooling water from the Train A Component Cooling Water System; and each of the four Train A cooler fans is supplied with power from the Train A, 480-V Class 1E, diesel-generator-backed bus. The Train B air cooler units are similarly supplied from Train B sources.

Power to the air cooler fan motors is supplied from a Class 1E electrical system. The air coolers are environmentally qualified.

The air coolers are mounted on foundation platforms at the 208 ft 5 in. elevation of the Containment. The coolers are above the Containment spray headers. The vane-axial fans draw air horizontally across the cooling coils and discharge the cooled air downward into the Containment proper.

The Containment Air Cooler System is provided to limit post-accident Containment pressure to the design value. Under DBA conditions, only three of the eight equal capacity air coolers are required for adequate safety margin cooling. The system is also designed so a single failure of an active component during the injection or recirculation phases will not degrade the system's ability to fulfill the design objectives.

Display:

CR — Indicators are available on control room Panel C17 for each of the Containment air coolers. The indicators are on/off status lamps that are energized from 125-V d-c control power located in the respective load center that supplies 480-V a-c power to the air cooler fan motors. Run indication is also available on the safety injection status panel on control room Panel C19. This indication is also energized in the same manner as the lamps on C17.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

D-23 Heat Removal by the Containment Fan Heat Removal System

Compliance: The Containment air coolers meet Category 2 requirements of Regulatory Guide 1.97.

Position: The Containment fan heat removal system (air coolers) meets Regulatory Guide 1.97 Category 2 requirements, and no modifications to this system are planned.

In addition to Containment air cooler fan motor on/off status lights, a backup means of verifying heat removal by the Containment fan heat removal system is provided by the monitoring of component cooling water (CCW) flow and CCW inlet and outlet temperatures. In this way, a heat balance may be performed across the Containment air coolers, as CCW is the only means of cooling them. In addition, the operators will be observing the decrease in Containment atmosphere pressure and temperature which result from the removal of thermal energy from the inside to the outside of Containment. These observations, together with cooler fan motor operation indications, provide adequate evidence of Containment heat removal by the Containment fan heat removal system.

Implementation Schedule: Complete.

D-24 Containment Atmosphere Temperature

Required Range: 40°F-400°F

Category: 2

Existing Design: RTD temperature sensors are located throughout Containment to provide ambient temperature measurement. The RTDs and associated instrument loops are non-Class 1E and are powered from a non-Class 1E 120-V a-c power source. The power source can be supplied from the emergency diesel generator for backup capability.

The RTDs and cabling in Containment are not environmentally qualified. The range of control room indication is 0°F to 300°F.

Display:

CR — A single multi-point indicator is used for display in the control room. By selection of the appropriate toggle switch, the desired RTD temperature is displayed on control room Panel C17.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: The Containment atmosphere temperature measurement system has the following deviations from Regulatory Guide 1.97 Category 2 criteria:

1. The RTDs and cable are not environmentally qualified.

2. The existing range of indication (0°F to 300°F) does not match the specified range of 40°F to 400°F.

Position: The Containment air temperature RTDs and cabling should be upgraded to be environmentally qualified. It should not be necessary to upgrade all RTDs and cable since redundancy is not required. One RTD is sufficient to provide a representative atmospheric temperature. It should be noted that redundancy is not required for Category 2 equipment.

Upgrading of the indicator to provide a display range of 40°F to 400°F should not be required. The design basis accident maximum stable Containment temperature is 288°F, which is consistent with the existing range of 0°F to 300°F.

D-24 Containment Atmosphere Temperature

Implementation Schedule: End of 1987 refueling outage.

D-25 Containment Sump Water Temperature

Required Range: 50°F to 250°F

Category: 2

Position: Containment sump water temperature indication has not been specifically included in the Trojan design. Regulatory Guide 1.97 states that the purpose of this parameter is "to monitor operation." It is not believed that this parameter is necessary or would provide useful indication if available. The accomplishment of Containment cooling can be directly evaluated by monitoring of Containment atmosphere temperature indication (D-24). As noted in D-24, one RTD in Containment will be replaced with an environmentally qualified RTD.

