PUBLIC SERVICE COMPANY OF COLORADO

FORT ST. VRAIN NUCLEAR GENERATING STATION

FORM 344 · 22 · 4082

SPECIFICATION COVER SHEET

NO. WS-03-0004

PAGE 1 OF 17

Work Specification: Reevaluation of Plant Protection System Set Points	PLANT ITEM NO'S.

TABLE OF CONTENTS

PAGE SCHEDULE

ATTACHMENTS

ISSUE SUMMARY

ISSUE	PREPARED BY	ENGRG. REVIEW	Q. A. REVIEW	APPROVED BY	DATE	BASIS FOR REVISION
A	Mike Flower	JR Johnson JA Fouyer		M.H. Holmes	2-17-84	Initial Issue

PLANT PROTECTION SYSTEM SET POINT WORK SPECIFICATION

1.0 PURPOSE

10CFR50 Appendix A (General Design Criteria for Nuclear Power Plants) Criterion 13, "Instrumentation and Control", requires that instrumentation be provided to monitor variables and systems important to safety and that controls be provided to maintain these variables and systems within prescribed operating ranges. NRC Regulatory Guide 1.105 "Instrument Set Points" describes a method acceptable to the NRC staff for complying with the Commission's regulations to ensure that the instrument set points in systems important to safety initially are in and remain within the specified limits.

In July, 1983, the NRC informed PSC that ISA Standard S67.04-1982, "Set Points for Nuclear Safety-Related Instrumentation Used in Nuclear Power Plants" would be endorsed by an NRC Regulatory Guide in the near future and should be used as a guide by PSC in reevaluating the Plant Protection System set points for Fort St. Vrain. Revision 2 to Regulatory Guide 1.105, endorsing ISA Standard S67.04-1982, was issued "for comment" in December, 1981.

This work specification provides guidance for the derivation of Plant Protection System (PPS) "Trip Set Points" and "Allowable Values" to ensure compliance with the intent of applicable regulatory requirements.

PSC desires, additionally, to investigate the drift characteristics of the PPS instrument loops to evaluate the propriety of existing surveillance frequency requirements. Should instrument drift history indicate that longer surveillance intervals may be acceptable, a statistical evaluation would be performed to justify this position.

2.0 SCOPE OF WORK

The scope of work includes the following:

a) Derivation of "Trip Set Point" and "Allowable Value" points for the PPS instrument loops shown in Attachment 1.

b) Evaluation of existing PPS instrument surveillance frequency requirements based on historical drift data and other documented surveillance testing. Recommendation for new longer surveillance intervals wherever warranted based upon a statistical evaluation of drift experienced to date. See Attachment 2 for surveillances to be evaluated.

3.0 WORK TO BE PERFORMED

A. "Trip Set Point" and "Allowable Value" Derivation

1. Review system drawings to identify the PPS instrument configuration associated with each PPS set point. (Piping and Instrumentation Diagrams, Control Logic Diagram, Control and Instrumentation Diagrams, Control Schematics, Wiring Diagrams, etc.)

2. Obtain necessary information to document each PPS instrument's operating characteristics with regard to all effects addressed in ISA-S67.04-1982. This may include contacting vendors, searching existing PSC files for documentation, locating previous test data for identical or similar equipment, evaluation of historical data, engineering analysis of equipment characteristics, etc.

3. Field verification of all documentation. This includes verification of location within environmental zones, verification of instrument loop configuration, verification of manufacturer model number, verification of any name plate data with specification information, or any other information pertinent to set point calculations.

4. Obtain information and document PSC Test Equipment Accuracy for all test equipment used in PPS set point calibrations. The test equipment used during each surveillance must be determined and manufacturers specifications identified for that test equipment.

5. Prepare PPS Set Point "Allowable Value" and "Trip Set Point" calculations based on guidelines established in NRC Regulatory Guide 1.105, ISA-S67.04-1982, and the General Instructions contained within this work specification.