Since Regulatory Guide 1.97 is not especially specific regarding the purpose of Containment sump temperature indication, a review has also been performed to confirm that all equipment which takes a suction on the Containment recirculation sump is capable of operating under these temperature limits. The RHR pumps and the Containment spray pumps can take a suction on this sump for long-term operation. As discussed in Updated FSAR Section 6.3 (RHR pumps), and Section 6.5 (Containment spray pumps), these pumps are capable of operation under all expected conditions.

RTDs are located on the discharge of each RHR pump, and this indication is recorded on control room Panel C13 on dual pen recorders, with the second pen recording residual heat exchanger outlet temperature. These RTDs would provide some indication of Containment sump temperature; however, credit is not taken for this since the RHR pumps operate with suction taken from the refueling water storage tank during the initial phase of an accident. These RTDs would only be useful later when suction was shifted to the Containment recirculation sump.

Since other indication of Containment conditions is available and since this parameter does not serve any specific accident or post-accident function, it is not intended to install additional RTDs in the Containment sump. No modifications are intended.

D-26 Makeup Flow - In

Required Range: 0 to 110 percent design flow

Category: 2

Existing Design: Makeup flow indication is obtained from a flow transmitter located on the 25-ft elevation of the Auxiliary Building. The transmitter and associated instrument loop are powered from a Class 1E, battery-backed bus. The transmitters are located in an accident/post-accident mild environment; hence, a review per 10 CFR 50.49 for environmental qualification is not required.

Display:

CR: A dedicated indicator is provided on control room Panel C12. The range of indication is 0 to 200 gpm.

TSC: This parameter may be monitored in the TSC on a CRT display.

EOF: See Footnote a to Table 4-1.

Compliance: Makeup flow indication complies with Regulatory Guide 1.97 requirements. As shown on Updated FSAR Table 9.3-7, maximum makeup charging flow is 100 gpm. The range of indication is 0 to 200 gpm. This provides a range of 0 to 200 percent design flow.

Position: Makeup flow is a required parameter for post-accident monitoring. The Trojan Emergency Instructions require reestablishing makeup and letdown for natural circulation cooldown and safety injection termination following a LOCA, loss of secondary coolant, or steam generator tube rupture.

The system complies with Category 2 requirements, so no modifications are necessary.

Implementation Schedule: Complete.

D-27 Letdown Flow - Out

Required Range:	0 to 110 percent design flow
Category:	2
Existing Design:	Letdown flow indication is obtained from a flow transmitter located in the 45-ft elevation of the Auxiliary Building. The transmitter and associated instrument loop are powered from a Class 1E, battery-backed bus. The transmitters are located in an accident/post-accident mild environment; hence, a review per 10 CFR 50.49 for environmental qualification is not required.
Display:	
CR	A dedicated indicator is provided on control room Panel C12. The range of indication is 0 to 200 gpm.
TSC	This parameter may be monitored in the TSC on a CRT display.
EOF	See Footnote a to Table 4-1.
Compliance:	Letdown flow indication complies with Regulatory Guide 1.97 requirements. As shown in Updated FSAR Table 9.3-7, maximum letdown flow is 120 gpm. The range of indication is 0 to 200 gpm. This provides a range of 0 to 167 percent design flow.
Position:	Letdown flow is a required parameter for post-accident monitoring. The Trojan Emergency Instructions require reestablishing makeup and letdown for natural circulation cooldown and safety injection termination following a LOCA, loss of secondary coolant, or steam generator tube rupture. The system complies with Category 2 requirements, so no modifications are necessary.
Implementation Schedule:	Complete.

D-28 Volume Control Tank Level

Required Range: Top to bottom

Category: 2

Existing Design: Two level transmitters are provided for indication of volume control tank (VCT) level. Both transmitters and associated indicator instrument loops are powered from Class 1E, battery-backed sources. One level transmitter is located in an accident/post-accident mild environment; hence, a review per 10 CFR 50.49 for environmental qualification is not required. The backup level transmitter is located in a harsh environment and is not environmentally qualified.

Display:

CR — Dedicated indicators are available on control room Panels C02 and C12. The indicators' range of display is 0 to 100 percent level, which covers a span of 70 inches from about 18 to 82 percent volume. The displays are continuously available.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: The VCT level indication system complies with the requirements for Regulatory Guide 1.97 Category 2 instrumentation with the exception of range. The range of indication from 18 to 82 percent volume is considered adequate to perform the primary function of monitoring operation of the volume control tank. Two level channels govern the water inventory in the VCT. These channels provide local and remote level indication, level alarms, level control, makeup control, and emergency makeup control. The normal operating range for the VCT is automatically controlled between 41 and 54 percent level by the level control channels.

If the VCT level rises above the normal operating range (54 percent level), a three-way control valve automatically diverts part of the letdown flow from the VCT to the holdup tanks. If the automatic control circuit fails and the VCT level continues to rise to the 90 percent level, a high-level alarm will alert the operator to the malfunction and the letdown flow can be manually diverted to the holdup tanks. If no action is taken by the operator and the tank level continues to rise to the 93 percent level, the entire letdown flow will be automatically diverted to protect the tank from an overpressure condition.

D-28 Volume Control Tank Level

During normal operation, a low level (41 percent level) in the VCT initiates automatic makeup into the VCT. When the VCT is restored to normal, automatic makeup stops. If the automatic makeup fails and the tank level continues to decrease to the 17 percent level, a low-level alarm is actuated. Manual action may correct the situation or if the level continues to decrease to the 1.4 percent level, makeup to the VCT is supplied directly from the refueling water storage tank and outlet flow from the VCT is stopped.

Position: No modifications are necessary. VCT level complies with Category 2 requirements with the exception of range. The available range of 18 to 82 percent is adequate to ensure that the automatic level control system is operating correctly.

Implementation Schedule: Complete.

D-29 Component Cooling Water Temperature to ESF System

Required Range: 40°F to 200°F

Category: 2

Existing Design: A platinum RTD is located on the outlet of each component cooling water (CCW) heat exchanger in the 45-ft elevation of the Fuel Building. These RTDs indicate CCW temperature to ESF systems.

The RTDs and associated instrumentation loop are powered from non-Class 1E 120-V buses; however, these buses can also be powered from the emergency diesel generators. The range of indication is 0°F-300°F. The RTDs are located in an accident/post-accident mild environment; hence, a review per 10 CFR 50.49 for environmental qualification is not required.

Display:

CR — Temperature indicators are available on control room Panel C18. Each heat exchanger outlet temperature is displayed on a separate indicator; however, these indicators are not dedicated to these RTDs. Each indicator may indicate one of eight RTD inputs, of which CCW heat exchanger outlet temperature is one of the eight possible inputs.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: CCW temperature indication complies with Category 2 requirements. Indication may be continuous; however, this depends upon operators and their decision regarding which parameters are more important to monitor.

Position: No modifications are necessary.

Implementation Schedule: Complete.

D-30 Component Cooling Water Flow to ESF System

Required Range: 0 to 110 percent design flow

Category: 2

Existing Design: Component cooling water flow to ESF system components is not indicated in the control room. This parameter is not considered necessary for Trojan, based upon the following Plant-specific design features:

1. The Component Cooling Water (CCW) System is normally operating with one CCW pump and heat exchanger in continuous operation, supplying flow to ESF and non-ESF loads. The other train of CCW is maintained in a standby condition. During normal operation, cooling water is not required for the RHR heat exchangers, and the valves in the lines to these heat exchangers are closed; however, annunciation is available in the control room to indicate a low flow condition.

   Since the CCW system is in operation prior to an accident, there is assurance that flow to ESF components during and after an accident would be as designed and expected.

2. CCW pump and heat exchanger performance is indicated by means of pressure transmitters and RTDs. Each train of CCW has a pressure transmitter installed in the pump discharge line. A dedicated indicator for each pressure transmitter is located on control room Panel C18. The range of indication is 0 to 200 psig, which extends to 111 percent of CCW pump design pressure as specified in the Updated FSAR Section 9.2. Verification of flow in each CCW pump discharge line could also be confirmed by comparing CCW heat exchanger inlet and outlet temperatures. These temperatures are available on control room Panel C18 also.

3. A Plant Periodic Operating Test (performed quarterly) checks flow (using local indicators) in the CCW lines going to the components in Containment and to the RHR heat exchangers. This test confirms that the system continues to function as designed.

4. In accordance with the Plant Technical Specifications, two CCW loops are demonstrated to be operable at least once per 31 days by verifying that each valve (manual, power-operated, or automatic) servicing safety-related equipment that is not locked, sealed, or otherwise secured in position is in its correct position.