6. Prepare a Set Point Calculation File consisting of the following:

   a) Cover Page identifying the set point being evaluated, components in the instrument loop, reference to drawings showing the instrument loop, safety limit or analysis value, allowable value, trip set point.

b) Analysis Value Page (to be supplied by GA Technologies). This will identify the analysis value as referenced in the General Instructions of this work specification. It will contain the analysis value, a brief description of how it was determined, information on all considerations such as transient overshoot or time response that are identified in the ISA Standard and included in the analysis to determine the analysis value.

c) Set Point Calculation Pages showing the step-by-step calculations used in deriving the "Allowable Value" and "Trip Set Point" in accordance with NRC Regulatory Guide 1.105, ISA-SP67.04 1982, and the General Instructions of this work specification.

d) Independent Review Page documenting independent verification of set point calculations completed by a qualified individual.

e) Supporting Documentation consisting of the necessary documentation to verify every item of information used in the calculation.

NOTE: It is PSC's intention to maintain portions of this file as a design document. For this reason, thoroughness and consistency of format will be required.

7. Inform PSC after the completion of any PPS set point calculation that appears to be more restrictive than set points presently used (as identified in PSC's Master Set Point List) such that action may be initiated to justify a less restrictive analysis value or other appropriate action may be taken. This would be in the form of a letter to PSC explaining the problem set point, a copy of the calculation, and any recommendations to alleviate the problem.

8. Prepare a detailed work completion schedule for presentation to the NRC as a basis for the program completion commitment date. It may be necessary to accompany PSC to a meeting with the NRC regional office to present the methodology used in the Set Point Reevaluation Program and discuss the schedule for completing the work.

9. Recommend a work completion tracking method including bi-weekly progress reports to PSC and periodic progress and problem solving meetings with PSC.

B. "Surveillance Frequency" Evaluation

1) Obtain the actual instrument drift data from PPS surveillances and other appropriate surveillance data over the past 2 years. If a definite trend is not identifiable, a larger sample size will be required.

2) Analyze the drift trends of the PPS instruments to determine which PPS instruments may display sufficiently low drift characteristics to justify extending their surveillance intervals. Criteria to consider would include amount of drift experienced, direction of drift, frequency that allowable value is exceeded, other related instrumentation (i.e. second line of defense), etc. (NUREG-1024 may be of assistance)

3) Prepare a formal evaluation based on recognized statistical methods to justify extending the surveillance interval for those PPS Instruments which would be acceptable with a longer interval.

4) Provide a recommended interval for the analyzed surveillances based on your evaluation for submittal to the NRC.

4.0 GENERAL INSTRUCTIONS

It is necessary to make some clarifications and modifications to the step-by-step procedure outlined in ISA-S67.04-1982 for use at FSV. The following general instructions were adopted at a meeting with the NRC:

A. ISA-S67.04-1982, "Set Points For Nuclear Safety-Related Instrumentation Used in Nuclear Power Plants", will be used as guidance in derivation of PPS Instrument Set Points. Most accident analyses at FSV do not identify a "Safety Limit" as defined in this standard and, therefore, an alternate approach is necessary. Other possible conflicting areas exist where the accident analysis already compensates for items specified within the standard.

B. The following simplified model depicts the method discussed with the NRC as an acceptable method for calculating PPS

Instrument Set Points. An explanation of considerations for each area follows:

AREA	SAFETY LIMIT
1	ANALYSIS VALUE
2	ALLOWABLE VALUE
3	TRIP SET POINT

Area 1 is bounded by the "Safety Limit" and the "Analysis Value". The "Analysis Value" exists which represents the set point value used in the computer code for the accident or the associated equipment limit provided by other testing and has been determined to be satisfactory. The code may simulate the transient overshoot, time response of components, etc. and therefore this "Analysis Value" may not represent the most limiting value the set point parameter may achieve. The accident analysis does, however, determine that the consequences of reaching this most limiting value are acceptable. An additional unquantified margin of safety will most likely exist between the most limiting value reached in the computer analysis and the actual safety limit. Developing a "Safety Limit" for derivation of the set point, as inferred in the ISA Standard, is not required. GA Technologies will provide the information concerning this analysis value to be added to the set point calculation package.

Area 2 consists of allowances between the "Analysis Value" and the "Allowable Value" for the following items <u>if not already considered</u> in the accident analysis (i.e., transient overshoot, time response of temperature instruments, are often included in the computer code used for the accident analysis):

1. Accuracy (including drift) of components not tested when the monthly/quarterly surveillance is performed. (Same surveillance used to obtain "As Found/As Left" data.)