D-30 Component Cooling Water Flow to ESF System

CCW flow indication to ESF components should not be required for Trojan. Compliance with this section of Regulatory Guide 1.97 would require the installation of many flow transmitters and associated electrical equipment at significant expense and negligible gain in safety. For these reasons, no modifications are planned.

D-31 High-Level Radioactive Liquid Tank Level

Required Range:	Top to bottom
Category:	3
Existing Design:	The reactor coolant drain tank (RCDT) at the 42-ft elevation of the Containment inside the recirculation sump normally collects contaminated drainage that originates within the Containment. A level transmitter is located inside the Containment for RCDT level indication. The level transmitter and associated instrument loop are powered from a non-Class 1E power source; however, this source can also be energized from the emergency diesel generators. The range of indication is approximately 13.6 to 100 percent level.
Display:	
CR	A dedicated indicator is located on control room Panel C17. The span of indication is 0 to 100 percent, which corresponds to an actual range of approximately 13.6 to 100 percent level.
TSC	This parameter may be monitored in the TSC on a CRT display.
EOF	See Footnote a to Table 4-1.
Compliance	RCDT level indication complies with Category 3 requirements with the exception of range. The specified range is top to bottom, whereas the actual range is 13.6 to 100 percent level.
Position	The system is believed to be adequate as designed and meets the intent of Regulatory Guide 1.97 as a Category 3 post-accident monitor. No change to the range of level indication is required since it is adequate to confirm storage capacity. Upper level indication is considered more significant than the lower level and the existing range does extend to the top. Based on this, no modifications are necessary.
Implementation Schedule:	Complete.

D-32 Radioactive Gas Holdup Tank Pressure

Required Range: 0 to 150 percent design pressure

Category: 3

Existing Design: The gas collection system is designed to process gaseous wastes that may contain appreciable amounts of radioactive fission product gases and hydrogen. Gases are collected via a gas collection header by the waste gas surge tank at the 61-ft elevation of the Auxiliary Building, which is designed as a storage point for transient gas volumes in excess of waste gas compressor capacity.

The system is designed to work automatically, with the waste gas compressors taking a suction on the waste gas surge tank as shown in Updated FSAR Figure 11.3-4. These compressors discharge to four waste gas decay tanks located at the 61-ft elevation of the Auxiliary Building for storage.

Each waste gas decay tank and the waste gas surge tank have a pressure transmitter for pressure indication. The waste gas surge tank pressure transmitter is located in a post-accident harsh environment, and the waste gas decay tank pressure transmitters are located in a post-accident mild environment. The pressure transmitters and associated instrument loops are powered from non-Class 1E power sources; however, they can also be energized from the emergency diesel generators.

The range of pressure indication is 0 to 200 psig for the waste gas decay tanks, and their design pressure is 125 psig. The range of pressure indication for the waste gas surge tank is 0-20 psig. The design pressure of this tank is 50 psig; however, an installed relief valve set at 20 psig assures that tank pressure cannot exceed 20 psig. In addition, the system is designed to maintain waste gas surge tank pressure between 0.5 and 2.0 psig by diverting some flow back to the compressor suction, if necessary.

Display:

CR A dedicated indicator for waste gas surge tank pressure indication is available on control room Panel C12. Waste gas decay tank pressure indication is available on control room Panel C16 on the Plant computer CRT.

D-32 Radioactive Gas Holdup Tank Pressure

TSC	Since total system capacity is of concern for TSC functions, only the four waste gas decay tanks are available for monitoring in the TSC.
EOF	See Footnote a to Table 4-1.
Compliance:	Waste gas decay tank pressure indication complies with Category 3 requirements. It is also believed that waste gas surge tank pressure complies with Category 3 requirements. This is based on the system design that maintains 0.5 to 2.0 psig at the compressor suction.
Position:	No modifications are necessary.
Implementation Schedule:	Complete.

D-33 Emergency Ventilation Damper Position

Required Range:	Open/closed status
Category:	2
Existing Design	The control room emergency ventilation system (CB-1) is designed to provide the cooling, filtration, and ventilation required to maintain habitability of the control room and integrity of the equipment in the control room under conditions of contamination of the outdoor air with such things as chlorine, smoke, or airborne radioactive material. Power supplies to system components, including the emergency ventilation dampers, are designed as Class 1E systems. The system is located in an accident/post-accident mild environment in the Control Building; hence, a review for environmental qualification per 10 CFR 50.49 is not required.
Display:	
CR	Emergency ventilation damper position is displayed on control room Panel C17 as open/closed indication.
TSC	Emergency ventilation damper position indication has not been provided for the TSC since this parameter is not important for performing TSC functions.
EOF	See Footnote a to Table 4-1.
Compliance:	Emergency ventilation damper position complies with Category 2 requirements.
Position:	No modifications are necessary.
Implementation Schedule:	Complete.

D-34 Status of Standby Power and Other Energy Sources Important to Safety

Required Range: Voltages, currents, pressures - Plant specific

Category: 2

Existing Design: Standby power and other energy sources important to safety are indicated or annunciated on control room Panel C11.

The following parameters are continuously monitored on this panel:

Emergency Diesel Generator 1 - kilowatts
Emergency Diesel Generator 1 - kilovars
Emergency Diesel Generator 1 - hertz
Emergency Diesel Generator 1 - rpm

Emergency Diesel Generator 2 - kilowatts
Emergency Diesel Generator 2 - kilovars
Emergency Diesel Generator 2 - hertz
Emergency Diesel Generator 2 - rpm

4.16-kV Bus A1 - volts
4.16-kV Bus A1 - amperes
4.16-kV Bus A2 - volts
4.16-kV Bus A2 - amperes

4.16-kV Bus A5 - volts
4.16-kV Bus A5 - amperes
4.16-kV Bus A6 - volts
4.16-kV Bus A6 - amperes

480-V Bus B01 - amperes
480-V Bus B02 - amperes
480-V Bus B03 - amperes
480-V Bus B04 - amperes

The following parameters are annunciated on this panel:

4.16-kV bus faults
4.16-kV bus breaker trips
480-V bus feeder breaker trips
4.16-kV buses undervoltage
4.16-kV buses 80 percent voltage
Battery buses failure/undervoltage/ground
Preferred instrument buses undervoltage

The following parameters are annunciated above control room Panel C41:

Emergency diesel generator not ready for auto start
Emergency diesel generator field overexcited

Emergency diesel generator output breaker auto-close and trip
Emergency diesel generator voltage unbalance
Emergency diesel generator motoring
Emergency diesel generator trouble.

The following parameters are indicated or annunciated on control room Panel C17:

Emergency diesel generator fuel oil day tank level (continuous indication)
Emergency diesel generator fuel oil day tank high/low level (annunciation)

All instruments are powered from their associated bus, and all ranges are consistent with the design maximum and minimum values. The instruments are located in an accident/post-accident mild environment; hence, a review per 10 CFR 50.49 for environmental qualification is not required.

Display:

CR — The indicators are located on control room Panel C11, with the annunciators located above this panel. Emergency diesel generator fuel oil day tank level indication is located on control room Panel C17. Other annunciators are also located above Panels C17 and C41.

TSC — Whereas the control room design provides the operators with indication and annunciation, the TSC design provides only the annunciation inputs so that abnormal conditions are noted. This design concept is consistent with the TSC functions.

EOF — See Footnote a to Table 4-1.

Compliance: Regulatory Guide 1.97 specifies that status indication should be available for all standby power a-c buses, d-c buses, inverter output buses, and pneumatic supplies. The existing system at Trojan does not fulfill this requirement for the d-c buses, preferred instrument buses, and portions of the emergency diesel generators. As noted above, only abnormal conditions are annunciated.

D-34 Status of Standby Power and Other Energy Sources Important to Safety

Position: The existing displays for the 4.16-kV and the 480-V buses are considered acceptable for post-accident monitoring purposes. Status of d-c buses and preferred instrument 120-V buses is not indicated in the control room; however, the annunciators alone are considered adequate to ensure these buses are available. This review did conclude that station battery breaker position should be indicated or annunciated since it is possible to have these breakers open without control room knowledge. In this case, a loss of offsite power could result in a station blackout since field flash for the emergency diesel generators would also be lost. RDC 81-057 has been written for this purpose and should suitably resolve this item.

With the above RDC completed, it is believed that the status indication of standby power supplies will be adequate.

Implementation Schedule: End of 1986 refueling outage.