2. Test Equipment Accuracy.

3. Process Measurement Accuracy (if not included in computer code for accident analysis).

4. Transient Overshoot (if not included in computer code for accident analysis).

5. Time Response (if not included in computer code for accident analysis).

6. Environmental Effects (if not included in computer code for accident analysis).

Area 3 consists of allowances between the "Allowable Value" and the "Trip Set Point" to account for instrument drift. The instrument drift considered here is determined from the "As Found/As Left" data taken during monthly or quarterly surveillances, vendor specifications, and other test data available. The drift is for the portion of the instrument channel that is tested during the surveillance.

The area below the "Trip Set Point" will be controlled by the surveillance procedures and has no direct implication concerning the safety of any set point providing the set point is always left below the "Trip Set Point" following surveillances.

The methodology outlined in ISA-S67.04-1982, NRC Regulatory Guide 1.105, and the General Instructions of this work specification are intended to give detailed instructions in the derivation of PPS "Trip Set Points" and "Allowable Values". Due to the complexity of some instrumentation involved in the Plant Protection System, it may not be possible to comply verbatim with this methodology. If deviation is unavoidable, it must also be accompanied with a detailed justification for the alternate approach concluding that the intent of the aforementioned guides has been satisfied.

5.0 TERMS AND CONDITIONS

A. Work Manager for this project will be Mr. Mike Flower (303) 571-7372.

B. Invoices should be addressed to:

Mr. H. L. Brey, Manager
Nuclear Engineering Division
Public Service Company of Colorado
2420 West 26th Avenue, Suite 100-D
Denver, Colorado 80211

C. All coordination in this effort involving GA Technologies will be accomplished through PSC personnel.

D. A Quality Assurance Program which complies with 10CFR50 Appendix B and ANSI N45.2 must be in effect and implemented throughout the course of this work. Approval of this QA program is required prior to awarding the contract.

ATTACHMENT 1

Plant Protection System Set Points to be Evaluated

REACTOR SCRAM

FUNCTIONAL UNIT	PRESENT TECHNICAL SPECIFICATION TRIP SETTING
Linear Channel-High, Channels 3, 4, 5	≤140% power
Linear Channel-High, Channels 6, 7, 8	≤140% power
Wide Range Channel-Rate of Neutron Flux Rise High Channel 3, 4, 5	5 DPM
Primary Coolant Moisture	
High Level Monitor	≤67 degrees F Dewpoint
Loop Monitor	≤27 degrees F Dewpoint
Reheat Steam Temperature -High	≤1075 degrees F
Primary Coolant Pressure - Low	≤50 psig below normal, load programmed
Primary Coolant Pressure - High	≤7.5% above normal rated, load programmed
Hot Reheat Header Pressure - Low	≥35 psig
Main Steam Pressure - Low	≥1500 psig
Plant Electrical System-Loss	(to be provided)
High Reactor Building Temperature (Pipe Cavity)	≤325 degrees F

ATTACHMENT 1

Plant Protection System Set Points to be Evaluated

LOOP SHUTDOWN

FUNCTIONAL UNIT	PRESENT TECHNICAL SPECIFICATION TRIP SETTING
Steam Pipe Rupture Under PCRV, Loop 1	≤9 v. dc.
Steam Pipe Rupture Under PCRV, Loop 2	≤9 v. dc.
Steam Pipe Rupture, North Pipe Cavity Loop 1	≤9 v. dc.
Steam Pipe Rupture, South Pipe Cavity Loop 1	≤9 v. dc.
Steam Pipe Rupture, North Pipe Cavity Loop 2	≤9 v. dc.
Steam Pipe Rupture, South Pipe Cavity Loop 2	≤ 9 v. dc.
High Pressure, Pipe Cavity	≤2.5" w.g.
High Temperature, Pipe Cavity	≤130 degrees F
High Pressure, Under PCRV	≤2.5" w.g.
High Temperature, Under PCRV	≤130 degrees F
High Reheat Header Activity, Loop 1	<5 mr/hr Above Background
High Reheat Header Activity, Loop 2	<5 mr/hr Above Background
Low Superheat Header Temperature, Loop 1	≥800 degrees F