E-1 Containment Area Radiation

Required Range: 1 to 10^7 R/hr (E-1)
1 to 10^4 R/hr (C-7)

Category: 1

Existing Design: Two in-Containment area radiation monitors are located on opposite sides of the Containment at the 106- and 136-ft levels. The monitors are environmentally and seismically qualified systems; however, the system was not installed in an environmentally qualified configuration. The system is powered from Class 1E battery-backed buses. The range of indication is 1-10^7 R/hr with an energy response from 60 keV to 3 MeV, with an accuracy of ±20 percent for photons of 100 keV to 3 MeV. The system meets single-failure criteria with the exception of environmental qualification, which is discussed below. Indication ambiguity due to a failed channel may be resolved by means of an installed electronic check source circuit which verifies operability of each system from the detector to the display. The electronic check source is actuated from the control room at the respective indication units on Panel C09.

Display:

CR — Containment area radiation is indicated and recorded on both trains of the post-accident monitoring Panel C09. The range of indication is 1-10^7 R/hr for each indicator and recorder.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: The Containment area radiation monitors were installed in accordance with NUREG-0737 II.F.1.3 requirements. The monitors comply with Category 1 requirements, with the exception of the environmental qualification of the detector to cable connectors. In a test being sponsored by another utility and scheduled to be completed in March 1985, the environmental qualification of RTV sealed connectors is being verified. If the test is successful, the PGE connectors will be sealed with RTV by the end of the 1985 refueling outage to complete the environmental qualification of this variable. In the event the qualification test proves unsuccessful, the cable and/or detectors will be replaced with an environmentally qualified system by the end of the 1986 refueling outage.

E-1 Containment Area Radiation

Position: With the exception of environmental qualification, the Containment area radiation monitors comply with Regulatory Guide 1.97 requirements. The environmental qualification of the monitors should be upgraded.

Implementation Schedule: End of 1986 refueling outage.

E-2 Radiation Exposure Rate - Inside Buildings Or Areas Where Access Is Required To Service

Required Range: 10^{-1} to 10^{4} R/hr with a dose rate exposure accuracy within a factor of 2 over the energy range of 60 keV to 3 MeV.

Category: 3

Existing Design: Fixed area radiation monitors are located throughout the Plant, as shown on Updated FSAR Figures 12.3-3 through 12.3-7. The monitors and associated instrumentation are powered from a Class 1E, battery-backed source. The range of indication is 10^{-1} mR/hr to 10^{7} mR/hr with an energy response accuracy of $\pm$10 percent from 80 keV to 3 MeV as shown on Updated FSAR Table 12.3-3.

Display:

CR — A dedicated ratemeter for each area radiation monitor is available on control room Panel C20. Each monitor is also recorded on a 24-point recorder located on control room Panel C20.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: The area radiation monitors comply with Regulatory Guide 1.97 Category 3 requirements with the exception of energy response range.

Position: The existing monitors have an accuracy of $\pm$10 percent over an energy range of 80 keV to 3 MeV. This does not meet the required lower range of 60 keV; however, this is considered to be a very minor deviation. For this reason, no modifications are planned.

Implementation Schedule: Complete.

E-3 Noble Gases and Vent Flow Rate

Required Range: Varies

Category: 2

Effluent radioactivity monitoring of noble gases, particulates, and halogens has previously been addressed in NUREG-0737, Item II.F.1.1, Noble Gas Effluent Monitor, and Item II.F.1.2, Sampling and Analysis of Plant Effluents.

Since this item has received extensive review per NUREG-0737, it is not addressed in detail in this report. Any additional review will be completed in accordance with NUREG-0737.

E-4 Particulates and Halogens

Required Range: 10^{-3} to 10^{2} µCi/cc
0 to 110 percent vent design flow

Category: 3

Effluent radioactivity monitoring of noble gases, particulates, and halogens has previously been addressed in NUREG-0737, Item II.F.1.1, Noble Gas Effluent Monitor, and Item II.F.1.2, Sampling and Analysis of Plant Effluents.

Since this item has received extensive review per NUREG-0737, it is not addressed in detail in this report. Any additional review will be completed in accordance with NUREG-0737.

E-5 Airborne Radiohalogens and Particulates (Portable Sampling With On-Site Analysis Capability)

Required Range: 10^{-9} to 10^{-3} µCi/cc

Category: 3

Existing Design: Portable sampling capability is provided by portable a-c and d-c powered low-volume air samplers. Samples are taken through filtering paper and a silver zeolite or charcoal cartridge.

Onsite analysis capability consists of two germanium-type semiconductor detectors used in conjunction with a Nuclear Data 6600 series computer spectrum analyzer. Minimum detectable levels are 10^{-12} µCi/cc and 10^{-11} µCi/cc for radioiodine and particulate samples, respectively. (Reference Updated FSAR Table 11.5-4.)

The Post-Accident Sampling System (described in PGE to NRC letters of December 17, 1982 and November 16, 1983) is designed to obtain and analyze samples of Containment atmosphere radiohalogens and particulates with Regulatory Guide 1.4 source terms, which are substantially higher than 10^{-3} µCi/cc. Therefore, the analysis capability is adequate to detect up to 10^{-3} µCi/cc in air for portable air sampling.

Compliance: The system as described above meets the Regulatory Guide 1.97 specified ranges and Category 3 requirements.

Position: The existing system is acceptable as designed; no further modifications are necessary.

Implementation Schedule: Complete.

E-6 Plant and Environs Radiation (Portable Instrumentation)

Required Range: 10^{-3} to 10^{4} R/hr, photons
10^{-3} to 10^{4} rads/hr, beta radiations and low-energy photons

Category: 3

Existing Design: Existing portable instrumentation consists of:

Low-range γ: Eberline E-520
[5×10^{-5} to 2.0 R/hr, γ]

Low-range ß: Eberline E-530
[2.5×10^{-4} to 1.0 rad/hr, ß]

High-range ß-γ: Eberline RO-2A
[5×10^{-4} R/hr to 5×10^{1} R/hr, γ]
[2×10^{-3} rads/hr to 2×10^{2} rads/hr, ß]

High-range γ: Teletector
[10^{-4} to 10^{3} R/hr, γ]

Very high-range γ: Eberline RO-7
[0.05 to 2×10^{4} R/hr, γ]
[0.05 to 2×10^{4} rads/hr, ß]

Very high-range γ: PIC-6A
[1×10^{-3} to 10^{3} R/hr, γ]

Compliance: The existing instrumentation complies with the required ranges in Regulatory Guide 1.97 and meets Category 3 requirements.

Position: The existing equipment is acceptable; no further changes are necessary.

Implementation Schedule: Complete.

E-7 Plant and Environs Radioactivity (Portable Instrumentation)

Required Range: Isotopic Analysis

Category: 3

Existing Design: Analysis of airborne radioiodine levels in the environs will be determined by taking grab samples of air through filter paper and a silver zeolite or charcoal cartridge using a portable air sampler. The radioiodine levels will be determined by analyzing the cartridges with an Eberline SAM-2 portable two-channel gamma analyzer with a NaI detector. The SAM-2 has a minimum detectable level for I-131 of less than 1×10^{-7} µCi/cc.

Compliance: Regulatory Guide 1.97 references a statement from an article in International Symposium on Environmental Monitoring (IEEE Catalog No. 75-CH 1004-1, 1976) that "A portable multi-channel gamma ray spectrometer would provide the earliest capability for scoping the radionuclide content of the source." While the portable instrumentation described above can measure only radioiodine in the air, the onsite analysis capability described in E-5 provides for detailed analysis of both radioiodine and particulates in air. The combination of these two methods provides adequate capability in this area to meet the intent of Regulatory Guide 1.97.

Position: The existing system is acceptable; no further modifications are necessary.

Implementation Schedule: Complete.

E-8 Meteorological Monitoring

Regulatory Guide 1.97 Required Ranges:

Wind Speed	0 to 22 mps (50 mph) ±0.2 mps (0.5 mph) accuracy for wind speeds less than 2 mps (5 mph) with a starting threshold of less than 0.4 mps (1.0 mph) and a distance constant not to exceed 2 meters.
Wind Direction	0 to 360 degrees (±5-degree accuracy with a deflection of 10 degrees) Starting speed of 0.4 mps (1.0 mph) Damping ratio ≥ 0.4, distance ≤ 2 meters
Estimation of Atmospheric Stability	Based on vertical temperature difference from primary meteorological system, -5°C to 10°C (-9°F to 18°F) and ±0.15°C accuracy per 50-meter intervals (±0.3°F accuracy per 164-ft intervals) or analogous range for alternative stability estimates.