ATTACHMENT 1

Plant Protection System Set Points to be Evaluated

LOOP SHUTDOWN (continued)

FUNCTIONAL UNIT	PRESENT TECHNICAL SPECIFICATION TRIP SETTINGS
Low Superheat Header Temperature, Loop 2	≥800 degrees F
High Differential Temp. Between Loop 1 and Loop 2	≤50 degrees F

ATTACHMENT 1

Plant Protection System Set Points to be Evaluated

CIRCULATOR TRIP

FUNCTIONAL UNIT	PRESENT TECHNICAL SPECIFICATION TRIP SETTINGS
Circulator Speed-Low	1910 rpm Below Normal as Programmed by FW Flow
Loop 1, Fixed Feedwater Flow-Low (Both Circulators)	20% of Rated Full Load
Loop 2, Fixed Feedwater Flow-Low (Both Circulators)	20% of Rated Full Load
Loss of Circulator Bearing Water	$\geq$475 psid
Circulator Penetration Trouble	$\leq$810 psig
Circulator Drain Malfunction	$\geq$5 psid
Circulator Speed-High, Steam	$\leq$11,000 rpm
Circulator Seal Malfunction	$\geq$-10"H20, or $\leq$80"H20
Circulator Speed-High, Water	$\leq$8,800 rpm

ATTACHMENT 1

Plant Protection System Set Points to be Evaluated

ROD WITHDRAWAL PROHIBIT

FUNCTIONAL UNIT	PRESENT TECHNICAL SPECIFICATION TRIP SETTINGS
Startup Channel-Low count rate	$\geq$2.5 cps
Linear Channel-Low power RWP (Channels 3, 4 and 5)	$\geq$5%
Linear Channel-Low power RWP (Channels 6, 7 and 8)	$\geq$5%
Linear Channel-High power RWP (Channels 3, 4 and 5)	$\leq$30%
Linear Channel-High power RWP (Channels 6, 7 and 8)	$\leq$30%

ATTACHMENT 2

Surveillance Requirements to be Evaluated

Surveillance	Channel Description	Method
SR 5.4.1.2.1b-m	Linear Power Channel Test	Internal test signal to verify trips and alarms
SR 5.4.1.1.4b-m	Linear Power Channel Test	Internal test signal to verify trips and alarms
SR 5.4.1.1.6e-m	Primary Coolant Moisture Test (all channels)	Verify that each of the eight monitors will alarm on low and high sample flow
SR 5.4.1.1.7a-m	Primary Coolant Moisture Test (High Level Channels)	Trip one high level, one low level channel, pulse another low level channel
SR 5.4.1.1.8b-m	Reheat Steam Temperature Test	Trip channel, verify alarms and indications. Internal test signal to verify trips and alarms
SR 5.4.1.1.9b-m	Primary Coolant Pressure Test	Trip channel, internal test signal to verify trips and alarms
SR 5.4.1.1.10b-m	Circulator Inlet Temperature Test	Trip channel, internal test signal to verify trips and alarms
SR 5.4.1.1.11a-m	Hot Reheat Header Pressure Test	Reduce pressure at sensor to trip channel, verify alarms and indications
SR 5.4.1.1.12a-m	Main Steam Pressure Test	Reduce pressure at sensor to trip channel, verify alarms and indications
SR 5.4.1.1.13a-m	Two Loop Trouble Test	Special test module used to trip channel by energizing e of four appropriate pairs c two-loop trouble relays

ATTACHMENT 2

Surveillance Requirements to be Evaluated

Surveillance	Channel Description	Method
SR 5.4.1.1.14a-m	Plant 480 V Power Loss Test	Trip each channel by applying simulated loss of voltage signal, verify alarms and indications
SR 5.4.1.1.15b-m	High Reactor Building Temperature (Pipe Cavity) Test	Trip channel, verify alarms and indications. Internal test signal to verify trips and alarms
SR 5.4.1.2.1b-m	Steam Pipe Rupture (Pipe Cavity) Test	Pulse test one temperature and pressure channel with another temperature and pressure channel tripped, while simultaneously having two ultrasonic channels tripped
SR 5.4.1.2.1d-m	Steam Pipe Rupture (Pipe Cavity) Test	Pressure switch actuated by pressure applied at sensor
SR 5.4.1.2.1e-m	Steam Pipe Rupture (Pipe Cavity) Test	Temperature switch actuated by heat applied at sensor.
SR 5.4.1.2.1f-m	Steam Pipe Rupture (Pipe Cavity) Test	Internal test signal to adjust ultrasonic trip.
SR 5.4.1.2.1g-m	Steam Pipe Rupture (Pipe Cavity) Test	Trip test signal solenoid valves to verify loop integrity
SR 5.4.1.2.2b-m	Steam Pipe Rupture (Under PCRV) Test	Pulse test one temperature and pressure channel with another temperature and pressure channel tripped while simultaneously having two ultrasonic channels tripped
SR 5.4.1.2.2d-m	Steam Pipe Rupture (Under PCRV) Test	Pressure switch actuated by prssure applied at sensor
SR 5.4.1.2.2e-m	Steam Pipe Rupture (Under PCRV) Test	Temperature switch actuated by heat applied at sensor

ATTACHMENT 2

Surveillance Requirements to be Evaluated

Surveillance	Channel Description	Method
SR 5.4.1.2.2f-m	Steam Pipe Rupture (Under PCRV) Test	Internal test signal to adjust ultrasonic trip
SR 5.4.1.2.2g-m	Steam Pipe Rupture (Under PCRV) Test	Trip test signal solenoid valves verify to loop integrity
SR 5.4.1.2.3a-m	Circulator 1A and 1B Tripped Test	Pulse test and verify proper indications
SR 5.4.1.2.4a-m	Circulator 1C and 1D Tripped Test	Pulse test and verify proper indications
SR 5.4.1.2.5a-m	Steam Generator Penetration Pressure Test	Pressure switches actuated by pressure applied
SR 5.4.1.2.5b-m	Steam Generator Penetration Pressure Test	Pulse test each channel with another channel tripped and verify proper indications
SR 5.4.1.2.6b-m	Reheat Header Activity Test	Pulse test each channel with another channel tripped and verify proper indications
SR 5.4.1.2.7c-m	Superheat Header Temperature Test	Pulse test one channel with another channel tripped and verify proper indications
SR 5.4.1.2.8a-m	Primary Coolant Moisture (Low Level Channels) Test	Trip each channel, verify proper indications
SR 5.4.1.2.8b-m	Primary Coolant Moisture (Low Level Channels) Test	Trip each channel, pulse test other loop to check loop identification
SR 5.4.1.2.9a-m	Primary Coolant Pressure Test	Pulse test one channel with another channel tripped and verify proper indications, both channels
SR 5.4.1.3.1b-m	Circulator Speed-Steam and Water Test	Internal test signal to verify trip settings and indicators

ATTACHMENT 2

Surveillance Requirements to be Evaluated

Surveillance	Channel Description	Method
SR 5.4.1.3.1c-m	Circulator Speed-Steam and Water Test	Pulse test one channel with another channel tripped, and verify proper indications
SR 5.4.1.3.2b-m	Feedwater Flow Test	Internal test signal to verify trip setting and indications
SR 5.4.1.3.2c-m	Feedwater Flow Test	Pulse test one channel with another channel tripped, and verify proper indications
SR 5.4.1.3.3b-m	Circulator Bearing Water Pressure Test	Pulse test one channel with another channel tripped, and verify proper indications
SR 5.4.1.3.4a-m	Circulator Penetration Pressure Test	Pressure switches actuated by pressure applied
SR 5.4.1.3.4b-m	Circulator Penetration Pressure Test	Pulse test one channel with another channel tripped, and verify proper indications
SR 5.4.1.3.5b-m	Circulator Drain Pressure Test	Pulse test one channel with another channel tripped, and verify proper indications
SR 5.4.1.3.6b-m	Circulator Seal Malfunction	Pulse test one channel with another channel tripped, and verify proper indications
SR 5.4.1.4.2b-m	Linear Channel Test	Internal test signal to verify trips and alarms