Trojan Existing Ranges:

Wind Speed	0 to 125 mph ±0.25-mph accuracy with a starting threshold of 0.75 mph and a response distance of 18 ft. System accuracy is ±0.41 mph.
Wind Direction	0 to 360° ±2.5 degrees with a resolution of 0.36 degrees. Starting speed is 0.75 mph and damping ratio is 0.5 to 0.6 with a delay distance of 4 ft. System accuracy is ±3.1 degrees.
Estimation of Atmospheric Stability	Temperature differences of 33 to 200 ft and 33 to 500 ft over an operating temperature range of -30°C to +50°C with an overall system accuracy of ±0.09°C.

Category: 3

Existing Design: As described in Section 2.3 of the Updated FSAR and shown on Updated FSAR Figure 2.3-20, two meteorology towers are located at the Trojan site. A 33-ft tower contains instrumentation for wind speed and direction and a 500-ft tower contains instrumentation for wind speed and direction, temperature, and temperature difference. This instrumentation is powered from offsite power.

Display:

CR	Indication for these parameters is located on control room Panels C34 and C35. These panels are located in

E-8 Meteorological Monitoring

the rear of the control room as shown on Updated FSAR Figure 7.7-10. All parameters are recorded on two-channel Esterline-Angus Model C11525 recorders. Signals are also directed to a data logger located on C34.

TSC — This parameter may be monitored in the TSC on a CRT display.

EOF — See Footnote a to Table 4-1.

Compliance: As shown above, the available ranges meet the Regulatory Guide 1.97-specified ranges; however, there are minor deviations in system accuracy/response characteristics. As can be seen, these deviations are minor and will not impact system reliability.

Supplement 1 to NUREG-0737 states:

"No changes in existing meteorological monitoring systems are necessary if they have historically provided reliable indication of these variables that are representative of meteorological conditions in the vicinity (up to about 10 miles) of the Plant site."

At Trojan, the effect of the topographic features within 10 miles of the site on airflow trajectories and dilution is quite significant. As described in Updated FSAR Section 2.3, the Trojan Nuclear Plant is located in the Columbia River Valley, which at this location is in a general north-south orientation. North of the Plant site the Columbia River bends to the northwest, and south of the site the river bends to the southeast. Within the immediate vicinity of the Plant site there is a bluff 1/4 mile to the west rising sharply 400 to 500 ft. North of the Containment area there is a wooded hill which rises to 100 ft. The remaining area in the immediate vicinity of the Plant site is relatively flat and low. The Columbia River Valley is approximately 2 miles wide at the Plant site and widens to 3 miles north of the site at Longview-Kelso. The valley walls at the Plant site rise to an elevation of 1,000 ft mean sea level (MSL) within approximately 1.8 miles to the west and not quite so high to the east. Analyses of annual wind roses in Updated FSAR Section 2.3 reveal that the predominant wind flow is in a north-south direction at Trojan. Winds within the Columbia River Valley will be effectively channeled and therefore are expected to follow the changing orientation of this valley.

E-8 Meteorological Monitoring

Therefore, wind speed and direction data obtained from the on-site meteorological instrumentation described above can be used, along with the valley terrain features, to obtain a reliable indication of meteorological conditions representative of those within 10 miles of the Plant site. Furthermore, the aim of Regulatory Guide 1.97 is to provide instrument readings useful during accident conditions. In order to envelope any meteorological uncertainties in evaluations of offsite radiation doses, public protective actions, if required, are carried out in all 22-1/2° sectors out to the prescribed distance.

Thus, the current meteorological instrumentation system meets the intent of Regulatory Guide 1.97.

In addition, as required by Supplement 1 to NUREG-0737, information on meteorological conditions for the region surrounding the Trojan site is available from the National Weather Service (NWS) via the Portland Forecast Office. Procedures for obtaining NWS data are contained in the Trojan Radiological Emergency Plan and Implementing Procedures.

Position: The existing system is acceptable as designed. No further modifications are necessary.

Implementation Schedule: Complete.

E-10 Accident Sampling Capability (Analysis Capability Onsite)

Required Range: Grab sample (primary coolant and sump; Containment air)

Category: 3

Existing Design: A Post-Accident Sampling System (PASS) has been installed at Trojan in accordance with NUREG-0737, Item II.B.3 requirements. On August 15, 1983 the NRC issued a Safety Evaluation Report approving the PASS design.

Position: The acceptability of this system per NUREG-0737 requirements is considered adequate to satisfy Regulatory Guide 1.97 requirements.